Organic Farming – Feeding The Rich Or Enriching The Poor

By

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SEMINAR REPORT

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DECLARATION

I, Femi Elizabeth George (2018-11-021) declare that the seminar entitled **"Organic Farming – Feeding the Rich or Enriching the Poor"** has been prepared by me, after going through various references cited at the end and has not been copied from any of my fellow students.

Vellanikkara
10-01-2020

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CERTIFICATE

This is to certify that the seminar report entitled **"Organic Farming – Feeding the Rich or Enriching the Poor"** has been solely prepared by **FEMI ELIZABETH GEORGE (2018-11-021)**, under my guidance and has not been copied from seminar reports of any seniors, juniors or fellow students.

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INDEX

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

Organic Farming – Feeding the Rich or Enriching the Poor?

1. Introduction

Organic products are finding its way into the consumers' shopping baskets. There is a growing demand for organic foods driven primarily by consumer perceptions of these foods' quality and safety. Double digit rates are registered in many developed markets for organic products. The production side also keeps pace along with the demand. It is expected that the observed growth in demand and output will continue also in the foreseeable future.According to the latest FiBL survey (2019) on organic agriculture worldwide, 2017 was yet another record year for global organic farming, with the organic farmland, the number of organic producers and organic retail sales reaching an all-time high.

Table 1. Organic agriculture statistics in 2017 at a glance

Sl. No.	Particulars	Value
1.	Countries with organic activities	181
2.	Organic agricultural land	69.8 Mha
3.	Organic share of total agricultural land	1.4 %
4.	Organic producers	2.9 million
5.	Organic market	100 billion USD

(FiBL and IFOAM-Organics International, 2019)

Australia (35.6 Mha) followed by Argentina (3.4 Mha) had the largest area under organic farming and India (8,35,000) followed by Uganda (2,10,352) had the highest number of organic producers. Liechtenstein (37.9 %) followed by Samoa (37.6 %) had the highest organic share of total agricultural land. US (45.2 billion USD) followed by Germany (11.3 billion USD) had the largest organic market whereas the highest organic market shares were reached in Denmark (13.3 %) (FiBL and IFOAM-Organics International, 2019).

While organic agriculture slowly gets into the mainstream, with the proponents claiming organic farming can feed the world sustainably in the future, there is yet another group defending this claim questioning "can organic farming feed the world?" The latter propaganda was brought to the attention of the people through the statement made by Dr. Jacques Diouf in 2007, "We should use organic agriculture and promote it. It produces wholesome, nutritious food and represents a growing source of income for developed and developing countries. But you cannot feed six billion people today and nine billion in 2050 without judicious use of chemical fertilizers".

Keeping the contradictory views on organic farming in relation to its ability to feed the world in the future, we will discuss in detail about **'Organic Farming-Feeding the Rich or Enriching the Poor'** in the paragraphs that follow.

2. Types of farming systems

Farming systems can be broadly categorised into three as, Natural Farming System (NFS), Inorganic Farming System (IFS) and Organic Farming System (OFS), based on the types of inputs and agricultural management practices used for cultivation of land and production of crops (Thakur and Sharma, 2005).

The natural farming system (NFS) is considered a primitive and extensive farming system giving low production and income in the short-run. Therefore, the chemical or the inorganic farming system (IFS) based on high-tech advances in agriculture, which is embodied in the Green Revolution's strategy of external, purchased, costly, high-yielding varieties (HYVs) and hybrid seeds of crops, high doses of chemical fertilisers, pesticides, energy intensive costly farm machinery, energised well irrigation *etc*. all of which boost up production and income of the farmers substantially in the short-run, has been developed and implemented. Organic Farming System (OFS) is considered as a modified form of NFS and IFS. The OFS is carried out through internal farm and home produced, low-cost, natural, organic, biological inputs and cultural and mechanical methods and agricultural practices, in place of the inorganic or chemical inputs used under IFS.

A discussion regarding the inorganic farming system makes it mandatory to mention green revolution, as it is the green revolution which inducted inorganic farming system into the agricultural scenario of the world. Thus, green revolution can be addressed as the game

changer. Green revolution technologies such as greater use of synthetic agro chemicals like fertilizers and pesticides, adoption of nutrient responsive, high-yielding varieties of crops, greater exploitation of irrigation potentials *etc*. has boosted the production in most of the cases. India can be cited as an example here, since it is the green revolution, that transferred India from the status of a begging bowl to a feeding basket. But, despite these prospects, continuous use of high energy inputs without proper choice has led to decline in production and productivity of various crops as well as deterioration of soil health and environment. The most unfortunate impacts of Green Revolution Technology (GRT) not only on Indian Agriculture but also the whole world is as follows:

1. Change in soil reaction
2. Development of nutrient imbalance/deficiencies
3. Damaged the soil flora and fauna
4. Reduced the earth worm activity
5. Reduction in soil humus/organic matter
6. Change in atmospheric composition
7. Reduction in productivity
8. Reduction in quality of the produce
9. Destruction of soil structure, aeration and water holding capacity

(Behera *et al*., 2011)

The ill effects of the chemical farming practices compelled mankind to think about the importance and need for an environmentally friendly alternative farming system that would be both productive and sustainable in the long run. From the understanding that the farming methods produced and practiced by our ancestors for centuries were less harmful to the environment, people began to think about new alternative farming systems based on environmental conservation, which in effect would improve the well-being of human beings in various ways, like clean and healthy foods, an ecology which is conducive to the survival of all the living and non-living things, low use of the non-renewable energy sources *etc*. Many systems of farming such as organic farming, natural farming, bio-dynamic agriculture, do-nothing agriculture, eco-farming *etc*. evolved out of the efforts of many experts and laymen. However, organic farming is considered to be the best among them because of its scientific approach and wider acceptance all over the world.

"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." (FAO, 1999).

3. Developmental Era of Organic Farming

The development of organic farming worldwide had gone through mainly three stages, Emergence, Development and Growth in chronological sequence (Behera *et al*., 2011).

3.1. Era of Emergence (1924–1970)

1924 - *Spiritual Foundations for Renewal of Agriculture* by Rudolf Steiner (Founder of the biodynamic approach to agriculture)
This book explains the method that may be the first comprehensive organic farming system.

1939 - First use of the term organic farming by Lord Northbourne
He derived the term from his concept of "the farm as organism" which he explains in detail in his book *"Look to the Land"* (1940).

- Lady Eve Balfour started Haughley Experiment

This is the first scientific, side-by-side comparison of organic and conventional farming.

1942 - J.I. Rodale started publishing Organic Farming and Gardening magazine. Today the magazine is known as Organic Gardening.

1962 - *Silent Spring* by Rachel Carson

3.2. Era of Development (1970–1990)

1972 - The year marks the creation of IFOAM - the International Federation of Organic Agriculture Movements in Versailles, France.

1973 - Research Institute of Organic Agriculture (FiBL) was founded In Switzerland.

1978 - Creation of FNAB, the National Federation of Organic Farming in France.

1980 - IFOAM defined basic standards and regulations relating to the certification of organic agriculture.

3.3. Era of Growth (Since 1990)

1990 - Established the first fair of organic products BioFach (BIOFACH) in Germany.

1997 - USDA released the first National Organic Program (NOP).

1999 - Codex Alimentarius, a commission run by the UN's World Health Organization and the Food and Agriculture Organization, sanctioned international guidelines to cultivate, process, market and label organic foods

2008 - IFOAM offered the following definition for Organic Agriculture:

"Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."

4. Essential Characteristics of Organic Farming

The most important characteristics are as follows:

1. Maximal but sustainable use of local resources

2. Minimal use of purchased inputs, only as complementary to local resources

3. Ensuring the basic biological functions of soil-water-nutrients-human continuum

4. Maintaining a diversity of plant and animal species as a basis for ecological balance and economic stability

5. Creating an attractive overall landscape which gives satisfaction to the local people

6. Increasing crop and animal intensity in the form of polycultures, agroforestry systems, integrated crop/livestock systems *etc*. to minimize risks (Behera *et al*., 2011)

5. Principles of organic farming

Organic agriculture is based on: The principle of health, The principle of ecology, The principle of fairness and The principle of care (IFOAM-Organics International, 2010).

The principle of health - Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.

This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people. Thus, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and well-being. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

The principle of ecology - Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes and recycling. Nourishment and well-being are to be achieved through the ecology of the specific production environment. For example, in the case of crops, this is the living soil; for animals, it is the farm ecosystem; for fish and marine organisms, the aquatic environment. Organic management must be adapted to local conditions, ecology, culture and scale. Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve environmental quality and conserve resources. Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

The principle of fairness - Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties – farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products.

The principle of care - Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and well-being. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken.

6. Aspects of organic farming

Polyculture - Polyculture is an essential part of organic farming. In this method of farming, a number of crops are planted on a single piece of land. It helps attract different soil microbes. Some crops act as repellents to pest and thus results in pest control, in an organic manner. In organic agriculture systems, one strives for appropriate diversification, which ideally means mixed farming, or the integration of crop and livestock production on the farm. In this way, cyclic processes and interactions in the agro-ecosystem can be optimized, like using crop residues in animal husbandry and manure for crop production.

Soil fertility building - Nutrient management in organic systems is based on building soil fertility, combined with nutrient recycling *via* bulky organic materials such as farmyard manure (FYM) and crop residues, with only limited inputs of permitted fertilizers. Composts are used in organic farming methods to enhance the soil fertility. Green manuring too add nutrients to the soil. It is the practice of growing plants with prolific leaf growth like alfalfa

and burying them in the soil before the cultivation of the main crop. The green manuring crops add organic matter to the soil that is necessary for plant growth.

Crop Rotation – The second principle of organic farming is crop rotation within the mixed farm setting. Other options for optimizing interactions are the classical rotation involving one crop per field per season, intercropping, mixed cropping and relay cropping.The important advantages of crop rotation include weed suppression, reduction in soil-borne insects and diseases, complimentary nutrient supply and nutrient catching.

Organic Cycle Optimization - Each field, farm, or region contains a given quantity of nutrients. Management should be used in such a way that optimal use is made of this finite amount.

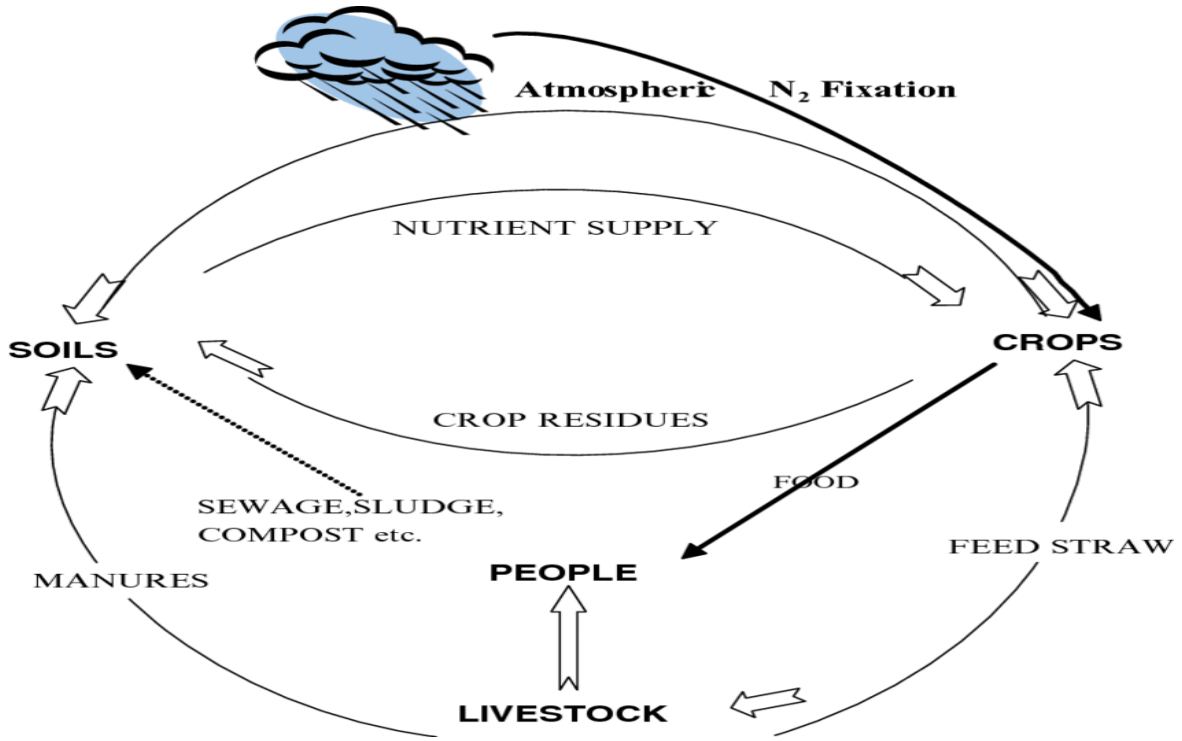


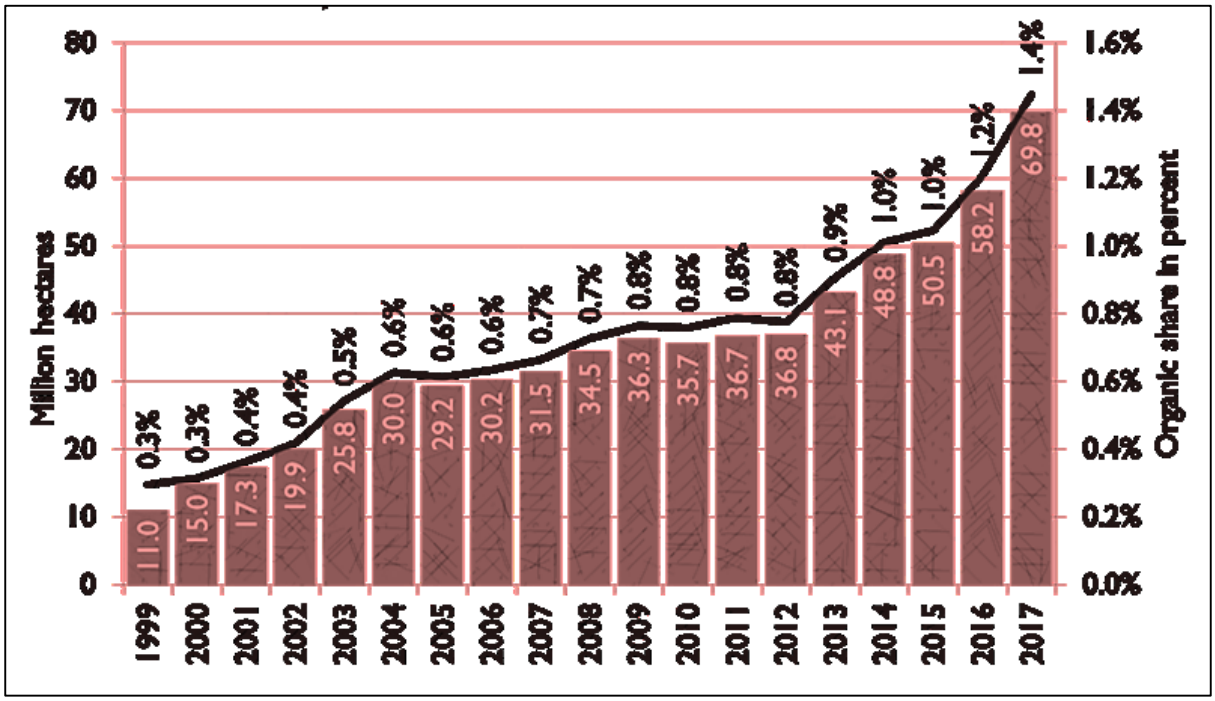
Plate 1. Organic cycle of an organic farming system

i) This means that the nutrients should be recycled and used a number of times in different forms.

ii) Care should be taken that only a minimum amount of nutrients actually leave the system so that “import” of nutrients can be restricted.

Biological pest control - Organic pest control involves various pest control activities, without the use of chemical pesticides and insecticides. Growth of beneficial insects is promoted by growing appropriate plants that attract them. In fact, beneficial insects are predators which control harmful insects. Special types of crops known as companion crops are cultivated to control pests. These crops help to divert or deter the growth of harmful pests. Biological pesticides such as neem extract are useful in controlling many different pests. Crop rotation practice helps disturb the pest reproductive cycles, thereby inhibiting their growth and protecting the crops.

7. Organic agricultural land and organic share – Global scenario



(FiBL and IFOAM-Organics International, 2019)

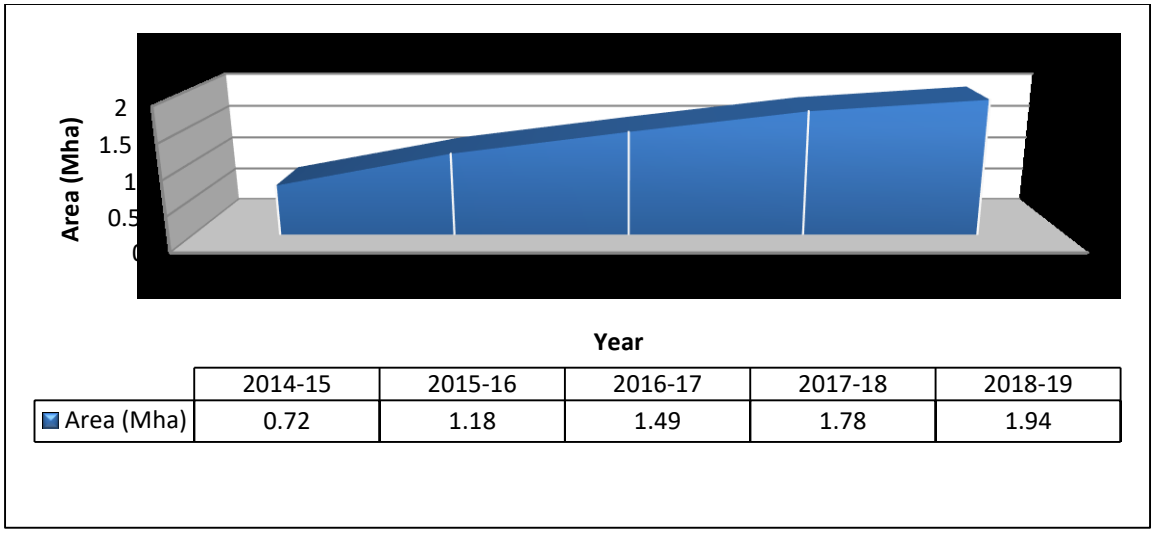
Fig 1. Growth of the organic agricultural land and organic share – Global scenario

The total organic agricultural land has increased from 11 Mha in 1999 to 69.8 Mha in 2017. That is, over a period of twenty years, the total organic agricultural land has increased by about 60 Mha. Correspondingly, share of organic agricultural land in the total agricultural land has also shown an increase. Organic share has increased from 0.30 per cent in 1999 to 1.40 per cent in 2017.

8. Organic farming-where do India stands?

- Country has the highest number of organic producers in the world (28.79%)
- Stands eighth in the world with respect to area under organic farming (2.55%)
- Stands sixth in the world with respect to exports of organic food (3.96%)

(FiBL and IFOAM-Organics International, 2019)



	2014-15	2015-16	2016-17	2017-18	2018-19
Area (Mha)	0.72	1.18	1.49	1.78	1.94

Source: FiBL and IFOAM-Organics International, APEDA

Fig 2. Change in area under organic certification process during last 5 years – Indian scenario

8.1. Area and production for the year 2018-19

Area under organic certification process (organic + in-conversion) - 1.94 Mha (APEDA, 2019)

- **Madhya Pradesh** had the largest area under organic certification process followed by **Rajasthan**, **Maharashtra** and **Odisha** (APEDA, 2019).

Farm production (organic + in-conversion) - 2.61 Mt (APEDA, 2019)

- Among different states, **Maharashtra** was the largest producer followed by **Madhya Pradesh**, **Karnataka** and **Uttar Pradesh** (APEDA, 2019).
- In terms of commodities, **sugar crops** formed the single largest category followed by **oil seeds**, **fiber crops** and **Cereals and Millets** (APEDA, 2019).

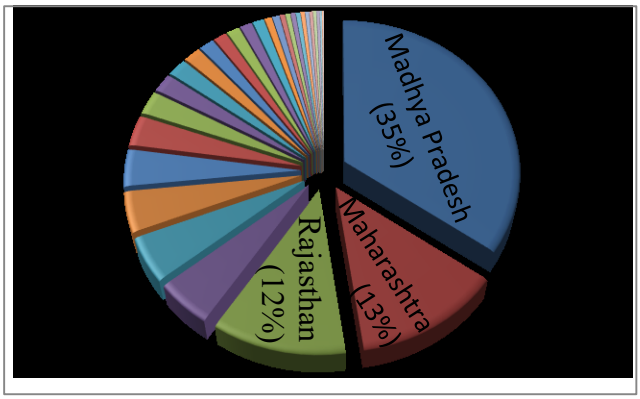


Fig 3. Area under organic certification process

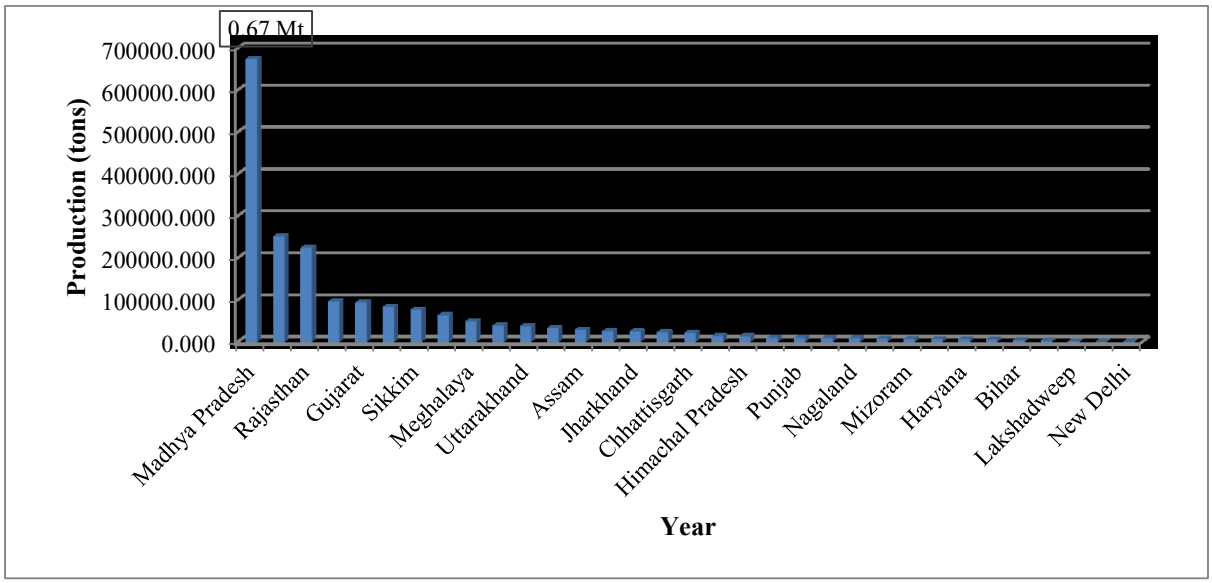


Fig 4. Farm production (statewise)

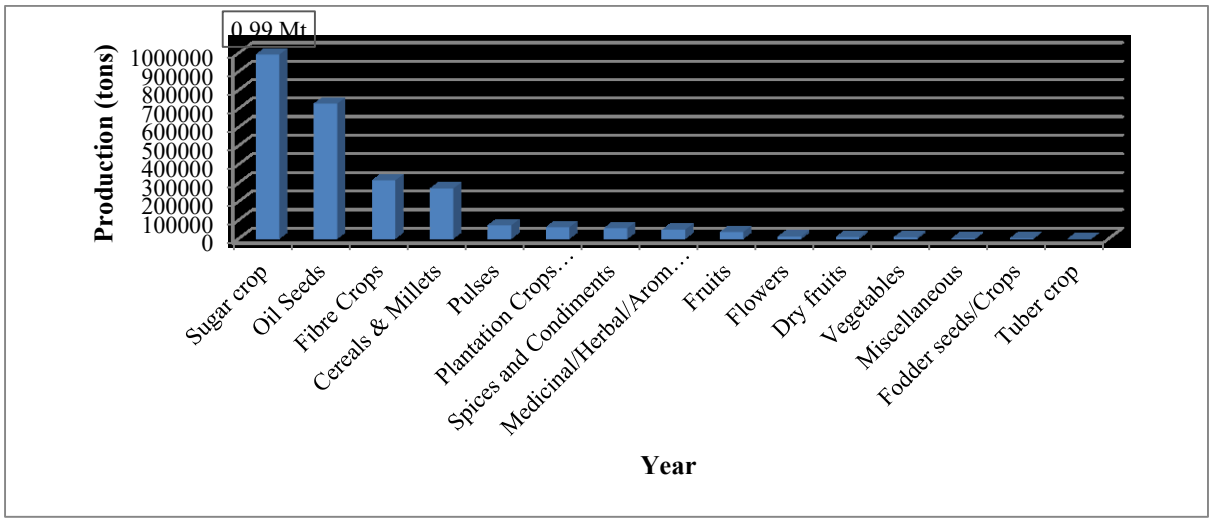


Fig 5. Farm production (cropwise)

8.2. Export earnings for the year 2018-19

Total export quantity - 0.61 Mt (APEDA, 2019)

Total export earnings - INR 5150 crores (APEDA, 2019)

- Among different states, **Madhya Pradesh** was the largest exporter followed by **Telangana**, **Gujarat** and **Maharashtra** (APEDA, 2019).
- Main international markets for organic products were **USA**, **EU**, **Canada**, **Switzerland** and **Australia** (APEDA, 2019).
- Main exported commodities were **Oil cake/meal**, **Oil seeds**, **Processed food**, **Cereals and millets** and **Plantation crops** (APEDA, 2019).

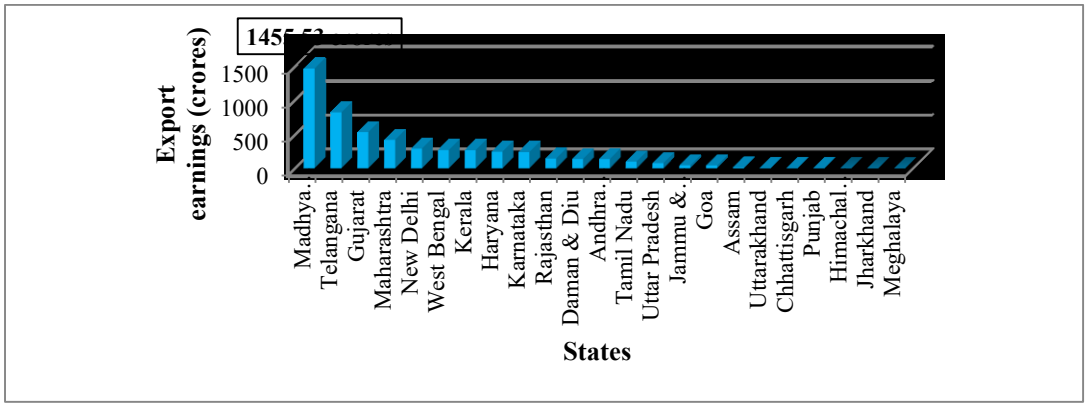
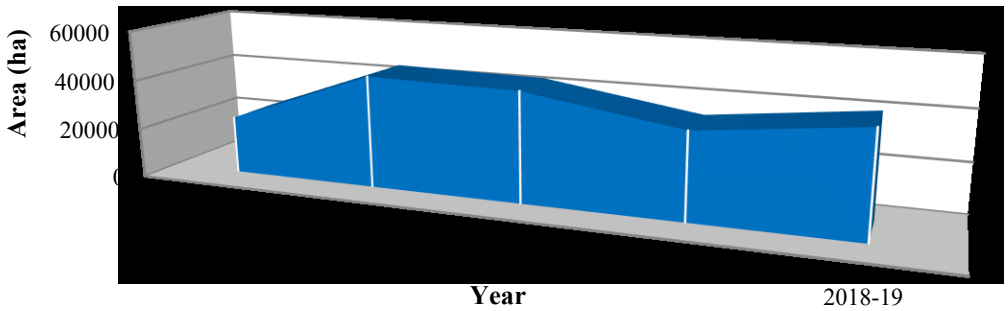


Fig 6. Statewise export earnings (2018-19)

9. Organic farming-where do Kerala stands?

- Tenth in the country with respect to area under organic farming (1.96%)
- Eleventh in the country in terms of organic crop production (0.958%)
- Seventh in the country with respect to exports of organic food (5.08%)

(APEDA, 2019)



	2014-15	2015-16	2016-17	2017-18	2018-19
Area (ha)	23123	44788.495	43701.878	34160.142	40911.236

(APEDA, 2019)

Fig 7. Change in area under organic certification process during last 5 years in Kerala

9.1. Area and production for the year 2018-19

Area under organic certification process (organic + in-conversion) – 0.038 Mha (APEDA, 2019)

Farm production (organic + in-conversion) - 0.025 Mt (APEDA, 2019)

- In terms of commodities, **plantation crops** were the single largest category followed by **spices**, **dry fruits** and **oil seeds.**

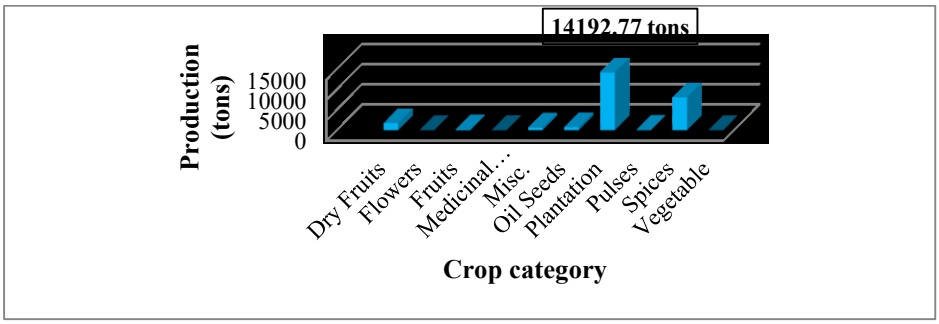


Fig 8. Farm production (cropwise)

9.2. Export earnings for the year 2018-19

Total export quantity - 6139.118 tons (APEDA, 2019)

Total export earnings - INR 260 crores (APEDA, 2019)

10. Organic farming and food security

With the world population crossing the 7 billion mark last year, the debate over our ability to sustain a rapidly growing population is heating up. Organic farming is being proposed as a measure to restore sustainability of agricultural production, with an eye on maintaining environmental amenity at the same time. Although it has made remarkable progress in recent times, the scientific community stands rather sceptical about the potential of organic agriculture to produce enough food to feed the fast-growing population throughout the world. Despite being recognized as offering some health and environmental benefits, its low yield potential as regards conventional farming, and inadequate availability of organic inputs to meet crop nutrient requirements, are some constraints that jeopardize its future prospect as a universally acceptable alternative farming system. In the light of these contrasting views, the latter section seeks to explore the merits and limitations of organic farming. It also discusses possible impacts of organic farming on food security.

World population is expected to grow by over a third, or 2.3 billion people, between 2009 and 2050. This is a much slower rate of growth than the one seen in the past four decades during which it grew by 3.3 billion people, or more than 90 per cent (FAO, 2009). Though the average annual rate of change of the total population is expected to slow down and shows a declining trend, the total population is increasing and is expected to breach the 9 billion mark by 2050. The average annual rate of change of the total population is expected to decline by 0.56 per cent from 2040-2045 to 2045-2050 while the total population is estimated to be at 9.8 billion by 2050 (UN, 2019).

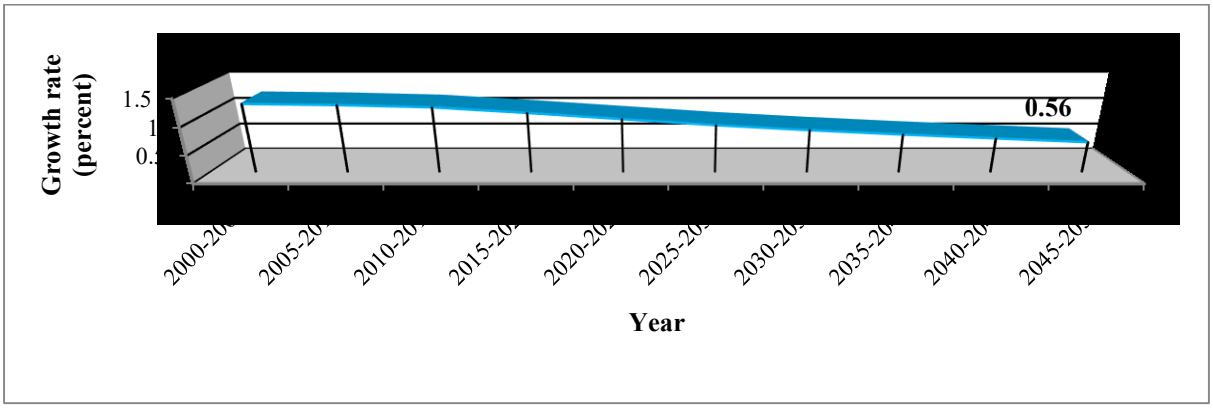


Fig 9. Average annual rate of change of the total population

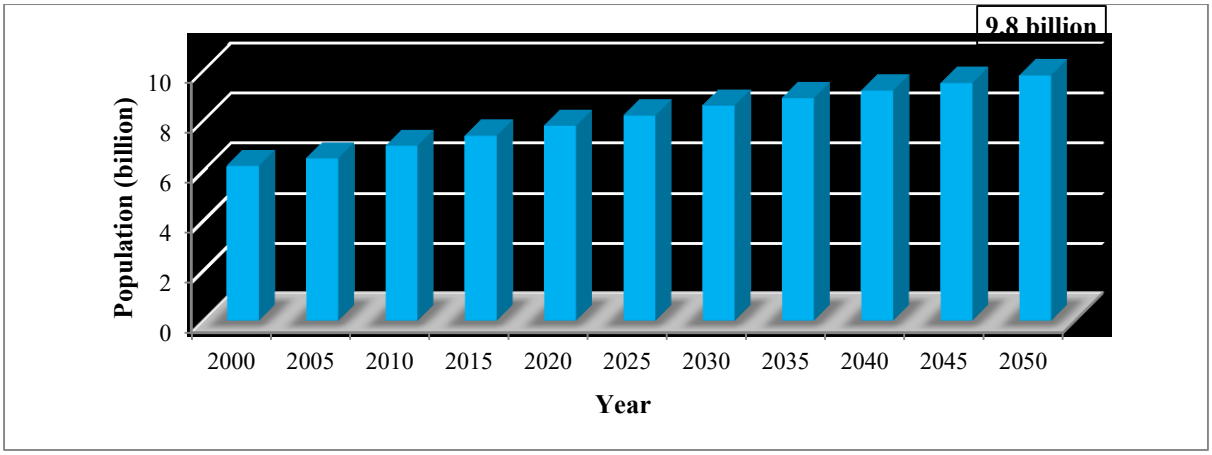


Fig 10. Annual total population at mid-year

The projections show that feeding a world population of 9.8 billion people by 2050 would require a 70 per cent increase in overall food production between 2005-07 and 2050. This implies the need to increase substantially the production of several key commodities. Annual cereal production, for instance, would have to grow by nearly a billion tonnes, meat production by more than 200 million tonnes to a total of 470 million tonnes in 2050 (FAO, 2009). Two main possibilities have been identified for achieving this increase: intensification (intensifying agricultural production on existing cropland), or expansion (ploughing up natural land into cropland, i.e. clearing pastures and rangelands, cutting forests and woodland areas *etc*.) (Behera *et al*., 2011).

The following four observations indicate that intensification is a better choice than expansion:

(1) Agricultural land is steadily decreasing as it is being taken over for urban or industrial use

(2) Global warming may reduce the potential for higher yields in large parts of the world

(3) Significant areas of farmland may be used for fuel production, competing with food production

(4) Cropland simply cannot be expanded, due to shortage of suitable land

There are recent claims that sufficient food can be produced by organic agriculture, expressed in terms such as ‘organic agriculture can feed the world’. However, keeping the lower yields in view, a fundamental question is whether organic yields can be increased radically or whether more natural ecosystems have to be converted into cropland. Here comes the need to revisit the claim ‘organic agriculture can feed the world’. This becomes important

as food production is coupled to a moral imperative as sufficient food supply is a cornerstone of human welfare.

10.1. Key challenges to organic farming

1. Yield gap

- Comparatively lower yield of organically grown crops

2. Cropland expansion

- Low yield necessitates more land to be put under plough

10.1.1. Yield gap

Studies revealing yield gap between organic and conventional systems

- Bjarrod trial, Sweden (Kirchmann *et al*., 2007)
- New South Wales, Australia (Ryan *et al*., 2004)
- Melby trial, Sweden (Torstennson *et al*., 2006)
- Lanna trial, Sweden (Aronsson *et al*., 2007)

Studies of farms under long-term organic management in Australia have shown that individual crop yields are substantially lower than those on conventional neighboring farms.

Table 2. Comparison of yield in organic and conventional systems

Crop	**Yield (Mg/ha)**	
	Conventional	**Organic**
Mixed crop-animal systems:		
1. Bjarrod trial (18 yr)		
Winter wheat	6.1	4.2
Barley	3.7	2.1
Forage	7.5	6.1
2. New South Wales(30 yr)		
Wheat	5.5	2.9
Pure cropping systems:		
1. Melby trial (6 yr)		

Oats	5.8	1.9
2. Lanna trial (6 yr)		
Winter wheat	5.9	2.3

Australian organic wheat crops reported by Ryan *et al*. (2004) were preceded by an average of 4.7 years of pasture, compared with 3.3 years for the conventional crops (New South Wales, Australia). While, Bjarrod trial was conducted on a nutrient-depleted soil that had received no inorganic fertilisers for 40 years prior to the start of the experiment (Kirchmann *et al*., 2007). Organic yields amounted to only 50 per cent of those achieved over 18 years in a comparable conventional cropping system, despite the use of animal manure in quantities greater than those obtained from on-farm production and large additions of rock phosphate and potassium sources approved by the organic farming organisations.

In two organic systems without animals, green manure crops were grown during two of the six years and no food/feed crops were produced (Torstensson *et al*., 2006; Aronsson *et al*., 2007). This means that organic yields are reduced by a further 33 per cent over the entire crop rotation. This correction of yield levels by considering years with non-food crops resulted in a 64 per cent reduction in overall yield in the organic system compared with conventional yields.

On average, organic systems in Europe and Australia that combined crops with animals had 25% lower yields and organic systems without animal husbandry had 47% lower yields than equivalent conventional systems.

10.1.1.1. A Ray of hope for organic farming!

Economics of a farming system is the key determinant of its sustainability. Organic and conventional farming systems are two distinct types of production systems having contrasting farm management practices and output price as well. Studies by several authors on the economics of organic and conventional farming systems brought out strong financial indicators as higher Net Present Worth (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Returns (IRR) for organic farming as compared to conventional farming, which makes organic farming appreciably more profitable than conventional farming. And, this supports farmers to go organic in spite of the lower yield and high cost of production.

Studies comparing benefit cost ratio between organic and conventional systems

- Thakur and Sharma, 2005
- Shrestha *et al*., 2014
- Sgroi *et al*., 2015
- Kumar *et al*., 2017

Table 3. Comparison of benefit cost ratio in organic and conventional systems

Crop	Benefit Cost Ratio (BCR)	
	Conventional	Organic
1. Thakur and Sharma, 2005		
Wheat	1.49	2.57
Maize	2.13	4.01
2. Shrestha *et al*., 2014		
Vegetable	1.35	1.47
3. Sgroi *et al*., 2015		
Lemon	2.04	3.18
4. Kumar *et al*., 2017		
Ragi	0.72	1.08
Maize	1.12	1.37

Overall, there was no significant difference between organic and conventional systems between total costs, variable costs and fixed costs. For organic crops and systems, labor costs which are a part of the variable costs, were found to be significantly higher. However, reduced use of non-renewable resources and purchased inputs such as synthetic fertilizers and pesticides offset the higher labor costs on organic farms. Organic farms often have higher labour costs because they devote more resources to the mechanical control of pests, have a greater diversity of enterprises, or need to develop new marketing and processing activities. But, since organic food fetches a high price in the market compared to conventionally produced food due to the premium price attributed to organic products, organic farmers are able to compensate for the increased cost and reduced yield. And, this encourages more farmers to go organic.

United States Department of Agriculture (USDA, 2016) estimated retail price premiums for 17 commonly purchased organic foods relative to their nonorganic counterparts from 2004 to 2010, using grocery store purchase data from a large set of nationally representative households. The data included detailed information on each product (degree of processing, flavor, package size and whether organic), its price and where it was purchased.

The investigation found that organic price premiums in 2010 were more than 20 percent of the nonorganic price for all except 1 of the 17 products. The highest premiums were for milk and eggs; 72 per cent of the nonorganic price for milk and 82 per cent for eggs. In 2010, premiums ranged from just 7 per cent for fresh spinach to 60 per cent for salad mix among organic fresh fruits and vegetables. The price premiums ranged from 22 per cent for granola to 54 per cent for canned beans among organic processed foods that year.

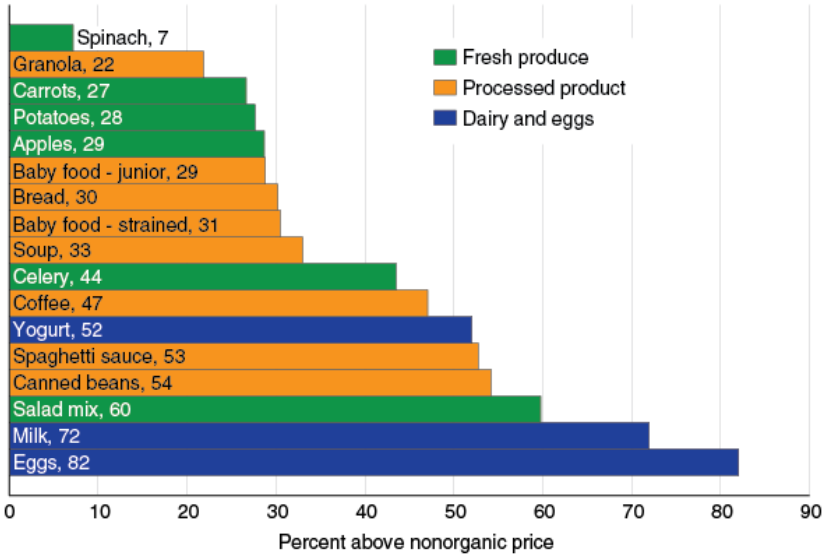


Plate 2. Price premiums for organic foods

However, based on a meta-analysis of 44 studies examining the financial performance of organic compared to conventional agriculture, Crowder and Reganold (2015) found that when organic price premiums were not applied, gross returns, benefit / cost ratios and net present values were significantly lower for organic crops (−10 per cent, −7 per cent and −23 per cent respectively) and systems (−18 per cent, −8 per cent and −27 per cent respectively) compared with their conventional counterparts. However, gross returns, benefit / cost ratios and net present values for organic crops (21 per cent, 24 per cent and 35 per cent respectively) and systems (9 per cent, 20 per cent and 22 per cent respectively) were

significantly higher when the actual organic premiums were applied. These results showed that the combination of ample organic yields, similar costs and organic premiums allowed for reliably higher net present values and benefit / cost ratios for an organic system.

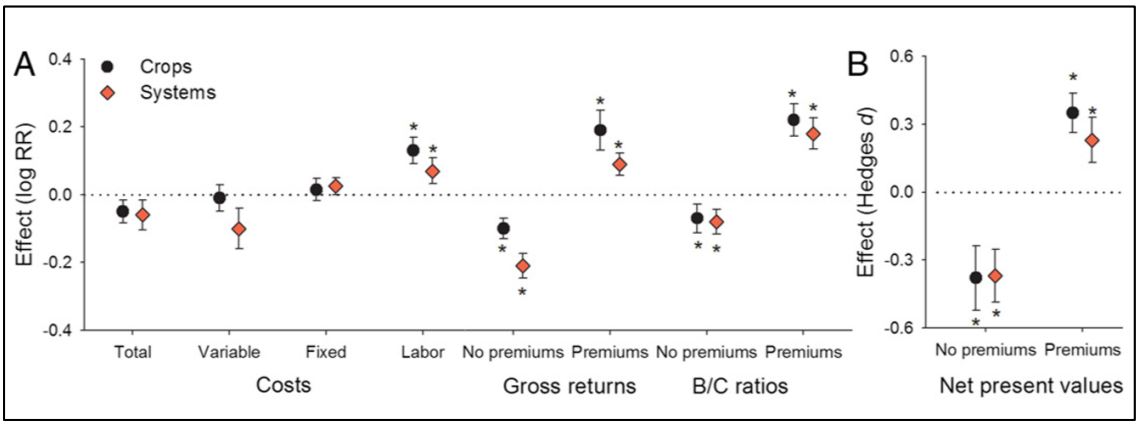


Plate 3. Financial performance of organic compared with conventional crops and systems

Also, it was found that when the actual premiums awarded were higher than breakeven premiums (premiums needed for net present values from organic agriculture to match net present values from conventional agriculture), organic agriculture was more profitable than conventional agriculture, and when the actual premiums awarded were lower than the breakeven premiums organic agriculture was less profitable.

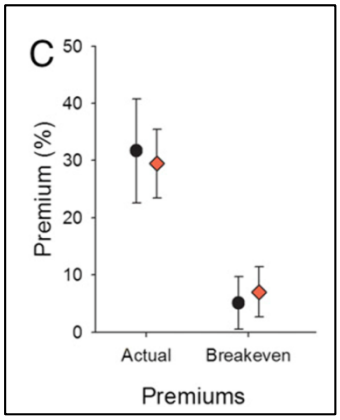


Plate 4. Comparison of organic premiums awarded and breakeven premiums

10.1.2. Cropland expansion

Based on yield data from long-term experiments and excluding any major nutrient transfer from conventional agriculture, Kirchmann *et al*. (2007) assessed the additional cropland required if organic practices were to be introduced. Conversion to organic cropping systems without animals would require 100% more cropland, as yields from such systems represent approximately just 50% of conventional yields, while organic crop-animal systems would require 33% more land as yields from these amount to about 75% of those in conventional systems. Mean estimates of relative yields for organic cropping and mixed crop animal systems indicate that agricultural land needs to be expanded by around 67%.

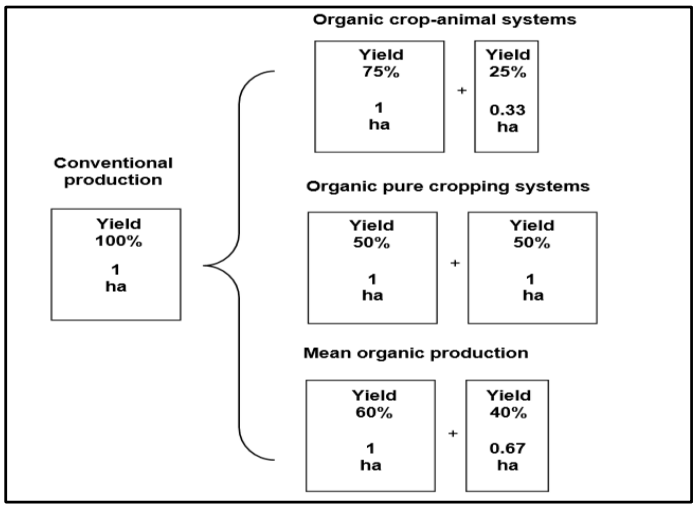


Plate 5. Demand for additional land – an illustration

With the world population expected to reach 9.8 billion (UN, 2019) and the urban areas to account for 68 per cent of the world population by 2050 (UN, 2018), the need for more farmland to produce the same amount of crops through low-yielding systems instead of high-yielding adds an important boundary condition. This is true because global land area remains a constant at 13.2 billion ha which has to include cultivated land, forest land, grassland and woodland ecosystems, sparsely vegetated and barren land, settlement and infrastructural land and inland water bodies (FAO, 2011). Conversion of other ecosystems into cropland means lost production of other raw materials (wood, timber, bio-energy *etc*.) from this area and a decline in specific functions and ecosystem services such as biodiversity and hence is not an option.

Combining expected population growth and projected land demand indicates that introducing low-yielding agriculture as an option for producing enough food in the future seems unrealistic. Population growth paired with introduction of low-yielding agriculture would roughly require at least a doubling of global arable land, from 1400 to 2500-3000 Mha. However, land suitable for agriculture is a limited resource and both the best and the second-best land is already in agricultural production. What remains is often only less suitable land, characterised by lower soil fertility, the presence of stones and gravel, high risk of erosion or other rapid degradation when cropped. Only forests are available for conversion in most cases. Thus, intensification on existing cropland seems to be the main path forward whereas, land expansion seems to be a stumper rather than a solution.

11. Advantages of organic farming

However, despite all the challenges which are pebbles on the path forward, organic farming is arguably one of the most intensively contested topics in recent times and is being proposed as an alternative way of farming to achieve the sustainability in agricultural production as it possesses the following advantages.

- Nutritional, poison-free and tasty food

The nutritional value of food is largely a function of its vitamin and mineral content. In this regard, organically grown food is dramatically superior in mineral content to that grown by modern conventional methods. A major benefit to consumers of organic food is that it is free of contamination with health harming chemicals such as pesticides, fungicides and herbicides. In crops, vitamin C ranges 5-90 per cent more and secondary metabolites 10-50 per cent more in organic. Also, less residues of pesticides and antibiotics are present (Huber and van de Vijver, 2009). Heaton (2002) reported that organic food contains higher minerals and dry matter and 10-50 per cent higher phytonutrients.

- Enhances soil nourishment

Organic farming effectively addresses soil management. The absence of chemicals in organic farming does not kill microbes which increase nourishment of the soil. Biodynamic farms had better soil quality with greater organic matter content and microbial activity, more earthworms, better soil structure, lower bulk density, easier penetrability and thicker topsoil

(Reganold *et al*., 1993). Agricultural productivity was found to be doubled with soil fertility techniques such as compost application and introduction of leguminous plants into the crop sequence (Edwards *et al*., 2007).

- Higher energy efficiency

Growing organic rice was found to be four times more energy efficient than the conventional method (Mendoza, 2002). According to Niggli *et al*. (2009) organic agriculture is found to reduce energy requirement for production systems by 25 to 50 per cent compared to conventional chemical-based agriculture.

- Carbon sequestration

German organic farms was found to sequester 402 kg Carbon/ha annually, while conventional farms had losses of 202 kg/ha (Niggli *et al*., 2009).

- Enriches the biodiversity

Comparative biodiversity assessments on organic and conventional farms revealed 30 % higher species diversity and 50 % greater abundance of flora and fauna in organic fields (Hole *et al*., 2005). According to Rundlöf *et al*. (2008), in regions where the number of organic farms increased, the diversity and abundance of bees was found to increase considerably, which contributed to the pollination of crops and wild plants over larger areas.

12. Conclusion

There is always a tug of war between the proponents and opponents of organic farming. As one claims ‘organic farming can feed the world’, the other defends the claim asking ‘can organic farming feed the world’? It is true that organic farming alone would not be able to feed the seven billion people today and nine billion in 2050, but can contribute a larger share in feeding the world sustainably, provided the existing yield gap is bridged. And, to the question, organic farming - feeding the rich or enriching the poor? The conclusion can be, organic farming can feed the rich who are willing to pay a significant premium for ‘food with integrity’ and also can enrich the poor, provided the premium price fetched by the organic products are transmitted to the resource poor farmers.

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14. Discussion

1. Is it possible to be 100 per cent organic?

No. As 100 per cent organic won't help us to control unexpected situations like a pest outbreak, to be 100 per cent organic will mean taking a chance on the food security of the population. So, the only conclusion that can be drawn is, organic farming can contribute a larger share in sustainably feeding the world, provided the yield gap is bridged, and not that it can be the sole player.

2. What about the future demand of organic products on account of the recent reports on pesticide residue found in organic products. Do you expect that to have an impact on the demand of the organic products?

Pesticide residue in organic products is something which the certification agency has to take care of, being the authority vested with the power and the right to take care of such issues. It is also possible that the pesticide residues may be found in non-organic products sold in the name of organic products. But in either case, I don't think that it will influence the demand, as there are fake products for any branded commodities, which are not found to have any kind of influence on neither their credibility nor their price.

3. What do you think, can organic farming really feed the rich and enrich the poor simultaneously?

Based on the review I have done, I coclude both is possible provided the gaps are bridged and

the flaws are rectified.

4. Which is the 100 per cent organic state in the country?

Sikkim

5. Does VFPCK promote organic farming in the state? If yes, how?

Yes, VFPCK does promote organic farming in the state. In 2012-13, VFPCK brought an area of 2509 ha under organic farming in Kerala. VFPCK had always included organic farming in the regular programs and conducted 200 organic camps, 28 organic seminars, formed 125 organic clubs and supported organic demonstration plots since year 2010.

6. Which crop occupies the highest area under organic farming in the world?

Grasslands occupy 27 per cent of the total area followed by arable crops (17 %). Among arable crops, cereals occupy the largest area.

7. What is the cost of organic certification in India?

The total cost of 'India Organic' label will be calculated depending on application fee, site inspection fee and an annual certification fee which can be between 10,000-60,000 depending on the type of product, size of the production operation and the accredited agency one chooses.

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Department of Agricultural Economics
Ag Econ 591: Master's Seminar

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Major Advisor : Dr. A. Prema

Venue : Seminar hall
Date : 10-01-2020
Time : 10.45 am

Organic Farming - Feeding the Rich or Enriching the Poor?

Abstract

Agriculture provides the most essential service to mankind, as production of crops in sufficient quantity is necessary for food security. Though the green revolution was a significant milestone in the race for ensuring food security, the ill effects of green revolution necessitated rethinking on eco-friendly alternative farming systems which can promote both food and ecosystem security. The most rapidly growing and widely accepted of these systems is organic farming.

"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity" (FAO, 1999). Organic farming is considered as a production management system that excludes all synthetic off-farm inputs, but relies upon on-farm agronomic, biological and mechanical methods, which promotes and enhances biodiversity, biological cycles and agro-ecosystem health.

Organic farming shows an increasing trend worldwide. Currently, organic agriculture is commercially practiced in 181 countries. The total organic agricultural land has increased to 69.8 million hectares which is managed by around 2.9 million producers. Australia has the largest area under organic farming and India has the highest number of organic producers. Share of organic agricultural land in the total agricultural land has increased from 0.30 per cent in 1999 to 1.40 per cent in 2017 and the highest share (37.9 %) is reported in Liechtenstein (FiBL and IFOAM-Organics International, 2019).

With the world population crossing seven billion last year, the debate on the ability of organic farming to sustain a fast growing population is heating up. Although it has made remarkable progress in recent times, the scientific community stands rather skeptical about the ability of organic farming to produce enough food to feed the fast-growing population. Organic farming demands additional cropland, because of its low yield potential in comparison to conventional farming. With the world population expected to reach 9.8 billion (UN, 2019) and the urban areas to account for 68 per cent of the world population by 2050 (UN, 2018), the availability of farmland becomes an important constraint.

However, in spite of the lower yield and the demand for additional cropland, organic farming is found to be significantly more profitable than conventional farming (Crowder and Reganold, 2015). Sgroi *et al*. (2015) reported 110 per cent higher Net Present Worth (NPV), 40 per cent higher Internal Rate of Returns (IRR) and 55 per cent higher Benefit Cost Ratio (BCR) for organically grown lemon as compared to its conventional counterpart on account of the premium price. Moreover, with its environmental benefits, organic farming can contribute a larger share in feeding the world sustainably. Organic farming is thus not a choice that can be completely neglected. It has an untapped potential role in global food and ecosystem security and thus can feed the rich and enrich the poor, provided the existing yield gap is bridged.

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