

# Organic Farming in Tamilnadu (a State in India) Evidence From the Field

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## Research Article

**Keywords:** organic products, India, Green Economy

**Posted Date:** September 23rd, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-927125/v1>

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# Abstract

Green Economy defined by UNEP as one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. Green economy also refers to the resilient economy that provides a better quality of life for all within the ecological limits of the planet. Major countries and agencies are looking towards a green economy that provides path ways for sustainable development and poverty eradication. While discussing the concept of Green Economy it is also important to look at the concept of Green Growth. The key economic indicator that is used to measure the Green Economy's Growth is referred as Green GDP. The potential economic and social impacts of environmental degradation are particularly important for developing countries in order to tackle many of the growth and development issues without compromising further growth and poverty reduction. The concept of Green growth has emerged as a new approach replacing the conventional economic growth model. The GDP refers to the Gross Domestic product generation Agriculture, Industrial and Service sectors. As on 2019, in addition to ensuring food security, agriculture has contributed 15.9% to the Indian GDP and employed 42.3% of its population despite its dependence on vagaries of monsoon. Agriculture continues to be the largest provider of livelihood in rural India and the livelihood of farmers are influenced by the demand and supply of agriculture products in the country and thereby influence the economy.

The organic products are priced with a premium in the market in the country. The demand for organic products across the globe, especially in developed countries, has been growing rapidly. Globally, organic farming is practiced in 162 countries and 37 million ha of land are managed organically by 1.8 million agricultural households. The sale of organic food and drink is estimated to be 63 billion US dollar in 2011 internationally. The organic farm land area had increased by 3 percent when compared to 2010. The countries with large-scale organic farm land are Australia, Argentina and United State in that order. The main contributor of expansion of cultivated area under organic agriculture in Asia is India. The cultivated area under certified organic farming has grown 17 times in the last one decade in the country. In India, certified organic farming is undertaken in all the states and Union territories.

States like Uttarakhand, Karnataka, Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, Tamil Nadu, Kerala, Nagaland, Mizoram and Sikkim have been promoting Organic farming. The organic produce is increasingly preferred by major urban centers in India. Huge demand for Indian organic products especially tea, coffee, cotton etc., exists in international market. The organic produces like tea, herbs, and species from Tamil Nadu are widely sought after globally.

The Tandon H.L.S et al (2007) have reviewed the fertilizer consumption in Indian Agriculture for the past five decades and concluded that the Integrated Nutrient Management would be the solution for the problems faced by Indian Agriculture. Gahukar R.T et al (2009) in his paper discussed about the Sustainable Agriculture in India at that time and brought up the future needs of Sustainable Agriculture in India with a series of recommendations. Jaganathan.D et al (2012) conducted a sample survey to assess the Knowledge Level Farmers on Organic Farming in India. Amarnath J.S et al (2012) looked at the

economic aspects of organic farming in Tamil Nadu. Panneerselvam.P et al (2013) studied the impact of large-scale organic conversion and food production and food security in Tamil Nadu and Madhya Pradesh. Amarnath J.S et al (2013) developed indicators for comparing sustainability in crop and dairy production in Tamil Nadu. Vandana Tyagi et al (2017) discussed in detail the prospects and challenges of Green Economy in India. Kalyani.V et al (2018) concentrated briefly on various issues and prospects for organic farming in Tamil Nadu. Krishnaprabu.S et al (2019) focused on concept, application and prospects on Organic Farming in India. Jothi Sivagnanam.K et al (2019) dwelt on fertilizers' consumption and soil health status in Tamil Nadu. Dr V. Bail Hans et al (2019) studied the relationship between the sustainable agriculture and economic growth especially in State Governments. Murugan.D et al (2020) studied the greening status of organic farming in wet and dry land in Nagapattinam and Erode District of Tamil Nadu under various crops. Hinz et al (2020) concentrated on land consumption dynamics in Tamil Nadu under various scenarios. Amit Khurana et al (2020) studied the challenges and possibility in the organic and natural farming in India. Delabre et al (2021) deliberated on how sustainable food production and consumption will impact post 2020 global Bio Diversity Framework.

This paper attempts probably for the first time to examine the data on consumption of inputs for evidence regarding the adaption of organic farming in the State.

## **Introduction**

Green economy refers to an economy (William Hynes et al.2012) that results in improved human wellbeing and social equity, while significantly resulting in reduction in environmental risks and ecological scarcity. Thus the green economy will be low carbon, resource efficient and socially inclusive (Vandana, 2017). The concept of green economy has some underlying principles namely planet integrity, polluter-pays, dignity, justice, resilience, governance and the plenty principles. Many countries are looking forward to the green economy framework that provides visible policy framework for sustainable development and poverty reduction. In order to study the green economy, it is necessary to evolve parameters that measure changes in the green economy. The concept of green growth has been evolved for this purpose and key features of Green growth are adoptability, desirability and measurability.

The effect of Greenhouse gases and climate change mitigation has changed the way the Governments think of development paradigm. The economic and social cost of development has been very huge and the result has been environmental degradation and climate change disasters. The climate and environmental impacts have introduced a whole new set of development issues without compromising positive economic growth and poverty reduction. Hence the concept of Green Economy has become the buzzword and Green Growth has emerged as new approach to development in place of conventional economic growth model.

## **Main Text**

### **Greening the Economy with Agriculture**

Currently huge volume of literature is available on the theoretical frame work of Green Economy. But putting this abstract concept into practice has remained largely unexplored due to lack of literature on Green Economy implementation. Evidently, there is knowledge gap between the theory and practice. So, there is an urgent need to build database required to track the changes in Green Economy at least in important sectors.

Akin to the conventional economic growth model, Green GDP may be assumed to have three sectors namely Agriculture and Allied sector (Primary), Industry Sector (Secondary) and Services Sector (Tertiary). The concept of greening the three sectors refers to the adoption of various environmental and climate friendly strategies specific to each sector without compromising on economic growth and poverty reduction. The focus of this paper will be to discuss one such implementation strategy with regard to greening of agriculture production. Activities related to agriculture are resource intensive and result in environmental degradation greening agriculture is not simple and straight forward as it has major impact on the livelihoods of large number of farmers and people living in rural areas. Greening of agriculture may be achieved by adopting eco system approach to agriculture, forestry and allied sector using eco friendly activities.

## **Sustainable Consumption and Production**

The major factors that indicate growth of agriculture sector is the agricultural production and consumption. All these years Governments have focused on increasing agricultural production using nutrients, pesticides and other chemical inputs. The consumption of chemical products aimed at increasing agriculture yield and to ensure food conservation are detrimental to environmental and consumer health such as biodiversity, soil fertility, water consumption and water pollution, energy, climate change, chemicals, food safety, food security and bio technology. Sustainable Production and Consumption is one of the important priorities identified at the Rio earth summit in 1992. Sustainable development also requires change in production and consumption pattern in the world.

## **Green economy in Indian context**

India is one of the fastest growing economies in the world. It is also signatory to the 2030 Sustainable Development Agenda adopted in September 2015. The Constitution of India contains enough provisions (Articles 48A and 51A) for protection of environment. The India's National Action Plan on Climate Change along with State Action Plans form the basic framework for bringing environment and climate to the main stream of development discourse. The Indian Government under the Copenhagen Accord has committed to reduce emission intensity by 20 to 25 percent. India also announced plan to reduce emission intensity by 30 to 35 percent by 2030. India recently has ratified Paris Agreement to ensure welfare of its citizens without crossing the limits of environment. India has also undertaken structural reforms in the rationalization of taxes. The rapid urbanization of the country has placed bigger cities as the engines of economic growth and at the same time the country faces several pressures on infrastructure such as power, telecom, roads, water supply and the mass transportation. Experts believe that the Green Economic transition has the potential to grow in India. But the transformation is happening

ever slowly and the progress made so far is not commensurate with what it is needed. Fortunately, agriculture sector provides livelihood to the two thirds of the population of the country. The greening of agriculture sector has large bearing in the Sustainable Production, Consumption, Economic Growth and Poverty reduction.

## **Green Economy and Agriculture in India**

The development of Sustainable Agriculture is becoming more and more favorable in India. New opportunities beckon the stake holders in the form of fresh markets and business opportunities. On the other hand, the agriculture is also facing the crisis. Long term vision is needed for inclusive growth of farmers and rural communities. Organic agriculture holds the key for sustainable agriculture in future. Some experts believe that organic and natural farming are necessary for making agriculture self-reliant. In India organic farming movement has been largely led by the farmer communities and civil societies. The Government of India has increased efforts towards popularizing organic farming by launching PARAMBARGAT KRISHI VIKAS YOJONA in 2015-16. The State Governments on their part have come forward with strategies to become 100% organic states.

The organic farming movement in India is in nascent stage rather than a mass movement. Only two percent of the net shown area is organically farmed and about 1.3% of farmers in India are registered for organic farming. The policy makers and businessmen of the country believe that environmental production is a hindrance to the economic growth and development. Financial instruments for green investment and systems for direct funding of green projects are miniscule and are inadequate. Business community also believes green technology as not reliable and cost effective. On the brighter side the organic products are priced at a premium in the urban markets and organic product retailers.

## **State of Tamil Nadu**

The State of Tamil Nadu is located on the south eastern tip of the Indian peninsula. It has geographical area 130 thousand square kilometers and is the 11<sup>th</sup> largest state in the country. The state has been divided into 38 districts and 385 blocks. It has a long coast line of 1076 kilometers and tropical climate. The state has a wide range of biosphere extending from south Western Ghats; in east to rain forests in the Western Ghats the south Deccan plateau to dry forests. The state has around 2000 species of native wild life. The state has population of approximately 8 billion in 2021. It is one of the most urbanized states with a population intensity of 555 persons per Sq.Km., and one of the comparatively better developed states in the country. The state has wide network of national and state highways supported by good railway network. The production of food grains in the State was 7.5 million tons in 2009-10 and it increased to 11.5 million tons towards in 2019-20.

## **Fertilizer consumption**

Fertilizers play pivotal role in maintaining soil fertility. They are used to increase crop production. India is at the second place in fertilizer consumption, next to China. Here, fertilizer consumption had increased

over a period of four decades. It is one of the largest producers and consumers of fertilizers in the world. There is an increase in production because of efficient technologies used in the agricultural sector leading to economic and social development. During 2010, Egypt (368.7 kg/ha.), Korea (269.7 kg/ha.), Malaysia (265.4 kg/ha.), Vietnam (223.9 kg/ha.), Japan (212.5 kg/ha.) and India (156.3 kg/ha.) were the leading fertilizer consumers in agriculture sector in the world. Among them, Egypt topped the list, while, India was consuming the lowest level of fertilizers compared to other large consumers in the world.

India was a food starved country during early 50's. Hence the country embarked on the Green Revolution in early 60's to increase food production. With the introduction of quality seeds and wide spread consumption of fertilizer and a pesticide, the country was able to increase the food grain production from 53.8 million tons in 1960 to 296.65 million tons in 2019-2020. Simultaneously, the fertilizer consumption also increased from 65.6 thousand tones 1950-51 to 25.84 million tons for 2012-13. It is to be noted that the food grain production always increased at a lower rate compared to the fertilizer consumption indicating that the higher food grain is achieved by higher doses of chemical fertilizers. On account of higher consumption of fertilizers, the soil degradation has become one of the serious issues faced by the country. It resulted in the negative growth in agriculture production and increase in the cost of agriculture cultivation. There is also wide variation in the fertilizer consumption across the regions in India as well as districts of Tamil Nadu.

In India, there is an increase in demand for food and this in turn has increased the demand for fertilizers. The increase in food production is due to consumption of inputs like fertilizers, quality seeds and pesticides. The fertilizer consumption in India increased from 65.6 thousand tons in 1950-51 to 25.84 million tons in 2012-13. The consumption of fertilizers has increased from 2.18 million tons in 1970-71 to 12.54 million tons in 1990-91. After the economic reform period, it increased to 28.12 MT in 2010-11; but it declined to 25.84 million tons in 2012-13. It implies that the rapid expansion of irrigation, introduction of High Yielding Variety seeds, introduction of Retention Price Scheme, distribution of fertilizers to farmers at an affordable price, expansion of dealers network, improvement in fertilizer availability and virtually no change in farm gate fertilizer prices were the major reasons for the increase in fertilizer consumption.

“Intensive agriculture, while increasing food production, has caused second generation problems in respect to the nutrient imbalance including greater mining of soil nutrient to the extent of 10 million tons every year, depleting soil fertility, deficiencies of secondary and micronutrients, decline of water table and quality of water, decreasing organic carbon content and overall deterioration in soil health”.

As per the Statistics of Indian Council of Agricultural Research (ICAR, 2010), among the total geographical area 120.40 million hectares of land is degraded. According to National Bureau of Soil Survey & Land consumption planning (NBSS & LUP, 2004) estimation, among the total geographical area, 146.8 million hectares of land is degraded by various causes.

Soil degradation is one of the serious issues facing the country; it leads to negative impact on agricultural production and also increase in the cost of cultivation. There are wide variations in the

consumption of fertilizers among different states and even at the district and block level in India. It varied from region to region. Among the states, Punjab, Bihar, Haryana, West Bengal, Andhra Pradesh, Uttar Pradesh, Tamil Nadu, Jharkhand and Uttarakhand account for high consumption of fertilizers in India. On the other hand, Arunachal Pradesh, Nagaland, Mizoram and Meghalaya states are the lowest consumers of chemical fertilizers (Department of Agriculture, Government of India).

In Tamil Nadu as a whole, average consumption of fertilizer is 197 kg/ha. (Jothi Sivagnanam et al 2019) Out of that, Nitrogen consumption is 109 kg/ha., Phosphate consumption is 54 kg/ha and Potash consumption is 34 kg/ha. In the consumption of fertilizers (in terms of NPK pattern), Thanjavur, Nagapattinam, Villupuram, Tiruchirapalli and Tirunelveli districts have the highest consumption of Nitrogen due to soil deficiency. Cuddalore, Thanjavur, Villupuram, Tiruchirapalli and Dindigul districts have the highest level of consumption of phosphate fertilizers due to soil deficiency. Tirunelveli, Villupuram, Tiruchirapalli and Salem are the highest consumption districts of potash fertilizers.

The major reason for higher consumption of NPK fertilizers among different districts of Tamil Nadu is soil condition. (Jothi Sivagnanam et al 2019) Districts like Thanjavur, Nagapattinam, Villupuram, Tiruchirapalli and Tirunelveli registered the highest deficiency in soil, in terms of nutrients of NPK ratio. Therefore, the farmers of these districts used more fertilizers for compensating soil deficiency. Generally, soil is deficient not only in NPK, but also it has inadequate secondary nutrients like Sulphur, Calcium and Magnesium and micro nutrients like zinc, copper and iron in most of the Indian states. The deficiency of soil varied from one region to another. Due to lack of soil fertility, 10 million tons have been depleting every year in India. There are deficiencies of secondary and micro nutrients, declining water quality and decreasing organic carbon.

## **Review of Literature**

The Tandon H.L.S et al (2007) have reviewed the fertilizer consumption in Indian Agriculture for the past five decades and concluded that the Integrated Nutrient Management would be the solution for the problems faced by Indian Agriculture. Gahukar R.T et al (2009) in his paper discussed about the Sustainable Agriculture in India at that time and brought up the future needs of Sustainable Agriculture in India with a series of recommendations. Jaganathan.D et al (2012) conducted a sample survey to assess the Knowledge Level Farmers on Organic Farming in India. Amarnath J.S et al (2012) looked at the economic aspects of organic farming in Tamil Nadu. Panneerselvam.P et al (2013) studied the impact of large-scale organic conversion and food production and food security in Tamil Nadu and Madhya Pradesh. Amarnath J.S et al (2013) developed indicators for comparing sustainability in crop and dairy production in Tamil Nadu. Dr Vandana Tyagi et al (2017) discussed in detail the prospects and challenges of Green Economy in India. Kalyani.V et al (2018) concentrated briefly on various issues and prospects for organic farming in Tamil Nadu. Krishnaprabu.S et al (2019) focused on concept, application and prospects on Organic Farming in India. Jothi Sivagnanam.K et al (2019) dwelt on fertilizers' consumption and soil health status in Tamil Nadu. Dr V. Bail Hans et al (2019) studied the relationship between the sustainable agriculture and economic growth especially in State Governments.

Murugan.D et al (2020) studied the greening status of organic farming in wet and dry land in Nagapattinam and Erode District of Tamil Nadu under various crops. Hinz et al (2020) concentrated on land consumption dynamics in Tamil Nadu under various scenarios. Amit Khurana et al (2020) studied the challenges and possibility in the organic and natural farming in India. Delabre et al (2021) deliberated on how sustainable food production and consumption will impact post 2020 global Bio Diversity Framework. While in the literature we could see articles studying at organic farming on related issues and strategies. Few articles are available looking for clear evidence from the field. This paper tries to put focus on that front. Any policy will be considered a success if stakeholder participation is spontaneous and clearly evident. That stands as proof about viability for sustainable agriculture and there by contributing to Green Economy.

### **Evidence for consumption of organic fertilizers**

In this paper, the input data collected as part of the ongoing General Crop Estimation Survey on paddy crops conducted by the Department of Economics and Statistics formed the data base for the analysis. Paddy is the staple food grain of the State. Chemical and organic inputs are largely used for paddy cultivation. The total consumption of Chemical and organic inputs are converted into per hectare consumption and used for analysis. The data collected for the period 2010-2020 is used for analysis to study the consumption pattern over the decade. During the last decade the consumption of both organic and chemical inputs varied wildly in the randomly selected fields.

### **Pesticides and Fertilizers consumption**

Pesticides are the chemicals designed to kill or control insects, weeds, fungi, rodents and microbes. But, many pesticides have been found to be harmful to human and animal health or to the environment which influence the persistence of pesticide residues in or on food. As the result of series of measures undertaken by the State Government for judicious consumption of pesticides and “Grow Safe Food” campaign initiated to create awareness and minimize the consumption of Pesticides (Table-1), the per hectare consumption of pesticides has declined by 92% over the decade. The per-hectare consumption of the pesticides was 720 kl per hectare in 2010-11, it reached a high of 1024 kl per hectare in 2011-12 and it recorded minimum of 56 kl per hectare during the year 2019-20. While analyzing the fertilizer data set, it is clear that the consumption of Chemical fertilizers has increased by 47% during the past 10 years.

### **Table: 1 Pesticides and Fertilizers – Per hectare Average Consumption**

YEAR	Pesticides (Kl/ha.)	Chemical Fertilizers (Kg/ha.)	Leafy (Kg/ha.)	Oil cake (Kg/ha.)	Farmyard (Kg/ha.)
2010-11	721	257	246	6	2261
2011-12	1024	347	727	22	4564
2012-13	458	335	506	126	3147
2013-14	259	317	537	257	3630
2014-15	159	454	802	18	6116
2015-16	298	831	1205	56	11570
2016-17	57	406	685	64	6148
2017-18	101	303	618	62	5560
2018-19	104	314	612	62	5641
2019-20	56	376	543	14	4273

### Pesticides Consumption

Reduction in per hectare consumption of Pesticides (Fig-2) was spread across all the districts. Tiruppur, Karur, Thiruchirappalli, Perambalur, Dindigul and Ramanathapuram districts were able to achieve near complete reduction in the consumption of Pesticides. Except Erode, all other districts have reduced the consumption of Pesticides by over 80%.

### Chemical Fertilizers

The consumption of Chemical fertilizers was 257 kg per hectare in 2010-11 (Table-1) and it reached a high of 831 kg per hectare in 2015-16. During the year 2019-20, the consumption was 376 kg per hectare. The consumption of Chemical Fertilizers was hovering around an average of 350 kg per hectare excluding the peak in 2015-16.

In the districts of Nagapattinam, Ramanathapuram, Dharmapuri and Madurai (Fig-3) the consumption of Chemical fertilizer has decreased by more than 50% whereas it has increased by more than five-fold in the districts of Erode, Salem and Namakkal. Perambalur consumed less amount of chemical fertilizer among the Cauvery delta Districts during 2010-11 to 2018-19, but increased notably in consumption of chemical fertilizers in the year 2019-2020 in samba season.(Peak Paddy growing season in vernacular).

## **Organic Fertilizers**

While analyzing the organic fertilizer data set (fig 4), it is clear that the consumption of farmyard manure is comparatively higher than other two manures namely oil cake and leafy manure and the consumption of farmyard manure has increased by 108% over the decade.

### **NPK- Leafy Manure**

Some districts (fig.5) show substantial increase in consumption of NPK-leafy manure during, 2010-2020. During 2010-11 to 2019-2020 Villupuram district has used more NPK (Fertilizer) than the Cauvery Delta Districts. Difference in pattern of consumption in Villupuram and Dharmapuri Districts has been noticed during some of the mid years, when comparing with the Cauvery delta districts in consumption of NPK-Leafy Manure. As far as the consumption of Leafy manure is concerned, the consumption has increased by more than 100% in Thoothukudi, Krishnagiri, Vellore, Villupuram and Ramanathapuram districts. The consumption has reduced by more than 90% in Thiruvannamalai, Perambalur and Thajavur districts. During 2017-18, 2018-19, 2019-20 (fig.4) NPK-Leafy Manure consumed by Dharmapuri District alone is more compared to Villupuram,

The per hectare consumption of NPK-Leafy Manure was phenomenally high across all the districts and many districts have reported an increase of more than 100 percent. Clear increase in consumption of NPK-Leafy Manure fertilizer by Villupuram is seen from 2010 to 2020.

### **Oil cake**

Here again the consumption of Oil cake was high across all the districts with many districts reporting an increase of more than 100 percent.

The consumption of Oil cake has dramatically increased over the decade which help in reducing, the consumption of chemical fertilizers whereas the consumption of Leafy manure also has increased by 76%.

The consumption of Oil Cake (Fig 6) has increased in Tiruvannamalai, Tiruchirapalli, Tirunelveli and Vellore Districts by more than five times. Whereas, the consumption has reduced significantly in Villupuram, Kanniyakumari, Nagapattinam, Karur and Erode.

### **Farmyard Manure**

The per hectare consumption of Farmyard Manure was consistently high in all the districts with the some of the delta districts (Thanjavur and Tiruvarur) reporting higher consumption of more than 250 percent. Farmyard Manure (Fig.7) Consumption has increased in most of the districts. In the districts of Krishnagiri, Thanjavur, Thiruvarur, Kanyakumari and Erode, the Farmyard manure consumption has increased extensively over the decade whereas, in the districts of Namakkal and Dindigul the consumption has reduced.

## Conclusion

From the above discussion, it could be seen that the consumption of Organic inputs for the staple crop of paddy of Tamil Nadu has gone up significantly while consumption of chemical fertilizers are in elastic. Similarly consumption of pesticides has come down significantly and the change has happened across all the districts of the state during past decade. There are variations among districts on the consumption of fertilizers and pesticides. In some districts the opposite trend is also noted. While the reasons for these changes have to be examined, it is evident that the concept of organic farming has caught up with the farmers largely due to the efforts of the State and Central Governments and also the farmers' willingness to embrace the changes towards Green Agriculture and thereby enabling smoother transition towards Green Economy. Evidence shows that the farmers have not completely done away with the use of chemical fertilizers unlike pesticides but they are cautious on this front. It is to be remembered that the transition to green economy especially in agriculture sector has to happen gradually to avoid economic shocks. The recent experience of Srilanka is to be recollected here, as total switch to organic farming in one stroke resulted in declaration of economic emergency. The study does not cover the period of Covid-19 i.e. after 2020 as data also is not available for these periods and such data require different type of analysis.

## Declarations

## Acknowledgement:

The authors' would like to acknowledge with thanks Dr. K. Vijayakumar and N. Rekha of Centre for Development of Advance Computing (CDAC) India for their contribution in the computations.

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## Figures

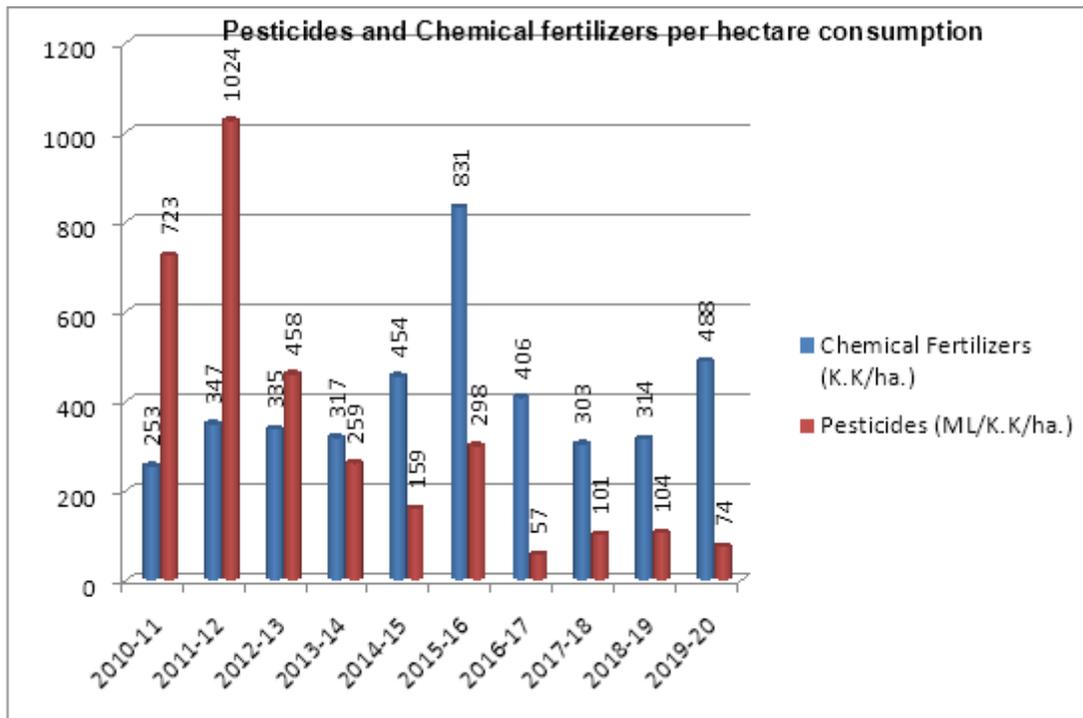


Figure 1

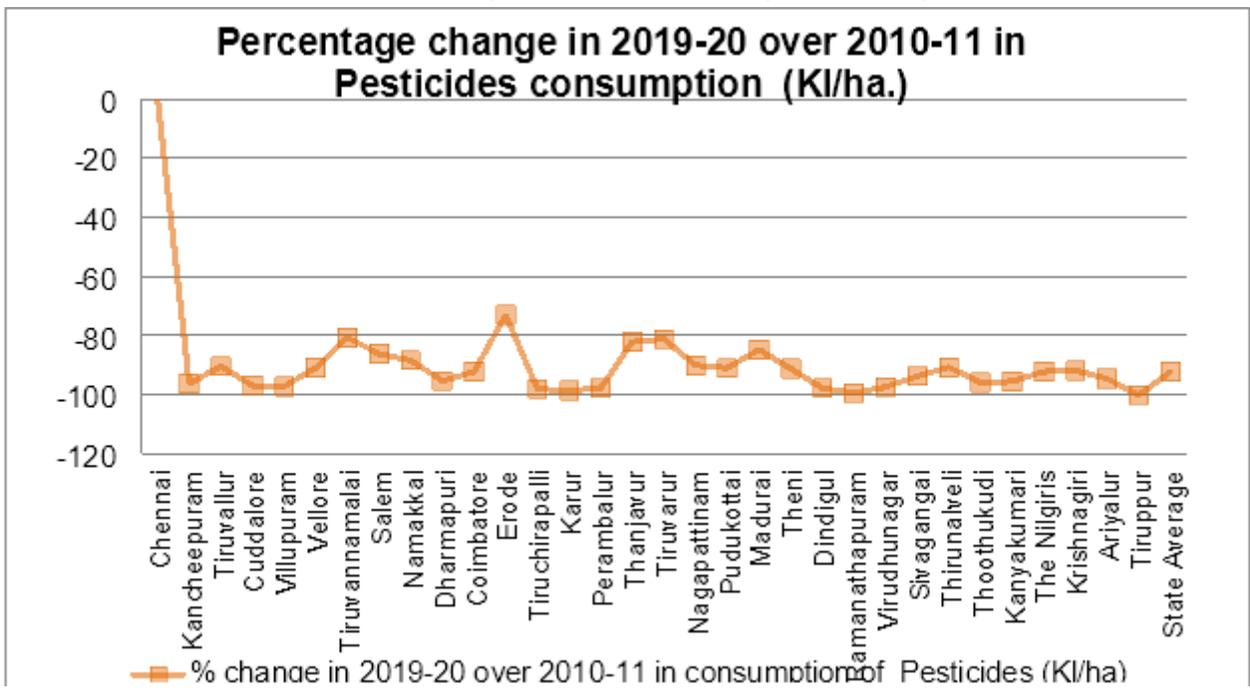
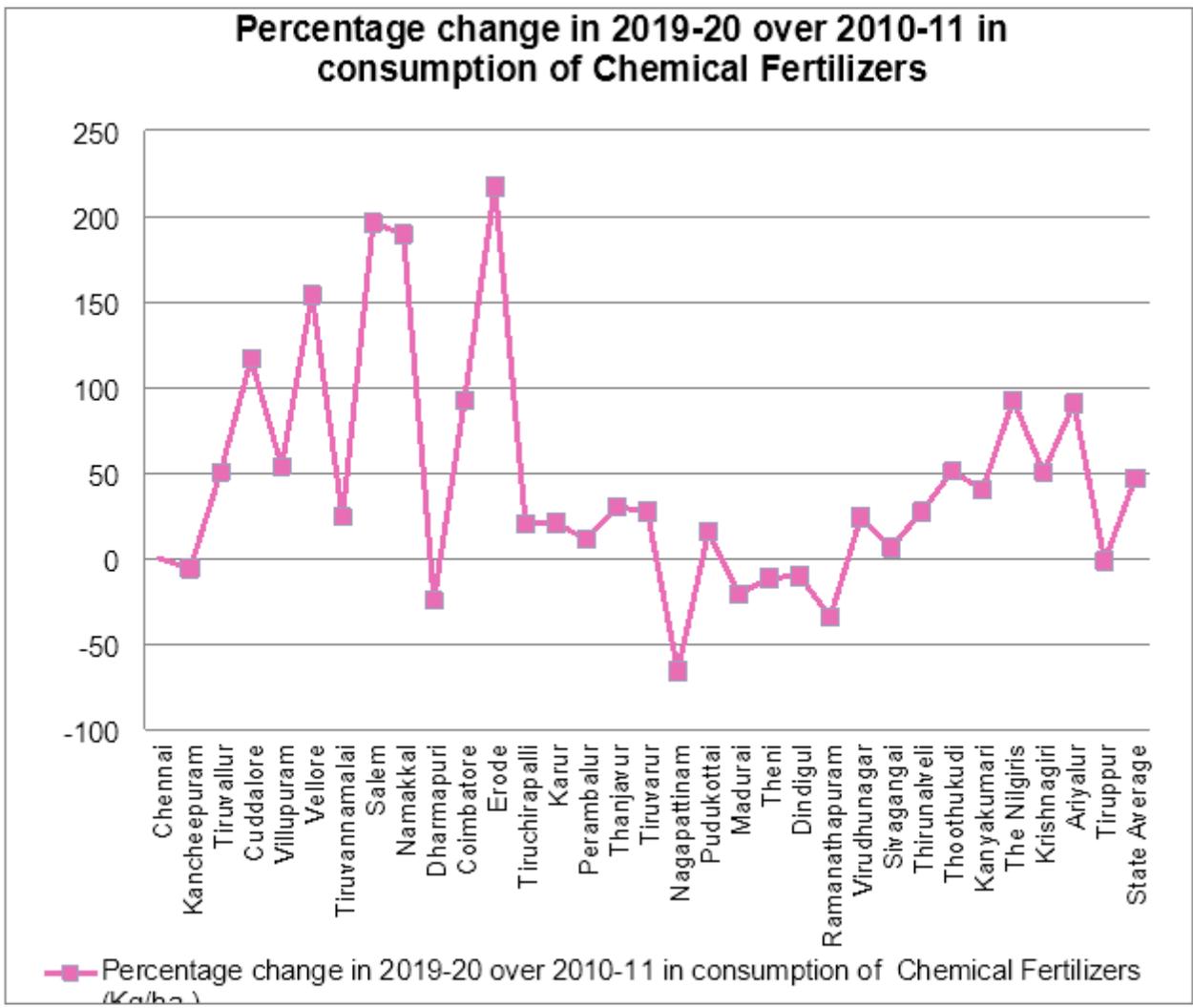


Figure 2

Pesticide consumption in districts during 2010-2020



**Figure 3**  
 Chemical Fertilizer consumption in districts during 2010-2020

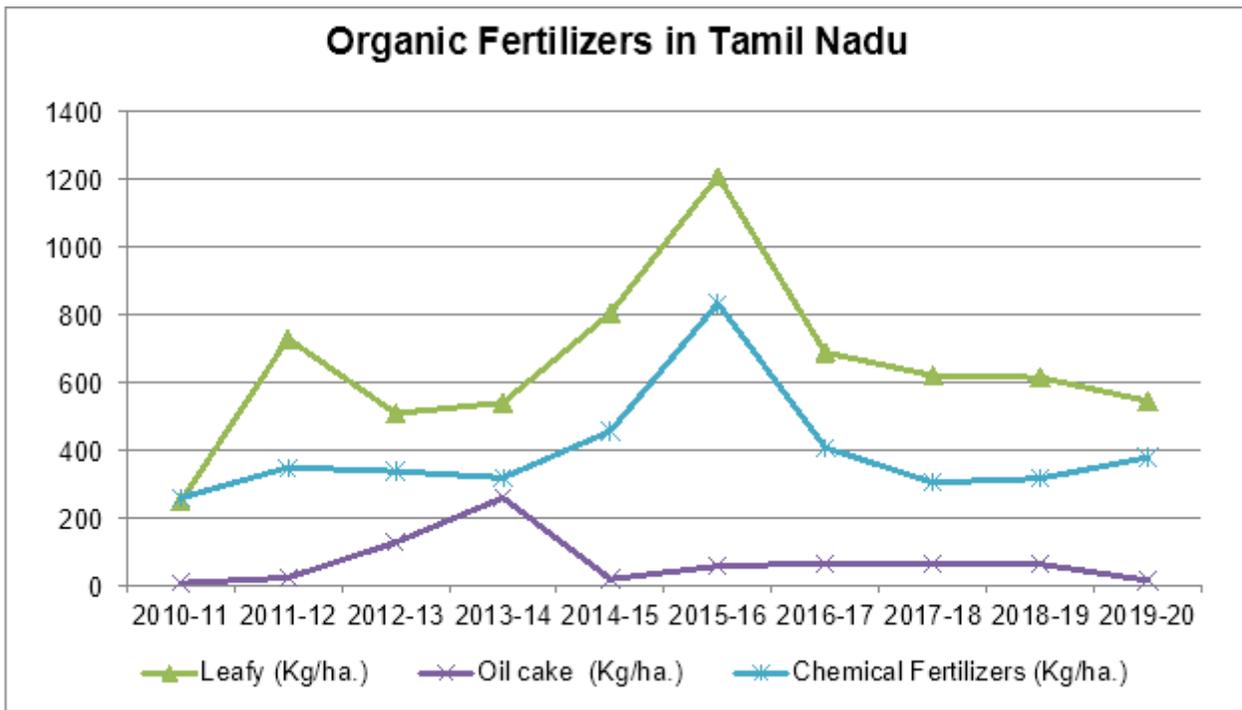


Figure 4

Organic fertilizers consumption in Tamil Nadu

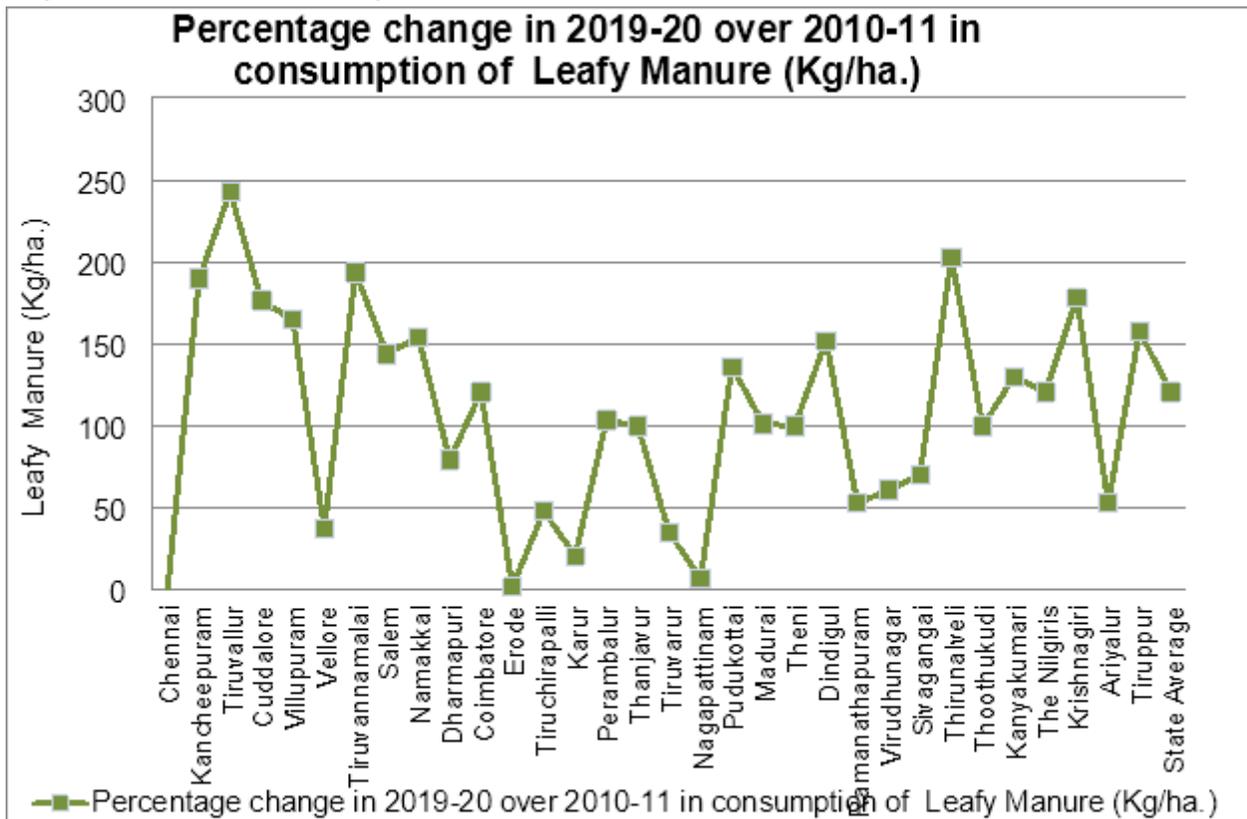
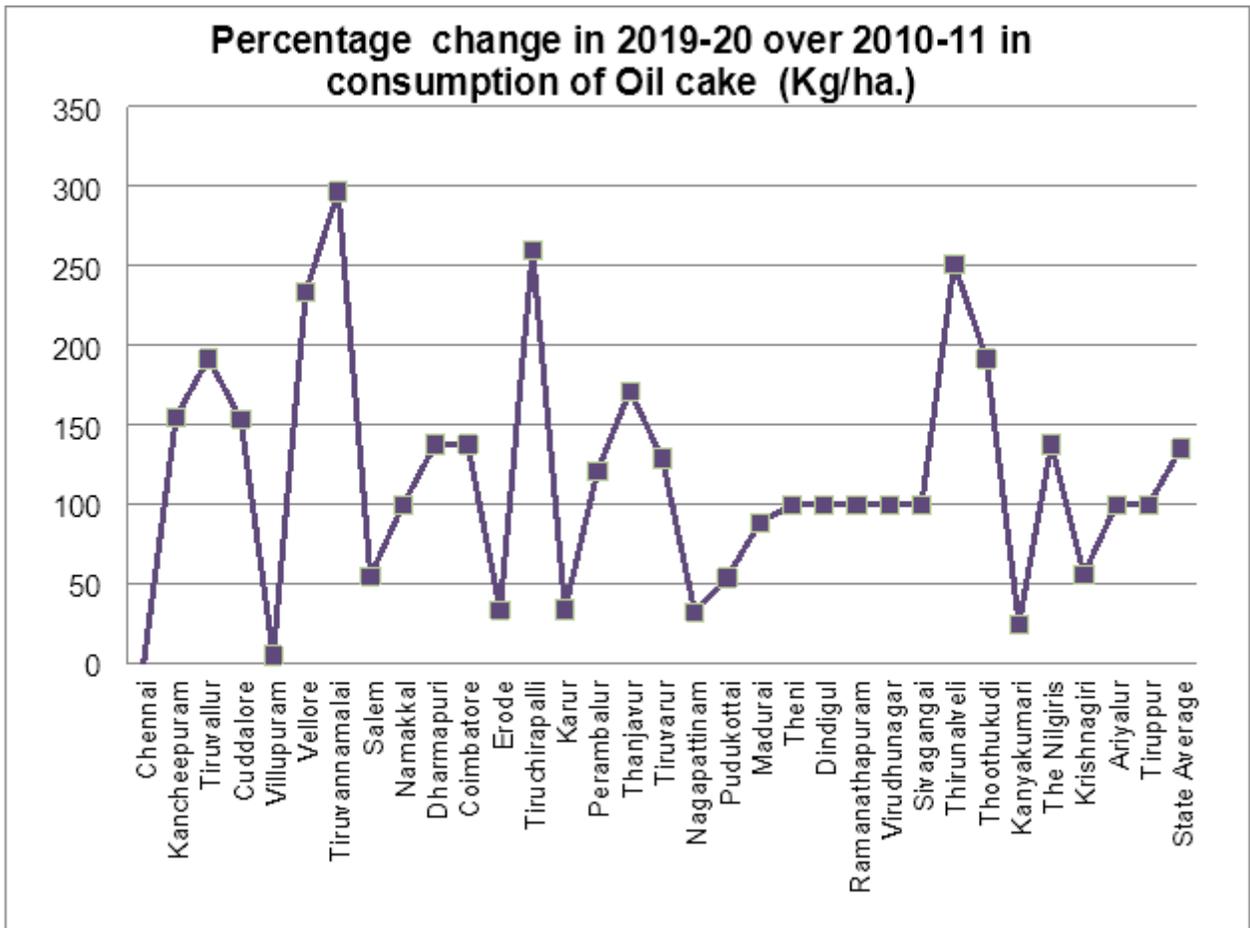


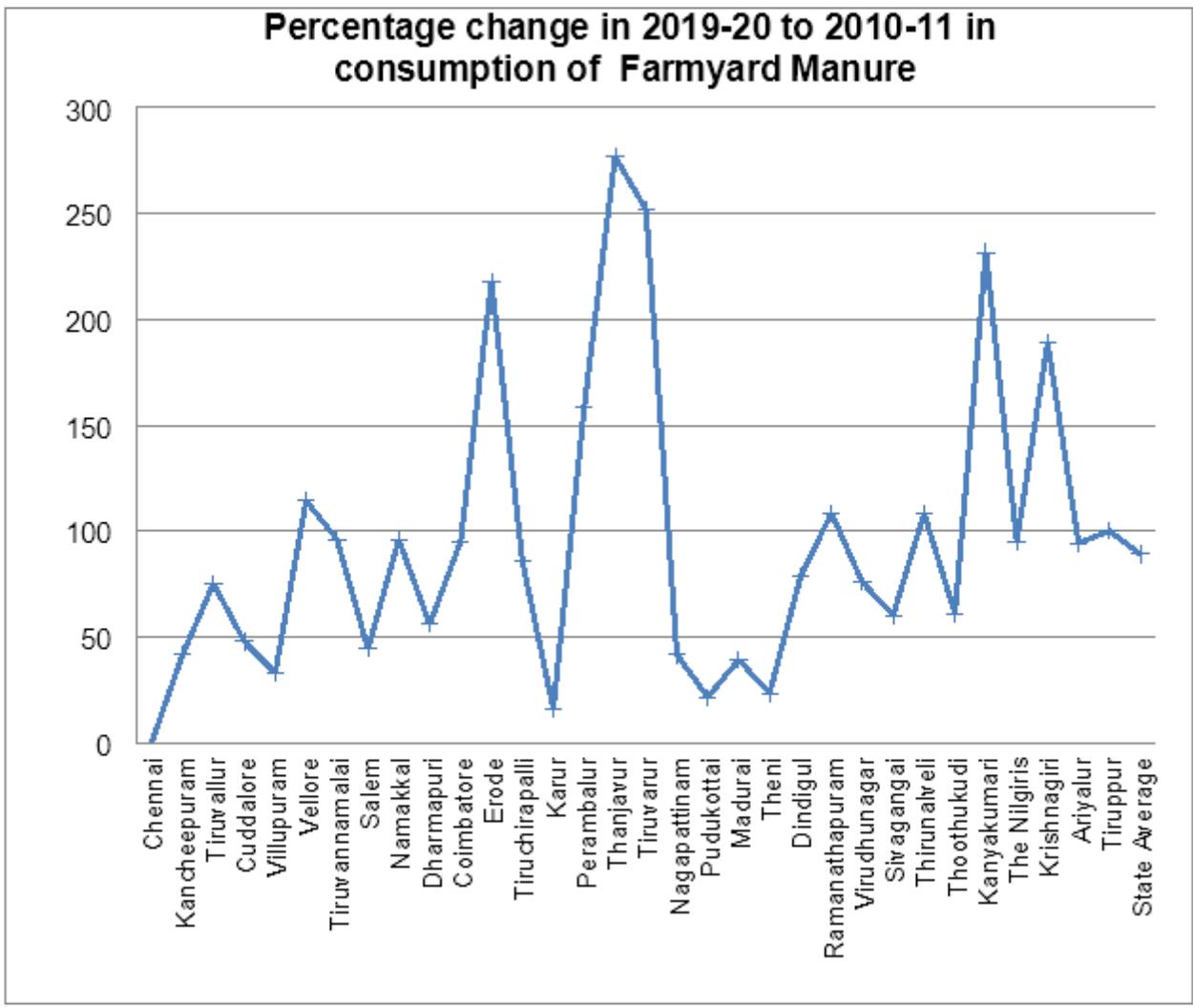
Figure 5

Leafy manure in the districts between 2010 and 2020



**Figure 6**

Oil Cake usage in the districts between 2010 and 2020



**Figure 7**  
Change in Farmyard Manure Consumption during the districts