Focus

Organic Agriculture Programming for Sustainability in Primary Sector of India: Action and Adoption

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Realizing the effects of Conventional System (CS) of agriculture by the stakeholders that are leading to unsustainable trends in productivity of primary industry, society and environment, organic agriculture (OA) is being gradually established as a viable option for sustaining growth of primary sector in India. In this article logical standing of OA as scientific, resources & energy efficient and climate resilient system has been presented with the experimental results and experiences of the farmers. Organic agriculture got significant momentum in India in all direction i.e. production, marketing, research and policy etc. during last 2-3 decades. During this period this has been proved that sufficient organic inputs are available and productivity & profitability remained almost at par with CS, if managed prudently, besides environmental (biodiversity, carbon sequestration) and human health improvement. However, there is need of programming for quantity and quality production of organic produce to meet the increasing indigenous as well as export demand. This programming and its execution will lead to gradual shift on OA, firstly in drylands and later on in irrigated areas, without losing food security. Consortium approach of all stakeholders in policy, research, and market and production is the need for success of this programming.

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Physical science (PS) has done tremendous progress as compared to biological science (BS). The main reason of slow progress in BS is numerous interactions in a biological system due to which any new intervention in that system never gives a calculated results as mostly happened in PS. Therefore, if any approach of PS is applied in BS it may give unexpected results in short/long term. PS is mostly used for secondary industry while BS is for primary industry e.g. agriculture, forestry, fisheries, animal husbandry etc. Therefore, in primary industry any new intervention may give positive or negative effects beyond the calculations. These effects may be visible in short term or in long term when system buffer capacity exhausts. This is being exactly realized all over the globe and in Indian primary industry too. Grow more food campaign that started in 1950s and later on continued with new term green revolution, had the base of technologies for targeted or cure and control approach that are mainly followed in PS e.g. use the synthetic form of nutrients that are found deficient in soil or kill the pest and weed with poisonous pesticides & weedicides. In other words these chemicals were used to cure the problem of food scarcity in Indian agriculture. Although at that time(1950-60) food was in the top agenda in the nation's program and it was done, at war level so nothing is to be criticized as it was need of the time. In late 1970s India achieve self sufficiency in food grain production, However, even after attaining the self sufficiency the use of chemicals was continued, in other words the medicine was continued even after the disease is cured because this has been found an easy short cut to sustain the production and the basic nature of biological system has been continuously ignored that converted remedy into

malady. In 1980s the consequences of disturbance in BS of production with chemicals were becoming visible and the production growth become almost stagnated or in some of the cases following negative trend with several socio-economical and environmental problems. The major reason of this negative trend is the BS of primary industry has been treated like machine in PS.This approach need to be rectified for sustaining the productivity. In the present article this system is described as "conventional system (CS)".

The Unsustainable Trend In Production and Profitability In CS

Productivity of CS that mainly dependent on external inputs e.g chemicals, irrigation, seed, exotic animals etc. gets a stagnation in productivity or in many cases it started following negative trend (Ladha et al., 2003; Timsina & Connor, 2001). This also affected not only the productivity of agriculture per se but also the regenerative capacity of natural resources like soil, sharp decrease in population of beneficial flora and fauna (particularly pollinators), deficiency of micronutrients e.g. Zinc, Iron, Boron etc., resistance in pest to pesticides, secondary salinization (Pingali and Shah, 2001), decline of ground water table (Ambast et al., 2006), decrease in soil organic carbon content (Lal, 2004) etc. are being observed and this is the actual cause of unsustainable trend. In this unsustainable trend even after using more and more external inputs the productivity will not follow to positive trend due to disturbed biological system of production and it cannot be repaired easily as machine in PS but takes very long time to restore. Now after soil health deterioration the more serious thing is that the CS is starting to disturb the life of producer/farmer, by several diseases (cancer, birth of deformed children etc.). Since the end of the 1990s, increased incidence of farmer suicides in India has been the most dramatic outcome of the hopelessness faced by many farmers, due to a combination of factors like high input prices, crop failure, indebtedness, etc. (Mishra, 2007). An estimated 27% of farmers did not like farming because it was not profitable. In all, 40% felt that, given a choice, they would take up some other career.(NSSO,2005 P:11). There are several reports and references on the decreasing productivity of CS and its adverse effects on environments and society and, lower marginal returns with continuous intensification (Gupta & Seth, 2007). Dr M.S.Swaminathan who was the pioneer of green revolution in India has also accepted the need of evergreen revolution described 'Evergreen Revolution,' as the increasing productivity in perpetuity without ecological harm, he laid stress on the 'organic agriculture' which meant cultivation without use of chemical pesticides and 'green agriculture' which meant conservation agriculture with the help of integrated pest management, integrated nutrient supply and integrated natural resource management. Agro forestry system involving fertilizer trees was another component of evergreen revolution(Swaminath,2011). Adverse effects of CS is now being accepted by most of the stakeholders of agriculture production. Hence, rather entering in detail discussion of adverse effects of CS on agriculture this article is devoted to find best possible option for sustainable agriculture based on integration of two or more than two components e.g. crops, trees, animals, fish, poultry (agroforestry, rice+fish, farming systems etc.) etc. of production system for efficient cyclic use of mainly local resources. Obviously, any approach for sustainability has to be taken into consideration of primary sector as a whole.

Organic Agriculture(OA): The Imperative Option for Sustaining Productivity and Profitability

In late 1970s farmers world over realized the adverse effects of conventional farming and started their own efforts to develop a sustainable system; in 1990s consumers are also realizing the ill effects of produce with pesticides and due to that demand of safe and sustainable food production was increasing that forced policy makers to promote such systems and one such system is now very well recognized is OA that consider agriculture or in wider sense the primary industry is nature's system and long term productivity can be maintained only by understanding and providing all possible support so that nature can work at its best to meet the three goals of agricultural development. These are: (a) achieve sustainable growth in agriculture and raise incomes by increasing productivity (land, labor), diversification to high value agriculture and rural non-farm by maintaining food security; (b) sharing growth (equity) by focusing on small and marginal farmers, lagging regions, women etc.; (c) third is to maintain sustainability of agriculture by focusing on environmental concerns (Dev, 2012).

Two words ecological agriculture and organic agriculture are synonymous in the context of this article but use of OA is opted because of its wider acceptance and knowledge. Before going into details of OA the scope of OA that will be dealt in this article need to be clear. In this article organic agriculture is a nature, producer and

consumer friendly system with the optimum use and recycling of mainly local resources and maintaining diversity. Although for trade use it may be having some rules and regulations but for this article it will be limited to the ecologically and economically sustainable production system. Also, work is going on, on every aspect of organic agriculture world over, however, preference in this article is given for refereeing the work in India to increase relevancy because OA is designed mainly on the basis of climate, soil and social environment of the area. Complexity in experiments in OA, experiences are equally important to complete the story of a system and the author has shared some of his or farmers' experiences (documented) about organic agriculture in this article.

Interestingly, many a times OA is projected as a new system with several apprehensions however, before the synthetic chemicals were invented it was all OA based on times tested traditional technologies and civilization was thriving for millenniums. In India the production of rice had been recorded upto 9.0 t/ha during 17th century (Alvares, 2009). Later on productivity has gone down during British period and recorded only 700 kg/ha in 1947.Therefore, food production technologies (obviously organic only) were capable to maintain sufficiency level during ancient time and these technologies can be revalidated and improved with the integration of modern ecofriendly technologies. Modern science has not only developed the synthetic chemicals (fertilizers, pesticides,weedicides) but also the several ecotechnologies i.e. use of enriched compost, biofertilisers, biopesticides, rainwater conservation, crop rotation, mulching, agroforestry etc. and OA is just integration of them considering the local conditions and traditions with a set ideology(described below).Therefore, this is a highly scientific system with all possibility of need based improvements.

Productivity with profitability

Many factors contribute in long term productivity and profitability of organic system that also support to decide OA may be the best option considering the farming and environmental conditions of India . These factors include ideology and ability to meet the challenges from production to consumption (e.g. climate, society, market etc.) chain.

A. Ideological superiority

In last few decades awareness about social and environmental issues has been increased. Agriculture is one of the basic enterprise that has major role in these two issues. OA is one of the agriculture production system that not only supportive to the environment but also sensitive to the social issues like employment, health, migration etc. Definitions given by two international organizations also verifies this concept. These definitions are-

1. Organic agriculture is a holistic management system, which enhances agro-ecosystem health, utilizing both traditional & scientific knowledge. Organic agriculture systems rely on ecosystem management rather than external agricultural inputs. (IFOAM,2006)
2. Organic agriculture is an environmentally and socially sensitive food supply system. The primary goal of organic agriculture is to optimize the health and productivity of independent communities of soil life, plants, animals and people.(FAO,2002)

In simple words organic agriculture is the production system with the optimum utilization of local resources in such a way so that sustainability of production and wellness of the society and environment can be maintained for fairly long time. Although organic agriculture seems to be just the exclusion of synthetic external inputs but it is the ideological differences with conventional agriculture (Sharma, 2001) that makes OA friendly to society and environment. These differences are given in table 1.

After going through the ideological differences the questions arises - Are two systems comparable ? and many times they (CS to OA) are compared on yield basis only. With the comparison shown in table it is clear that OA has ideological superiority over conventional agriculture, as far as its sensitivity concern the society and environment. With such a vast difference in approach in both systems, on one side OA is based on traditional methods (some improvement by incorporation of modern science) and traditional seeds and no subsidy rather tax on organic inputs on the other side CS with High Yielding Varieties and modern technologies and heavy subsidy to inputs (fertilizers pesticides etc.), it is difficult to compare CS to OA on the basis of yield only. A logical comparison need to be done before referring OA capacity to meet the requirements of society. It needs a long term study for budgeting tangible and nontangible inputs and outputs of both the system for comparison. Also, there is immense scope for research in organic farming to develop technologies for efficient resource use, and policy support to organic system and whenever, level playing status will be achieved, than there is possibility of fair comparison.

Table 1 : Ideological differences between organic agriculture and conventional agriculture

Organic Agriculture	Conventional (chemical) Agriculture
Holistic approach: Any technology applied considering the system as a whole- No imbalance	**Reductionist approach**: Targeted approach for one commodity or one pest or deficiency of nutrient- creates imbalance in system
Decentralize production: Most of the inputs e.g. seed, manure, biopesticides etc. produced at farm/village level- suitable to local environment+ generate employment+ low cost of production	**Centralize production**: Produced in factories/farms, away from the place of use- no proper use of local resources+ least employment+ increase cost of production
Harmony with NATURE: Harness the benefit of natural resources, flora and fauna by using or giving favorable environment to them- sustained productivity of natural resources	**Domination on NATURE**: Agriculture system is forced to produce more- Regenerative capacity of natural resources decreased+ decrease productivity in long term.
Diversity: Includes all possible organisms complimentary in a system. Work as mutual service providers for nutrient and pest management. Least cost and time required of system owner.	**Specialization**: Only one crop or tree or animal. All cost and time of nutrient and pest management has to be borne by system owner/ farmer.
Input optimization: best use/recycling of available resources. System regenerative capacity and owners economic capacity maintained/enhanced.	**Output maximization**: Over use of resources disturbs system and resources productivity in long term- increasing cost.
Knowledge intensive: Only few resources but need how timely and best integrated. Least dependency on experts/imported technologies, once farmer trained-possible in remotest area.	**Input intensive**: Comprehensive list of chemicals with time and method. Needs experts for timely updating. Only possible in resources sufficient areas.
Preventive, protective and proactive approach: All the actions/ applications are done in anticipation of system requirement-least use of inputs.	**Cause and control approach**: Most of the actions/applications are done to control the damage to system-heavy use of inputs.
Decreasing input use: As the system reaching at perfection it conserve/generate its own resources e.g. for nutrition and protection- decreasing requirement of inputs	**Increasing input use**: Target and action approach that rather, deteriorate systems regenerative capacity- increasing requirement of inputs.

B. Market competitiveness and Demand

Competitiveness in terms of price, premium and quality: Production of food in organic farming and maintaining quality is becoming a compulsion for standing in international and gradually in the domestic market also, because :

1. International demand of organically produced foods from India is increasing by almost 30% every year. According to the recent data (APEDA,2013), statistics of organic farming in India (2010-11) is as follows-
   - Total production (organic) – 3.88 million MT
   - Quantity export – 69837 MT
   - Export Value – 157.22 million US$
   - Share of export to total production – 4%
   - Certified area (including wild harvest) – 4.43 million ha
   - Certified are under cultivation – 0.24 million ha
   - Increase export (from 2010 to 2011) – 33%

Enforcement of phytosanitary regulations in Europe and other countries is also compelling to export only the food items free from residues of synthetic chemical.

2. Indian is a growing economy and the demand of organic produce within the country is also increasing at a very fast rate, and at the same time being open economy consumers are free to buy a quality with low priced produce from international market. Therefore, if India wants to discourage import, indigenous organic produce has to be made available in market. In a survey it has been found that within India presently there is potential market of Rs.23000 million for organic produce that will increase as the consumer awareness increases (Menon et al. 2011).
3. With the scientific advancement, many of our monopoly crops are being grown by several other countries and quoting lower rates in international market. For example, cumin was a monopoly crop of Indian but now it is being grown by China, Iran, Turkey

and Egypt. To remain competitive India has to produce organic for meeting the international demand.

4. Most of the spices like cumin,coriander,fennel, ajwain(carom), fenugreek, cardamom, clove etc. and medicinal plants are important ingredient of ayurvedic, unani and homeopathic preparations. These all medicines are supposed to be given to patient and if these ingredients have residues of pesticides it may have poisonous effect instead of curing the patient. Therefore, it is our ethical duty to grown spices and medicinal plant, only organically, as social obligation.

With the above discussion it is clear that organic farming is becoming necessary not only for market point of view but also for the welfare of farmer and society as a whole.

Therefore for maintaining our monopoly or rather competitiveness in international as well as domestic market, economic as well as quality production is becoming imperative.

Organic farming also helps in getting either low cost or high price quality produce. These are-

1. In organic production system, no external synthetic chemical is used, moreover emphasis is given on recycling of locally available resource. With this approach cost of production can be reduced upto 10-30% as compared to conventional chemical farming in irrigated areas (Ramesh et al., 2010; table 2). However, yield was comparable or slightly low to CS and that is presently easily compensated by premium

Table 2: Economics of crop production in organic versus conventional farming (Ramesh et al., 2010)

State	Crop	Cost of cultivation (Rs. ha^{-1})			Net returns (Rs. ha^{-1})		
		Organic farming	Conventional farming	Per cent increase(+)/ decrease (-) in organic farming	Organic farming	Conventional farming	Per cent) increase (+ decrease (-)/ in organic farming
Maharashtra	Vegetables	25,000	26,000	-3.8	25,000	29,000	-13.8
	Fruits crops	70,000	78,000	-10.2	50,000*	47,000	+6.4
	Rice	10,000	11,500	-13.0	20,000*	18,000	+11.1
	Wheat	8,000	9,000	-11.1	10,000*	9,000	+11.1
Karnataka	Soybean	7,200	7,800	-7.7	9,000	10,350	-13.0
	Chickpea	6,700	7,250	-7.6	4,700	4,750	-1.1
	Fruit crops	20,000	23,500	-14.9	84,000*	64,500	+30.2
	Groundnut	13,000	14,500	-10.3	17,000	23,000	-26.0
	Sugarcane	55,000	60,000	-8.3	101,000	108,000	-6.5
Tamil Nadu and Puducherry	Cotton	10,000	10,000	0	11,000*	10,000	+10.0
	Cashew	12,500	14,000	-10.7	13,500	6,000	+125.0
	Banana	60,000	80,000	-25.0	240,000*	170,000	+41.2
	Mango	25,000	30,000	-16.6	135,000	90,000	+50.0
	Guava	20,000	25,000	-20.0	80,000	90,000	-11.1
	Coconut	30,000	34,000	-11.7	111,250	109,250	+1.8
	Rice	25,000	20,000	+25.0	37,500*	40,000	-6.2
Kerala	Pepper	36,500	40,200	-9.2	88,600*	44,300	+100.0
	Banana	61,000	75,000	-18.6	194,000*	145,000	+33.8
	Coconut	50,000	60,000	-16.6	166,000*	120,000	+38.3
	Coffee	40,000	54,000	-25.9	75,000*	48,000	+56.2
	Turmeric	87,000	140,000	-37.8	130,000*	85,000	+52.9
Uttarakhand	Rice	18,000	20,700	-13.0	28,800*	17,750	+62.2
	Wheat	20,000	23,000	-13.0	17,500*	16,000	+9.3
	Potato	20,000	18,000	+11.1	28,000	42,000	-33.3
Mean				-11.7			+22.0

*Premium price available to organic produce

price but in future, research and development certainly make OA comparable productive to CS that to with sustainability. In a comprehensive study the unit cost of production was found lower in OA ,compared to CS and there is ample scope of improving efficiency under OA (Charyulu,2010). Interestingly, in rainfed areas OA yields 7-15 % more due to better nutrient and rainwater management (Yadav and Gahlot, 2011).

2. There are several example of experiments and farmers' (Alvares,2009) experiences which shows that due to balanced nutrient supply through organic sources, the quality of organic produce increases in terms of aroma, essential oil content, texture, taste and shelf life(helps in long distance transportation). Author himself experienced a much better (than chemically grown) aroma, luster, and keeping quality in leafy coriander at village Ballon-ka-guda in Udaipur (Rajasthan)district. In that whole village vermicompost was produced and used for coriander production. Farmers told that they get 1.5-2.0 times higher price in vegetable market and for coriander seed as well. Even people are ready to give premium price to organic by simply considering at least the product is free from pesticide residues. In exhaustive studies(Woese et.al, 1997and Worthington, 2001) organic foods were found nutritionally superior. Significant increase in micronutrient (Fe,Zn,Mn) contents was observed in Basmati rice under OA (Singh et al.2007).

Therefore, organic farming is the only option for low cost quality production.

C. Able to meet future challenges

Agriculture is going to face several challenges due to changing climatic and social environment. These challenges will affect the agriculture production in totality. OA can be a good option to meet these challenges.

1. Substitute of low & reducing supply of fertilizers and burden of subsidy: To some extent nitrogenous fertilizers and most part of other fertilizers are imported from various countries. Supply of Phosphate and Potash fertilizers is going to be reduced in future as their natural reserves are shrinking. Nitrogen fertilizers are produced with the use of petroleum products and its reserves also decreasing .Therefore planning has to be done to find out a system that is least dependent on these fertilizers. Moreover, most of the fertilizers companies give priority to irrigated areas Punjab, U.P., Haryana, Maharashtra etc.and supply in rainfed areas remained short supplied. Therefore, to reduce dependency on imported fertilizers and recurring problem of short supply in rainfed areas, opting OA is the only solution. Subsidy (Rs.1200 billion) on fertilizers not only encouraged over and improper use of fertilizers, also this subsidy goes mainly to irrigated areas (Roy et al,2010). Therefore, this subsidy needs to be rationalized and part of need to be diverted to the rainfed/drylands for promoting organic agriculture. This will be a remedy of several problems that arise due to CS.

2. Mitigating effect of climate change: Worldwide 90 million tons of mineral oil or natural gas are processed to get Nitrogenous fertilisers every year. This generates 250 million tons of CO_2 emission. On the contrary, organic farms returns 575 to 700 kg CO_2 to the soil. Organic farming thus reduces CO_2 emission by eliminating synthetic fertilisers, and at the same time reduces atmospheric concentration of this gas by storing in the soil, a win-win system.(Niggli, 2008) Further, soils with higher humas content can adopt to the adverse effect of climate change. It has been found that organic system provided better yield during climatic extremes(that happens due to climate change) as compared to conventional system (Sharma, 2013). Organic agriculture is a promising strategy to face these challenges. Many of its core concepts and practices focus on sustaining healthy and fertile soils with high organic carbon levels, a well- aerated structure and a rich diversity of the soil biota. Such soils are able to absorb large amounts of water from heavy precipitation without water logging or erosion. They also store the available water better, thus hedging against water scarcity and droughts and reducing irrigation needs.

   Organic agriculture uses local knowledge which is highly adaptive to local variations, and combines it with modern agro-ecological methods. Moreover, the high diversity on organic farms improves economic and ecological stability and increases resilience against adverse impacts of climate change. A higher diversity of income sources hedges against the risk of crop losses. Optimized and diverse crop rotations can break life-cycles of pests. Landscape elements such as fallow land, buffer or flower strips provide resorts for beneficial animals.

   Diversification towards combined crop and livestock production also increases resilience. Grasslands

can be used for animal feed production, also in situations where no crops can be grown, in particular on marginal and degraded lands. This adds to food security, as it helps utilizing land for human nutrition that cannot be used for this directly via crops. Economic risk is also reduced as organic agriculture is a low external input farming system. Absence of costly farm inputs reduce potential financial losses from crop failure, while net profits can still be higher for conventional farms, in particular if organic price premiums can be realised on the markets. The risk of indebtedness is thus reduced, which is particularly important for smallholders and poor farmers as it helps to avoid the poverty trap. Published studies show that organic farming systems are more resilient to the predicted weather extremes and can produce higher yields than conventional farming systems in such conditions (Drinkwater et al,1998; Pimentel et al, 2005).

3. Ensuring food security : As discussed above, organic farming provide resilience to climatic extremes and helps in sustaining food production. Rainfed/ dryland agriculture with nearly 58% of the cultivated area contributes 40% of the country's food production. Even after full irrigation potential of the country is realized, half of the cultivated area will continue to be under rainfed farming. Much of the acreage under coarse cereals (85%), pulses (83%) and oilseeds (70%), substantial area under rice (42%) and nearly 65% of cotton area is rainfed. Increasing the yields in the 42 % that comes from the irrigated areas will show little benefit for two reasons. Firstly, this sector is already high-yielding, and it has very little scope for large increases in yields such as the more than 100% that can be achieved by organic methods in traditional smallholder systems. Secondly, this sector is largely focused on the commodity supply chain. The large food surpluses produced in the sector have not lowered the number of people who are hungry. Logically, increasing the yields in the rainfed drylands areas is the key to ending hunger and achieving food security(Swaminathan, 2011a). Organic methods are the most suitable for rainfed drylands areas as the necessary methods and inputs that are needed to do this can be sourced locally at no or very little cost to the farmers(Sharma , 2001). CS have largely failed to provide consistent higher yields to the poorest farmers as the expensive synthetic chemical inputs have to be purchased. Most of these farmers do not have the income to do this. It is an inappropriate economic model for the India's most vulnerable farmers whereas organic agriculture is an appropriate one. This increase access to food in a variety of ways: by increasing yields, increasing total on-farm productivity, enabling farmers to use their higher earnings from sale to buy food, and, as a result of higher on farm yields, enabling the wider community to buy organic food at local markets. Further, OA is defamed as poor yielder and warned that promoting OA may lead to food scarcity. However, a comprehensive study summarized in the table 3 (Ramesh et al, 2010) disproves this hypothesis. The rice grain yield (4.0 t ha^{-1}) obtained

Table 3: Productivity of crops (t ha^{-1}) in organic versus conventional farming (Ramesh et.al.2010)

State	Crop	Organic farming	Conventional farming	Percent increase (+)/ decrease (-) in organic farming
Maharashtra	Vegetables	11.0	13.0	-15.3
	Fruits crops	11.4	13.6	-16.1
	Rice	2.0	2.5	-20.0
	Wheat	1.2	1.5	-20.0
Karnataka	Soybean	0.9	1.1	-18.2
	Chickpea	0.8	0.8	0.0
	Fruit crops	8.0	9.0	-11.1
	Groundnut	1.2	1.4	-14.2
	Sugarcane	120	140	-14.3
Tamil Nadu and Puducherry	Cotton	0.6	0.8	-25.0
	Cashew	1.3	1.0	+30.0
	Banana	25.0	30.0	-16.6
	Mango	8.0	6.0	+33.3
	Guava	20.0	23.0	-13.0
	Coconut	28,250 nuts	28,750	-1.7
	Rice	5.0	6.0	-16.6
Kerala	Pepper	1.38	1.40	-1.4
	Banana	23.6	27.2	-13.2
	Coconut	31,000 nuts	30,500	+1.6
	Coffee	1.23	1.31	-6.1
	Turmeric	22.5	25.0	-10.0
Uttarakhand	Rice	3.77	3.82	-1.3
	Wheat	3.12	3.92	-20.4
	Potato	12.0	15.0	-20.0
Mean				-9.2

under combined application of four organic amendments was at par with the yield recorded under recommended dose of chemical fertilizer application. An interesting observation recorded was that there was no serious attack of any insect pest or disease in organically grown crop (Singh et.al, 2007). In OA in low rainfall areas the yield of four high value crops (sesame, cluster bean, cumin, psyllium) was found comparable with the yield under CS (Sharma,2013). Area allocation to cash crops and biofuel crops need to be done cautiously so that sufficient area is maintained for food crops.

4. Maintaining soil health : Organic system improves soil physical, chemical and biological properties in long term that helps to maintain productivity. A comprehensive analysis (Ramesh et al,2010) strongly supports this development with OA(table 4). In Rice – wheat system, soil microbial population (Actinomycetes, Bacteria, Fungi and BGA) enhanced due to the application of organic amendments in comparison to recommended fertilizer application. Soil organic carbon and available phosphorus contents were also found to be significantly increased due to organic farming practice over chemical fertilizer application (Singh et al 2007). Increasing trend of soil organic carbon content was observed with OA (Sharma ,2013) in low rainfall areas.

5. Conservation of water : Water will be the most limiting factor for agriculture production in the coming years because of severe depletion in ground water and uncertainty in rainfall due to climate change effects. Also, over use of water (due to fertilizers application) can be categorized as one of the main factor that deteriorate the soil health. Soils under OA are able to absorb large amounts of water from heavy precipitation without water logging or erosion. They also store the available/irrgation water better, thus hedging against water scarcity and droughts and reducing irrigation needs. Successful sugarcane cultivation was done with 21 irrigation under OA as compared to 26 irrigation under conventional system(Kshirsagar, 2008). The favorable effects of OA on water use is more visible in drylands (Sharma, 2011).

6. Conservation of biodiversity : Maintaining biodiversity of both fauna & flora helps a lot in resource recycling, pollination, pest management etc. Therefore this is great and incomparable service of nature for our food production system. This was almost destroyed by the monoculture and use of pesticides. However, Most studies clearly demonstrated that species abundance and richness across a wide range of texa was higher in organic farms than on conventional farm in the same locality (Pratap, 2011) and helped in pollination and pest management (Altieri et al, 2006).

7. Conservation of energy : OA uses less fossil fuel based inputs and has a better carbon footprint than standard CS. Typically, organic agriculture uses 30 to 50 percent less energy in production than comparable non-organic agriculture. Organic operations provide promising possibilities for further energy reductions throughout the food system (Ziesemer, 2007).

Therefore, OA has potential to meet all the challenges that are going to be limiting factor for agriculture in future.

India's Readiness For Organic Production

India has done tremendous growth in the area of OA. The momentum developed during last 2-3 decades shows that OA will be the major production system in the coming decades. Presently three level of OA are exist in India-

I. Default organic in mainly in drylands (70% of total organic area) : Can be called below ground OA as small produce are mostly consumed locally, good for food security.

II. Improved organic(25%) : Higher production but low quality control, can be called ground OA as produce are used within the country.

III. Certified organic (5%) : Higher production and high quality control, can be called above ground OA

Now the need is to make balance in all the three categories for wider recognition of OA and its produce.

This preparedness is being visible in all four front i.e. production, research, market and policy level. However, sincere efforts by all stakeholders to maintain this momentum and a stronger policy support is required for maximizing OA at soil and at market.

***A. Production*:** At production level strong support of traditional technologies and sufficient input availability are the major factors for successful OA.

1. **Strong back up of traditional technologies/ systems:** Traditional agriculture system in India is

highly diversified in nature that includes crops, trees, animals, grasses etc. This system is scientifically efficient in nutrient recycling and restoration of soil fertility. In these systems 10-30 trees/ha are available and 2-5 animals are reared by a farm family. This integrated agriculture system minimizes pest incidence as well as favors organic agriculture (Altieri, 2006). This type of systems still exist in large part of India and mainly thriving best in rainfed conditions known as default organic. Our country has a vast treasure of tribal diversity and traditional knowledge. Locally adapted breeds and crop varieties coupled with their social structures to manage and conserve common resources, can support strengthen stability in agriculture. A balanced use of indigenous knowledge with integration of modern eco-technologies would drive sustainable agricultural to enrich itself. Some of the traditional preparation e.g.panchgavya has been found very effective in OA (Rupela et.al,2006). While some other technologies revalidated/invented by farmers groups/innovative farmers e.g Jeevamruit, Beejamrut, Dashiparni extract, cropping system.etc and reaching to millions of farmers through demonstration by farmer's themselves or by devoted workers (Yadav, 2011). Organic Farmers associations almost in every state becoming hub for mobilizing farmers for OA(Alvares, 2009). This also shows eagerness of farmers to shift on OA.

2. **Input availability and quality:** Availability of organic inputs is questioned most of the time at various platforms. To get answer of this question and to know the possibilities for further enhancement of quantity as well as quality, a survey was conducted by CAZRI during 2006-08(Sharma,2011) in low rainfall (below 500 mm) areas.

From the survey following information was generated.

- Availability at farm level was influenced by several factors like rainfall, cropping pattern, size of holding, availability of labor etc. In general most of the places farmers used raw cow dung, kept under sunlight for months and this caused heavy loss in nutrient availability that of the nitrogen. Further this increases weed population and termite infestation and farmers use chemicals to control both of them. On an average 1.5-4.5 t/ha organic manure was available at farm level in the form of crop residues and animal dung.
- Availability increased at village level by 1.5-2.0 folds mainly because of some farmers kept animals for dairy purpose. Also there are unproductive and old animals available at village level in large numbers. These animals may not give milk but provide manure in substantial quantity. Cattle provided 4.6 to 11 kg/ha/yr Nitrogen through urine (total agriculture land/total number of animals in the village).Trees are the integral part of farming system of low rainfall areas and contribute equivalent to 0.04t manure/tree. Trees available in common land, protected areas, waste land etc. also contribute to organic input availability at village level. Availability further increased at district level as intensive dairy farming was observed in peri-urban areas. After addition of organic input availability from all the sources the figure reached to 4.5-5.0 t/ha. This amount of organic input is sufficient for organic farming in low rainfall areas and increase in proportion of rainfall, and the technologies like use of microbs, green manuring, agroforestry are also used in integration. The availability of nutrient can be further increased by adopting following management practices-
  - Crop rotation with leguminous crops like cluster bean, moth bean, moong bean etc (Sharma, 2013).
  - Avoiding heaping of dung under sun and use of improved methods of composting through vermicomposting or pit composting methods.
  - Tree leaf litter, animal urine, bones of dead animals, non palatable weed biomass are some of the other rich and underutilized sources of nutrients that can suffice the nutrient requirements of the organic production system.

In several estimates it has been found that about 600 million ton organic material available in India and if it is speeded on 140 million ha cultivated land this will around 4.5 t/ha. Further, in a organic system once the cycle of organic matter starts, the system itself starts conserving/ recycling the applied organic matter and therefore, the external demand of organic matter reduces as the system become older.

Further, according to a survey conducted by National Sample Survey Organization (NSSO, 2005), organic manure was used by 56% farmer households during the kharif and 38% during the rabi season. It was available within the village for 68% households during the kharif and 75% households during the rabi season (it would have been 100% if part of it not burnt for energy). While, he has to

travel upto 10 km for getting fertilizers, pesticides and seeds.

Therefore, organic inputs are available in sufficient quantity and if it is not burnt for energy (cooking food, generating electricity, heat to kilns etc.) or cleaning the field (as being done in Punjab & Haryana), there is least possibility of scarcity of organic inputs for OA, the only need is their efficient utilization.

Quality of external inputs e.g. biofertilisers, biopesticides etc. is a major issue that affect output of OA to a great extent. Fortunately, Government of India established National Center of Organic Farming (NCOF), Gaziabad in 2004, that regularly monitor, making guidelines and capacity building for maintain quality of organic inputs.

B. Research : Research related to OA started in 1950's and continued till date on the name of eco-friendly farming technologies/conservation of natural resources . The issue of technology fatigue in agriculture is well known now. There is a need to shift away from individual crop-oriented research focused essentially on irrigated areas towards research on crops and ecofriendly cropping systems in the dry lands, hills, tribal and other marginal areas (Swaminathan, 2007). Most of the research institutions, work is being done on integrated use of eco-technologies with chemicals. In 2004, Indian Council of Agriculture Research (ICAR) started a network project on organic farming at 13 centers all over the country. Almost all the agriculture universities started course of farming system in their curriculum in which OA is a topic. Some pioneer universities (e.g Amity, Noida) have a full time management course or part time course (IGNOU, New Delhi) on OA. Recently, two agriculture universities namely Himachal Pradesh Ag. Univ. in north and University of Agri. Sciences in south India, opened department of OA.

In India research is in progress can be kept into three major groups i.e. 1. Revalidation of traditional technologies/ system, 2. Development of ecofreindly inputs, and 3. Organic system research.

1. Revalidation and standardize of traditional technologies/system: Under this group all the traditional knowledge/technologies developed in the millenniums are being revalidated and documented at various research organizations. Tamilnadu Agri. Unversity, University of agriculture sciences are the leading institute working on this aspect. They standardize technique of Panchgavya, a product of cows(indigenous breed) five products i.e. dung, urine, milk, curd and butter. Panchgavya is an elixir or promoter of soil health and plant growth. At ICRISAT,Hyderabad (a CGIAR institute) experiment was conducted for 8 years with panchgavya observed significant increase in the population of beneficial soil fauna(Rupela et al,2006). Several other preparation form botanicals as plant growth promoter or as biopesticides have been revalidated and standardized. The beauty of these traditional technologies is the cost effective, locally available and socially acceptable.

2. Development of ecofriendly organic inputs:This is the most liking aspect of research at various organizations because it does not require gestation period for system development, has some basic science/ biotechnology, easy funding availability and can be commercialized. Several such products has been developed by universities as well as private entrepreneurs. Some of the examples are enriched compost (with natural minerals and microbes), neem/ botanical based biopesticides, isolation of local effective fauna for biofertilisers/biopesticides etc.

3. Organic system research : This is the most difficult and time consuming aspect therefore at a few locations this type of research is going on. One interesting work of survey of productivity, soil health, economics of selected organic farms was done by Ramesh et al. (2010). Some of the NGOs like OFAI, CSA, Green foundation, Navdhanya etc. have documented the Organic systems available at various places (Alvares, 2009). Organized research after development of organic system is going on at limited places. One such system has been developed for the low rainfall areas at Central Arid Zone Research Institute, Jodhpur and research is going on all possible aspect (Sharma, 2013).

Crop based organic protocol has been developed for basmati rice, cotton, tea, and spices and continue on some other high value crops.

Fortunately at national level an increasing awareness about soil health may further support organic farming research one or the other.

C. Market: Several initiatives taken at government, corporate and individual level for promoting marketing of organic produce.

1. APEDA made a separate cell for organic import and export, regulating certification process and organizes meetings on OA issues under National Programme of

Organic Production(NPOP). Export-import bank, NABARD, KVIC are also funding for OA projects. Big programmes e.g National Horticulture Mission, Rasrtiya Krishi Vikas Yojana of Ministry of agriculture provides huge funds to organic inputs and soil health. Almost in every part of country, National Accreditation Board for Testing and Calibration Laboratories (NABL), Gurgaon, gives license and monitor the laboratories working for food quality testing.

2. Corporate associations e.g. ASSOCHAM, FICCI etc. are frequently organize workshops, business meets on organic marketing. ICCOA, Bangalore annually organizes international organic trade fair "Biofach-India".

3. Big corporate houses and many exclusive corporate are entering in contract farming, value addition and export of organic produce. Even, at most of the supermarkets, malls, organic products are displayed for sell.

4. The most important is the increasing number of small organic farmers groups, associations (e.g. Maharasthra organic farmers forum, Organic farming association of India,Goa etc.)and NGOs e.g Navdhanya, DDS,CSA, Jatan, ICRA etc. are facilitating marketing networks to sell organic produce at farm on profitable price to direct consumers and that is making strong linkages between producer and consumers, the ultimate need of fair marketing. It also saves energy by following "grow seasonally- eat locally" and several other advantages.

5. Media is playing a great role for awareness about pesticide residues in food and organic produce as safe substitute.

Programming For Action and Adoption

Although Considerable development has been done in India for enhancing production to marketing of organic produce. The most interesting aspect of leaving CS (NSO, 2005) by farmers despite of high financial and technical support and shift to OA with little support, is showing OA system viability. In 1999 only 40000 ha agriculture area was recorded as certified organic that increased upto 240000 ha in 2011 (six times) within a decade(APEDA,2013), if the non certified organic areas(mainly drylands) is also be added this will be much high figure. Therefore, it is the need of the hour that a multi-direction action plan has to be prepared for wider adoption and marketing of organic produce. The programming can be done to get active participation of all stakeholders in policy making, research, marketing and production. A target of 50% forest area (35 million ha)+ 80% drylands (60 million ha) + 10% irrigated area(5.0 million ha) can be realistic target of 100 million ha to be converted into OA by 2020, if the programming and execution is to be done efficiently.

A. Policy support

Considering the increasing awareness within the country and export demand of organic produce; it is need of the hour to do integrated efforts for higher quantity and quality organic production. These efforts are needed to be done at four level i.e. policy, research, market and production of spices. At market and production level the intensity of efforts is more as compared to research and policy support. Integration of technologies and programmes and coordination among various agencies is the prime requirement. Policy plays major role in promotion of any programme. Policy in terms of supporting rules & regulations, subsidies, facilities, allocation of budget & personnel etc. can alone is sufficient if executed properly. The best example is Cuba(Latin America), where organic farming was made a national policy and now whole of the country is organic. Similarly South Korea developed good system for organic production that include direct subsidy to farmers. (Jeong,2011). Although in India, organic movement was started in early 80s but it got momentum only after 2001 when govt. of India lunched National Programme of Organic Production (NPOP). Later on many of govt. agencies have started to give priority to organic farming. Similarly some of the state like Uttranchal, Sikkim and other NEH states etc. has declared organic state and they are taking lead. Some other states e.g. Madhya Pradesh, Karnataka, Maharashtra, Bihar, Himachal Pradesh etc. declared policy for promotion of OA. However simply giving budget, subsidies etc. may not be sufficient to promote organic farming, as least development has been done in arid & semi arid areas even, they are kept at Priority I & II in NPOP. For better development of OA additional measures need to be taken. They are:

1. **Priority to OA in ongoing programmes:** OS need not to be promoted as a new program that may cause overburden as additional progam. It would be better if OA is given priority in all rural development programmes e.g. watershed, SGSY, MNREGA. Food security mission, horticulture mission etc. Government of India now focusing eastern India as place for second green revolution and OA need to be given priority in that mission

2. **Popularization of OA without compulsion of certification:** The non certified organic contributes a great part of total supply of organic produce (FAO,2002). In rainfed/drylands areas farmers are very poor and unable to afford the cost of certification. Promoting organic farming with the compulsion of certification has made negative impact on adoption. Instead, at initial stage OA should be promoted for improving soil fertility, reducing cost of production and other environmental advantages and additional economic benefit to use organic farm as a place for ecotourism.

3. **Dissemination of OA in holistic manner:** Most of the agencies promoting organic farming in piecemeal approach e.g. .only vermi-compost, only IPM, only INM, only marketing etc. this makes confusion among the farmers. While organic farming is an integrated approach for nutrient recycling, conservation of natural resources, water conservation, crop rotation / diversification etc. So it must be inclusion of all these aspects which can make a sustainable OA in real term.

4. **Integrated efforts of supporting agencies:** Individual agency may not work efficiently for promotion of organic farming; For example KVIC have a scheme of margin money to establish vermi-compost unit but they are unable to ensure the use of produce of such unit. Similarly ICAR/SAUs have wealth of information but unable to provide financial support. Thus there is need of integrated programs by all related agencies. Even several ministries e.g agriculture, commerce, water resource, human resource, consumer affairs ,science & technology, tourism and culture (for eco-tourism) etc. need to be join hand for OA. Further agriculture is a subject that mainly governed by the policies of state governments and funding receives mainly from Central government, therefore all the states need to be involved while making policies for OA at national level.

5. **Encouragement of decentralized input supply :** Encouragement may be given to produce all inputs for organic farming in a decentralized manner at local level so that not only local resources can be utilized but also employment at village level can be generated. Self help groups sponsored by NABARD may be mobilized for this venture.

6. **Adoption of improved methods of composting and ban on burning of agro-waste**: Majority of the farmers apply animal and crop waste in undecomposed form to the soil, as a result the availability of nutrients to the plants decreases and also invites several pests. It would be better to apply these materials after composting them with any of the suitable methods. These methods can be popularized and financially. supported under the "Clean Village Scheme (Nirmal Gram Yojana)" of the central governments. Subsidy provision need to be done for mechanized systems for compost preparation and application. Ban on burning of agro-waste(straw, dung) for energy and promotion of biogas plants, solar energy use need to be done.

7. **Increase availability of responsive verities/ breeds to OA**: This is a very crucial input that need urgent attention as the verities /breed for CS may not perform well in OA. For example organic cotton is a high demanding crop but in a survey, scarcity of seeds for OA was observed. (Suchitra,2013). Similarly high milk yielding indigenous breads of cow (Sahiwal, harparkar, geer etc.) they are more responsive to OA, are not available easily.

8. **Awareness and capacity building:** OA is just not one technologies rather a group of technologies and ideology. Moreover it is a knowledge intensive system. Therefore, demonstrations, training, conferences, seminars, farmers fair etc. may be organized to make better understanding and a general consensus about organic farming and good organic management. Establishing a model organic farm (may be at PPP mode) at every tahseel/block level need to be done for successful capacity building.

9. **Subsidy and tax exemption on organic inputs :** Since fertilizer use in rainfed areas is very less as compared to irrigated areas therefore, partly diversion of fertilizer subsidy to organic inputs for OA in rainfed areas is needed. Financial support is also needed during conversion period for OA. Presently there is provision 4-5% VAT tax on organic inputs that need to be exempted and rather provision of subsidy may be made for organic inputs to make organic produce more competitive.

10. **Promotion of high value enterprises:** The demand of spices and medicinal plant is increasing when grown organically, so it must be promoted organically in the various rainfall zone of the country(Table 4). This will help to increase profitability of OA on one side and reduce pest load as most of these plants having pest repelling cpacity .Medicinal plant board, New Delhi and spice board, Cochin have taken some good initiatives that need to be executed in wider area.

Table 4: Potential high-value primary enterprises for OA in different rainfall regions

Rainfall zone	Rainfall Average(mm)	Suitable species and medicinal crop
Low rainfall	100-500	cumin, senna, psyllium, cluserbean (gum), fennel, asvagandha, fenugreek, lucorice, sesame, aonla, animal husbandary etc.
Medium rainfall	500-1000	coriander, turmeric, zinger, garlic, chili, safed moosli (indian ginseng), fruits and vegetables, cotton, dry fruits, honey and animal husbandry, poultry etc.
High rainfall	More than 1000	black paper, cardamom, coffee, tea, fruits and vegetables, cashew, rice+fish etc.
Temperate hills	750 and above	Apple, dry fruits, honey etc.

10. **Development of organic clusters of villages:** Available clusters of villages of watershed programs (mainly in drylands) may be converted into organic cluster of villages by providing technical support. This will help a lot for technical feasibility of OA, making cost effective and also make easier the group certification process. The cluster may also be promoted for ecotourism.

11. **Incentives to OA**: Farmers may be given incentive for carbon sequestration and environmental improvement services under OA.

12. **Separate Government personnel for OA:** In every cluster of OA separate trained personnel (Agriculture supervisor, extension officer etc.) need to be deputed exclusive for development of OA system. One personnel for both OA and CS may not deliver properly to both the systems.

B. Research

Research has been under taken on various components of organic farming by ICAR/SAUs, yet the research is needed to integrate the efforts and assess their effects. Besides, following aspects of research may be taken simultaneously:

a. Assessment of economic and ecological returns from organic vis-a-vis intensive agriculture system each sub agro-ecological zone. This work need to be unbiased for any of the system.

b. Development of organic farming models for each sub agro-ecological zone.

c. Development and multiplication of OA responsive varieties/breeds.

d. Human labor becoming scarce and costly for OA system. Development of manual/animal operated mechanical devices for compost preparation and application, weed control etc. to reduce labor requirement.

C. Market

Market environment plays major role to motivate producer for opting an enterprise and same is true for farmers. After emerging demand of organic produce from western countries and to some extent from domestic market many initiatives have been taken by Government of India. Still a large part of produce from default organic area are yet to be recognized as to get market premium. Certification still need many modification to make it easier for producer and credible for consumers. Some of possible measures need to be taken for better market environment and for proper remuneration to farmer are-

1. Development of cooperative organic marketing facility.
2. Encouragement to exporters for bearing expenditure of certification.
3. Promotion of alternative low cost certification system for domestic market e.g. participatory guarantee system.
4. Facilitating organic consumer-producers associations.
5. Development of post harvest processing and packaging facilities at Tahseel/block level.
6. Improvement in certification system in terms of easier/ cheaper for producer, wider acceptability to seller and buyer and reliable for consumer.

D. Production

Although production is the first step to get organic produce but it comes at the end in planning as the policy, market and research aspects should be strengthened before starting production. However, not only for market but also

for long term sustenance of soil fertility and farmer's livelihood, basic understanding and principals of OA should be applied in the production system. Main emphasis need to be given on efficient use and recycling of limited natural resources. Therefore for production and marketing point of view an strategy with following component need to be adopted.

1. Production of inputs (compost, vermicompost, biopesticides etc.) as much as possible at local level.
2. Efficient use of inputs (time, method & quantity).
3. Effective integration of perennials, animals and beneficial organisms in farming system.
4. Adoption of system based production rather than crop based.
5. Improvement in traditional (default) organic system.
6. Continuous experimentation at farm level to understand natural production system and interactions.
7. Doing farming and getting certification as a group effort.
8. Giving importance to quality production rather than quantity only.
9. Harvesting at proper time and cleaning & grading at farm level.
10. Grading and packaging at farm level as much as possible (to get more price and least contamination).

E. Consortium efforts for promotion of OA

Although several agencies and individuals are working for promotion of organic farming however there is need of coordination, cooperation and complimentary action of all the agencies specially at three levels-

1. Inter and intra ministry level and between central and state governments , ministry of commerce is already in action that need further momentum.
2. Industrial /Marketing federations and NGOs/civil societies
3. Farmers of all over the region and country as whole.

Finally a consortium of all these three groups may do programming, mid-course correction and lobbying for promotion of OA from producer to consumer.

F. Maintaining balance between sustainability and profitability

Although market is target of any production is done and same is true for primary sector too, yet caution has to be taken while deciding long term balance between sustainability and profitability of OA so that it may not convert into exploitive system.

1. Strict rules and regulations and monitoring mainly for external inputs used in OA system. Any compromise in quality may contaminate produce with heavy metals, harmful pathogens(mainly from manure of city waste), or disturb the beneficial flora & fauna life with improper/ excessive use of biofertilisers/biopesticides.
2. Export oriented commodity based (Cotton, plantation etc.) system need to be discouraged they may sometimes lead to exploitive system.
3. Organic animal husbandry for dairy products is ecofriendly however for meat purpose should be done cautiously as it is neither ecofriendly nor good for human health.
4. Certification system needs continuous improvement for benefit of both producer and consumer.
5. The ecofriendly aspects need to be considered for processing, packaging and transportation to a long distance of organic produce.

G. Stepping towards organic

After more than two decades India's experience in OA it is now time to make perfect planning for promotion of OA without losing the food security and maintaining quality of inputs and output of organic produce. This planning need to be done separately for irrigated and rainfed/drylands (Table 5) and can be divided in phases. Each phase can be of two years and at last food grain can be included assuming that by that time OA will reach to perfection.

The phases can be as follows

I. Dry lands, pasturelands, inland fisheries, poultry and animal husbandry.

II. Cotton, sugarcane and groundnut growing areas – A non food item that has high indigenous and export demand and used 68 % part of total pesticides consumption in India, also this area prone to farmers' suicide.

III. All non food grain items e.g. spices, tea, coffee , fruits, vegetables etc. growing areas – Not affects food security but high value and export demanding crops

IV. Pulses and oil seeds : Grown manly in drylands

V. Food grain growing areas

With this approach a successful OA will be developed in the country to provide quality and quantity of all food items along with environment improvement and meeting the future challenges of primary industry.

Table 5: Proposed approach for gradual conversion into OA in irrigated and dryland areas

Irrigated areas	Dryland/Rainfed areas
1. Use of slow release Nitrogenous fertilizers + Phosphate and potash fertilizers at proper time and place and gradual decrease in dose every year till reaches to nil.	1. Promotion of composting and ban on burning of agro waste.
2. Strict rules and regulations for marketing and use of avoid, fake pesticides, unnecessary and excessive use of pesticides.	2. Encouragement to Exchange of inputs for OA at village level
3. Use of increasing dose of composted manure every year (to fulfill nutrients requirement)+ Phosphorus, potassium, zinc, sulphur solubilizing microbial cultures+ biofertilisers+ Azola (rice fields).	3. Promotion of rainwater harvesting/efficient use at village and farm level
4. Restrictions on the use of pesticides and weedicides in soil application, vegetables and fruits . Cultural and manual control of weeds and to follow integrated pest management at initial phase.	4. Development of OA responsive improved varieties from traditional/conventional varieties
5. Ban on burning of agro-waste(straw, dung and promotion of biogas plants, solar energy use)	5. Starting of organic cultivation of corps in different phases (mentioned above)
6. Making crop rotation/ intercropping with legumes and fodder crops + animal husbandry with indigenous breed mandatory	6. Planting complimentary fruit/ multipurpose trees/shrubs on farm boundaries for round year flowers/fodder/fruit
7. Planting complimentary fruit/ multipurpose trees/shrubs on farm boundaries for round year flowers/fodder/fruit.	7. Improvement in traditional eco-technologies and capacity building
8. Promoting manure responsive composite varieties of crops.	8. Development of model organic farms at farmers field in every tahseel/block for easy adoption.
9. At initial phase starting of fruits, vegetables, cotton and spices under OA.	9 Development of cluster of farmers of a village for OA system that makes a system for area basis to reduce cost and better success
10. After 4-5 years when system reaches on perfection organic cultivation of food crops may be started	
11. Development of model organic farms at farmers field in every tahseel/block for easy adoption.	

BOX-1

Drylands: No constraint but opportunity for organic agriculture

Drylands with nearly 58% of the cultivated area contributes 40% of the country's food production. Much of the acreage under coarse cereals (85%), pulses (83%) and oilseeds (70%), substantial area under rice (42%) and nearly 65% of cotton area is rainfed. Improving the efficiency of rainfed/drylands agricultural systems through organic practices is the most appropriate, cost effective, environmentally sustainable and practical solution to ensure reliable food production in the increasing productivity. In drylands where shortage of rainfall light soils are constrains for intensive chemical input based CS while these constrains become opportunities for organic agriculture. Hence organic agriculture not only suitable due to climatic uncertainties but also feasible due to availability of support system of the following favorable conditions(Sharma, 2005). This system includes (i) Low fertilizer use therefore early conversion into OA is possible (ii) Natural Availability of inputs : Plants like neem, pongamia, calotropis etc. the best sources of biopesticides , are abundantly available in these areas. Minerals like rock phosphate, gypsum and lime are available in large quantity. These minerals are good soil ameliorator as well as good nutrients supplier. Further the agriculture systems are dominated by animals. Waste and product of huge animal population can be a best source of balanced nutrient supply.(iii) Employment opportunities : High density as well as high growth of human resource remains underutilized throughout the year due to erratic rainfall and limited irrigation facilities. Migration of human resources during drought imbalances the development of these areas. Since the OA is an integrated system provides round the year work, input preparation is made at local level, there is ample opportunity for round the year employment and proper utilization of human resource. Now under MNREGA scheme this work of water harvesting structure, input preparation may get good support. On the basis of carrying capacity potential of rainfed/drylands has been explored for food security and climate change mitigation through integrated adoption of ecotechnologies (Venkateswarlu and Prasad, 2012).

Conclusion

Organic Agriculture is a holistic production system runs with the efficient use and recycling of locally available resources blending with modern scientific ecotechnologies, that will not only helpful to revive sustainability in irrigated area but also enhancing production in rainfed/drylands. OA is also helpful for meeting the challenges to farming due to changing climate and socio-econimic environment at global, national and regional level. India has done tremendous progress in enhancing area of OA as well as quantity & quality of organic produce that proves the capabilities of OA. However, to meet the future demand of indigenous as well as export market a programming need to be done for gradual paradigm shift towards OA to increase quantity and quality of organic produce with the maintaining balance between profitability and sustainability. Programming with the all round support with policy, research and market, and efficient execution will certainly able to meet the requirements of producers, consumers and the earth ecosystem as a whole.

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If you're using first-class land for biofuels, then you're competing with the growing of food. And so you're actually spiking food prices by moving energy production into agriculture.

— Bill Gates