

State Agriculture Profile of Tamil Nadu - 2011

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Preface

Tamil Nadu, one of the major states of India, is endowed with diverse soil and weather conditions comprising of several agro-climatic conditions that help the state to adopt a diversified cropping pattern. The state has a substantial area under vegetable crops. It is also having the largest herd of livestock amongst Indian states. The state faces many challenges that are to be addressed systematically so as to facilitate a sustainable development of the State. In order to understand the prevailing impediments and challenges to agricultural growth in various states, the Ministry of Agriculture, Government of India proposed to carry out state specific reports focusing on agricultural scenario and the task was assigned to various AERCs/Units located in different states in India. The Agro-Economic Research Centre, University of Madras was entrusted with the responsibility of preparing a report on agricultural scenario in the state of Tamil Nadu. The framework of the report was given by the Ministry.

This report presents the state of agriculture in Tamil Nadu by using secondary data collected from various published sources. The present study evaluates the performance of agriculture in the state of Tamil Nadu in the recent years and also presents what could be the future options, given our objectives of accelerated growth, inclusiveness and reduction of poverty. I wish to thank the Ministry of Agriculture, Government of India for the unstinted cooperation and support. It is hoped that this study will be useful to agricultural scientists, economists, non-governmental organizations, policy makers and planners in understanding the present state of agricultural sector in Tamil Nadu.

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Chapter I

Introduction

1. Tamil Nadu

Tamil Nadu is one of the well developed states. It is the second largest state in economic activity after Maharashtra and the fifth largest contributor to India's GDP. The state is also one of the most urbanized one. Like the Indian economy, the share of the Service sector in the state is increasing along with the falling share of Agriculture sector. It is geographically located between 8°5' and 13°35' North latitude and between 76°14' and 80°21' East longitude. As a result of this geographical position, Tamil Nadu enjoys semi-arid climate, which permits higher crop productivity under irrigation.

Tamil Nadu is located in the extreme south of the subcontinent. It is bounded by the Indian Ocean to the east and south and by the state of Kerala to the west, Karnataka to the northwest, and Andhra Pradesh to the north. The capital is Chennai (Madras) on the coast in the northeastern portion of the state. Tamil Nadu is the eleventh largest state in India by area and the seventh most populous state. It is the second largest state economy in India as of 2012. But, in the case of the agricultural sector Tamil Nadu is one of the water starved states in India; it is endowed with only 3% of water resources in India. The profile of agricultural sector in Tamil Nadu is mixed with much strength, some weaknesses, many opportunities and some threats. The following section examines such mixed trends in terms a SWOT analysis.

1.1 Agricultural Sector

1.1.1 Strengths

- The State possesses varied types of agro-climatic conditions ranging from hot tropical through sub-tropical to temperate climate.
- The major types of soils like red, black, alluvial, loamy and sandy loam found in the State are highly suitable for growing a variety of crops.

- A wide range of crops such as cereals, pulses, oilseeds, fruits, vegetables and other crops are cultivated under varied agro-climatic conditions and elevations in the State.
- People in the State are industrious and hard-working and hence a science- based technological back-up can go a long way in improving agricultural production.
- Well-developed agri-based cotton textiles and sugar industries are the added strengths for the rapid growth of the economy.
- The rail as well as road transport systems, which are essential for agricultural development, are well – knitted in the State
- Both urban and rural electrification is close to 100 percent in the State and that acts as a catalyst for the growth of the State economy.
- The long coastal length of 1,076 kms. and the widely spotted inland water bodies indicate the high growth potential of fishery sector in the State; and
- The livestock population is sizable in the State. There exists very good potential for boosting production of milk and sheep / goat / poultry meat in the State through scientific feeding, breeding and health management.

1.1.2 Weaknesses

- The success of agriculture depends on the successful monsoons. Frequent monsoon failures, low and uncertain rainfall and its skewed distribution affect the tempo of agricultural growth.
- Uneconomic size of a very large number of marginal and small farms, low economic status of the farmers and the low literacy level among farmers affect the full adoption of scientific farming and hence the agricultural production and
- Many of the irrigation systems and structures are in dilapidated conditions for want of funds. The tanks and waterways are highly silted and filled with the growth of bushes. Heavy seepage losses and hindrance to the free flow of water are found in conveying water through the irrigation canals from dams, reservoirs and big tanks. Moreover, unauthorized encroachment of catchment and water spread areas of the irrigation tanks is a common phenomenon throughout the State. Improper up-keep of canal and river bunds

results in recurring breaches and consequent damages to the standing crops, livestock and human lives in the villages, especially during rainy seasons and flash floods.

1.1.3 Opportunities

- The rainfall pattern and its distribution provide scope for raising almost all field and horticultural crops round the year in most pockets of the State.
- As urbanization and industrialization are on the ascent in the recent years, the market demand for quality agricultural products and protective foods like milk, fruits and vegetables is getting increased. This indicates the need for incentives for increasing the yield per acre in field crops and in vegetables and fruits production etc., besides milk and meat production in the years to come.
- The demand for ready-to-cook as well as ready-to-eat foods is also increasing. Thus, there is ample opportunity for the agri-processing units to flourish, in the years to come in the State.
- The red, black, alluvial and loamy soils found in the State are highly productive and their capabilities can be sustained through proper and planned soil fertility management practices.
- As the labour availability is becoming scarce, especially during peak agricultural operations like transplanting and harvesting, the farm mechanization is on the increase. However, the high investment requirement and non-affordability by the individual farmer, especially the marginal and small, give way for custom services and evolution of small agri-business entrepreneurs in the State.
- Large extent of land (about 24 lakh hectares) is considered as waste land in the State. This provides opportunities for land reclamation and development of horticulture and plantation crops in the State and acceptable adoption of Hi-Tech like precision farming.

1.1.4 Threats

- Low and skewed distribution of rainfall and heavy downpour in a few days especially during northeast monsoon and consequent flash floods occurring often and inadequate infrastructure to control and store the flood water, damage the standing crops heavily and affect the production.

- Price volatility with high fluctuations and non-remunerative prices of farm products and consequent non-profitability of the farm business. This could lead to farmers quitting the agricultural occupation itself, once for all.
- The outbreak of pests and diseases is often recurring in certain endemic areas of the State. These pose the threat to the crops leading to complete loss to many farmers.
- In the recent years, due to heavy pumping of ground-water especially in summer and early kharif seasons, the reversal of ground water flow results in sea-water intrusion in the inlands along the coastal belt and consequently making the borewell as well as the open well-water, unfit for crop production and drinking. Many farmers in fact, abandoned the cultivation of especially the kharif crop, due to sea-water intrusion along the coastal belt.
- The inter-state disputes on the major irrigation systems like Cauvery, Mullai Periyar, Palar, etc. affect the agricultural growth of the State to a great degree and
- Fast urbanization and industrialization and indiscriminate conversion of agricultural land to non-agricultural purposes, pose a great threat of contraction of land put to agricultural uses and consequent reduction in production.

1.2 Population Growth in Tamil Nadu

Tamil Nadu is one of the most important states in the country and is the eleventh largest in terms of area. The state is the seventh most populous state in the country. As per details from Census 2011, Tamil Nadu has a population of 7.21 crores, whereas the population was 6.24 crores in 2001. As per 2011 census, out of the total population the share of male and female are 50.09 percent and 49.91 percent respectively

The total population growth in the decade 2001-2011 was 15.61 percent whereas in previous decade it was 11.19 percent. The population of Tamil Nadu constituted 5.96 percent of Indian population in 2011. In 2001, the figure was 6.07 percent.

Literacy Rate

Literacy rate in Tamil Nadu has seen upward trend and is 80.09 percent as per 2011 population census. Of that, male literacy stands at 86.77 percent while female literacy is at 73.14 percent. In 2001, literacy rate in Tamil Nadu stood at 73.45 percent of which male and female literacy rates were 83.28 percent and 64.91 percent respectively. In actual numbers, total literates in Tamil Nadu stand at 51,837,507 of which males were 28,040,491 and females were 23,797,016.

Density

Total area of Tamil Nadu is 130,060 sq. km. and the density of population in Tamil Nadu is 555 per sq km which is higher than national average of 382 per sq km. It is greater than the national average by about 150 points. In 2001, density of Tamil Nadu was 480 per sq km, whereas national average in 2001 was 324 per sq km.

Sex Ratio

Sex Ratio in Tamil Nadu is 996 and it is above the national average of 940 as per census 2011. In 2001, the sex ratio was 986 per 1000 males in Tamil Nadu.

Rural Population

Of the total population of Tamil Nadu, around 51.60 percent live in the villages. In actual numbers, males and females were 18,679,065 and 18,550,525 respectively. Total population of rural areas of Tamil Nadu state was 37,229,590. The population growth rate recorded for the decades (2001-2011) was 15.61 percent. In rural areas of Tamil Nadu, literacy rate for males and females stood at 82.04 percent and 64.55 percent respectively. Average literacy rate in Tamil Nadu for rural areas was 73.54 percent. Total literates in rural areas were 24,502,195.

Urban Population

About 48.40 percent people live in urban regions. The total figure of population living in urban areas is 34,917,440 of which 17,458,910 are males while the remaining 17,458,530 are females. The urban population in the last 10 years has increased to 48.40 percent. Sex Ratio in urban regions of Tamil Nadu was 1000 females per 1000 males. Average literacy rate in Tamil Nadu for urban regions was 87.04 percent in which the male literacy rate was 91.80 percent while female literacy rate stood at 82.31 percent. Total literates in urban regions of Tami Nadu were 27,335,312.

It can be observed from Table 1 that the total number of cultivators were 4.24 crore constituting about 12.9 percent of total workers of the Tamil Nadu population. Cultivators in rural areas were 3.89 crore in number constituting about 20.6 percent of total worker population in the state. Among the cultivators, about 1,515,978 were women constituting about 13.2 percent of the total workers. On the other hand, the total number of agricultural labourers in Tamil Nadu was 9,606,547 out of which 4,763,840 were women constituting about 41.6 percent of the total workers in agriculture in Tamil Nadu.

1.3 State Domestic Product and Per Capita Income

Tamil Nadu is one of the most socially developed and economically progressive States in the country. Its progress is evident in terms of per capita income and Human Development Indicators (HDI). Though the state has developed industrially, agriculture still continues to be an important sector and provides livelihood to nearly 45 percent of the people. But its share has come down sharply to 8.0 percent of GSDP in 2011-12 from 20 percent in 1997-98 (Figure 1.1). Global development experience reveals that one percent growth in agriculture is at least two or three times more effective in reducing poverty than the type of same growth emanating from non-agricultural sector.

Table 1.1: Composition of Population in Tamil Nadu (2011)

Total Population	Absolute			Percentage		
	Total	Rural	Urban	Total	Rural	Urban
Persons	72,147,030	37,229,590	34,917,440	100	51.6	48.4
Male	36,137,975	18,679,065	17,458,910	100	51.7	48.3
Female	36,009,055	18,550,525	17,458,530	100	51.5	48.5
Decadal Change 2001-2011	Absolute			Percentage		
	Total	Rural	Urban	Total	Rural	Urban
Persons	9,741,351	2,307,909	7,433,442	15.6	6.6	27.0
Male	4,737,066	1,147,571	3,589,495	15.1	6.35	25.9
Female	5,004,285	1,160,338	3,843,947	16.1	6.7	28.2
Sex Ratio	996	993	1000			
Literates	Absolute			Literacy rate		
	Total	Rural	Urban	Total	Rural	Urban
Persons	51,837,507	24,502,195	27,335,312	80.1	73.5	10.1
Male	28,040,491	13,665,839	14,374,652	86.8	82.0	10.3
Female	23,797,016	10,836,356	12,960,660	73.4	65.0	9.8
Total Workers	Absolute			Work Participation Rate		
	Total	Rural	Urban	Total	Rural	Urban
Persons	32,884,681	18,861,330	14,023,351	45.6	50.7	40.2
Male	21,434,978	11,214,535	10,220,443	59.3	60.0	58.5
Female	11,449,703	7,646,795	3,802,908	31.8	41.2	21.8
Total Cultivators	Absolute			Percentage to total workers		
	Total	Rural	Urban	Total	Rural	Urban
Persons	4,248,457	3,885,657	362,800	12.9	20.6	2.6
Male	2,732,479	2,476,311	256,168	12.7	22.1	2.5
Female	1,515,978	1,409,346	106,632	13.2	18.4	2.8
Total Agricultural Labourers	Absolute			Percentage to total workers		
	Total	Rural	Urban	Total	Rural	Urban
Persons	9,606,547	8,408,101	1,198,446	29.2	44.6	8.5
Male	4,842,707	4,162,199	680,508	22.6	37.1	6.7
Female	4,763,840	4,245,902	517,938	41.6	55.5	13.6
Total Other Workers	Absolute			Percentage to total workers		
	Total	Rural	Urban	Total	Rural	Urban
Persons	17,664,784	5,865,875	11,798,909	53.7	31.1	84.1
Male	13,268,660	4,286,822	8,981,838	61.9	38.2	87.9
Female	4,396,124	1,579,053	2,817,071	38.4	20.6	74.1

Source: Census of India 2011, Primary Census Abstract, Figures at a Glance, Tamil Nadu

During the period 2000- 11, this sector registered negative growth in five years and positive growth in six years and that shows the vulnerability of the sector and is also a cause of distress arising due to the instability in production and productivity. For instance, Table 1.3 provides the growth rates of the three sectors for the last six years from

2007-08 to 2012-13. In relations to industrial and services sector, the growth rate of agriculture is highly violated. Uncertain monsoon and irrigation is one of the major cause of this extreme volatility in the growth rates of this sector. A comprehensive package combining several components to stabilize the sector should be designed to enhance the productivity of agriculture working within the severe water constraints and by stabilizing or enabling inter- and intra- seasonal risk proofing of rain fed production systems.

Diversification of agriculture into animal husbandry, non-food crops, horticulture, floriculture and sericulture has the potential to enhance the farm incomes. The food consumption basket is getting increasingly diversified and though cereal baskets dominate, this dominance is being eroded by rising expenditure on fruits, vegetables, milk, egg, meat and fish, which is the “high value” Commodities, and this transformation, is in tune with development expectations. There are 13 coastal districts and 591 fishing villages with a total marine fisher population of about 8.92 lakh, of which 2.60 lakh fishermen are actively engaged in fishing activities. Hence, it becomes imperative to enhance the incomes of the fisherfolk by augmenting marine and inland fish production through innovative technologies. The output from the agricultural sector should be reflected in higher rural incomes leading to improved health and nutrition status. Enhancement of non-farming income such as post-harvest operations, maintenance of farm equipment, and connecting expansion of farm activity to that of rural non-farm income opportunities need more attention.

Table 1.2: Changing Sectoral Share of GSDP (in percentage)

Year	Sectors			
	Primary	Secondary	Tertiary*	Total
1997-98	19.62	33.35	33.35	100.00
1998-99	20.42	32.04	47.54	100.00
1999-00	17.37	29.57	53.06	100.00
2000-01	17.20	29.97	52.83	100.00
2001-02	17.13	27.12	55.75	100.00
2002-03	13.52	29.29	57.19	100.00
2003-04	12.58	29.47	57.95	100.00
2004-05	13.22	29.60	57.18	100.00
2005-06	13.12	30.37	56.51	100.00
2006-07	13.28	29.87	56.85	100.00
2007-08	11.85	29.26	58.89	100.00
2008-09	11.12	28.26	60.62	100.00

Note: Tertiary* - Communication Trade, Hotels etc.,

Source: Government of India, Central statistical Organisation, various issues.

Table 1.3: Sectorwise Growth Rates Decomposition of Net State Domestic Product (NSDP) (in percentage)

Year	Agriculture	Industries	Services	Other Services	Growth rates of GSDP	Per Capita Income NSDP (Rs)
2007-08	-4.41	3.86	9.33	6.13	6.13	47606
2008-09	-2.29	-2.06	9.62	4.89	4.89	54137
2009-10	6.14	20.93	6.14	10.36	10.36	64336
2010-11	4.54	9.16	10.96	9.83	9.83	75449
2011-12	7.08	6.12	8.05	7.37	7.37	84496
2012-13	1.14	5.12	4.82	4.61	4.61	94720

Source: Central Statistics Office.

Chapter II

Growth of Agricultural Sector in Tamil Nadu: Achievements and Challenges

This chapter discusses the various achievements of the agricultural sector in Tamil Nadu and the challenges the sector is facing. This is done in terms of some selected aspects like growth rates, its composition, structural changes taking place over a period of time etc.

(i) Agriculture in Tamil Nadu has enjoyed three decades of growth based largely on rapid technological change.

Food security has increased due to rapid increases in foodgrain output, sales from the Public Distribution System (supplied by Food Corporation of India stocks), targeted feeding and employment programs, and well-functioning rice markets that have enabled price-stabilizing inflows of rice from neighbouring states in years of local production shortfalls. Partly because of agricultural growth, rural poverty rates declined from 38.5 percent to 24.3 percent between 1993/94 and 1999/2000. The state's agriculture has a strong base for continued growth in terms of a strong agricultural research system, an extensive road network, and a relatively well-educated rural labor force.

(ii) While agricultural sector growth rates in Tamil Nadu were among the highest in India during the 1980s and early 1990s, deceleration in growth since the mid-1990s is of increasing concern to policymakers.

During the 1980s, agricultural GSDP grew at 3.4 percent, exceeding the all-India agricultural growth of 2.9 percent. Adequate rainfall contributed to even higher growth in the early 1990s. Between 1989/90 and 1994/95, agriculture grew by 7.2 percent in Tamil Nadu, compared with 3.1 percent in the whole of India. But between 1994/95 and 1999/2000, agriculture in Tamil Nadu suffered from severe consecutive droughts and grew only 1.3 percent a year, compared with 2.9 percent for all India. As a result, the state's

agricultural growth rate during the 1990s was only 2.9 percent a year, compared with 3.2 percent for all-India.

(iii) Faster growth in agriculture is central to rural development and poverty reduction in Tamil Nadu.

Although agriculture accounts for only 15.7 percent of total GSDP, farm income accounts for about half of household income for 35 million people (56 percent of the state's population) who live in rural areas. Much of this rural population is poor, with estimates ranging from 7.4 million people (20.6 percent of the rural population) to 11.4 million (31.8 percent of the rural population). For the poorest rural quintile (approximately 1.5 million households, or 7.5 million people), more than three-quarters of income is derived from agriculture, with agricultural wage labour alone accounting for half of household income. Given the importance of agriculture in the incomes of the poor in Tamil Nadu, growth in labour-intensive agriculture could further reduce rural poverty through higher yields to small producers, higher real wages to agricultural labourers, and increased income and employment opportunities with forward and backward linkages to the rural nonfarm sector.

(iv). Traditional sources of growth in agriculture face major constraints such as growing water scarcity, increasing land degradation, declining farm size, and rising costs of labour.

Tamil Nadu is one of the driest states in India, averaging only 925 millimetres of rainfall a year. The state's dry season lasts five months (January through May) even in good years, and severe droughts occur in 3 out of 10 years, severely limiting cultivation of crops between June and September. Per capita availability of water resources in Tamil Nadu is only 900 cubic metres a year, compared with 2,200 cubic metres for all-India. Irrigation through a combination of canals, wells, and tanks increases the reliability and availability of water for farming and is essential for cultivating crops in much of the state. But the seasonality and scarcity of supply limit cultivation to only one crop per plot for most of the state. The agricultural

sector faces increasing competition for water from industry and domestic users and intensifying interstate competition for surface water resources. In many parts of the state, the rate of extraction of groundwater has exceeded recharge rates, contributing to falling water tables. Water quality is also a growing concern. Effluents discharged from industries and heavy use of pesticides and fertilizers have had a major impact on surface water quality, soils, and groundwater.

(v) Agricultural land resources have also come under increasing pressure because of rapid population growth and urbanization.

The growing pressures on land, skewed pricing policies, and rural poverty have all contributed to land and soil degradation. As a result, poor soil fertility, salinity, water logging, overgrazing, and deforestation are growing problems and pose serious constraints to the performance of the agricultural sector in some parts of the state.

(vi) Seasonal labour shortages and rising real agricultural wages during the past two decades, in part caused by rapid rural-urban migration, have contributed to higher incomes for agricultural labourers, but make future agricultural growth more difficult by reducing the competitiveness of Tamil Nadu's agriculture vis-à-vis other agricultural producers.

Higher labour costs, due in part to rapid growth in demand for nonagricultural labour, have increased the cost of cultivation, especially for labour-intensive crops. In 1999–2000, rural wages for male agricultural labour in the kharif season in Tamil Nadu averaged Rs.62.2 a day, compared with only Rs.45.3 a day in Andhra Pradesh and Rs.42.8 in Karnataka. These higher labour costs encourage mechanized land preparation and harvesting, but small farm sizes constrain the rate of mechanization.

(vii) Given the constraints, diversification into higher value, less water-intensive products, such as fruits, vegetables, spices, and livestock products, may be one of the most promising sources of agricultural growth.

Tamil Nadu's agro-climatic conditions are well suited for diversified agriculture. Rapidly increasing incomes and changing patterns of food demand also provide strong impetus for diversification. Increased agricultural diversification and private investments in processing for many of the higher value agricultural commodities are likely to generate new rural nonfarm employment opportunities and contribute to higher rural incomes.

(ix) Rice dominates both food consumption and agricultural production

Rice accounts for about a third of total gross cropped area and nearly 60 percent of irrigated area in Tamil Nadu (over 90 percent of paddy is irrigated). Pulses (18 percent of total cropped area), millets (11 percent), and groundnuts (10 percent) require less water than rice or sugar-cane, and millets and pulses are grown almost exclusively on non-irrigated land. About 5 percent of total cropped area is devoted to sugar-cane, all of it irrigated (accounting for almost 10 percent of irrigated land). Cotton occupies about 3 percent of cropped area, and about a third of the cotton crop is irrigated.

(x) The livestock and fisheries subsectors are also important in Tamil Nadu

The state ranks second among Indian states in egg production and ninth in milk production. The state is also relatively well endowed with fisheries, accounting for 13.2 percent of total marine fish production and 4 percent of in-land fish production in India. In all, crop agriculture, livestock, and animal husbandry account for 92.2 percent of total value added in agriculture and allied activities, with fishing accounting for 4.5 percent and forestry for 3.3 percent.

(xi) The average size of individually held farms is only 0.91 hectares, with over half the farms smaller than 0.5 hectares

Nearly three-quarters of farms are smaller than 1 hectare, accounting for only 30.2 percent of total cultivable land. In comparison, the average farm size in India is 1.41 hectares, with 62 percent of farmers holding less than 1 hectare.

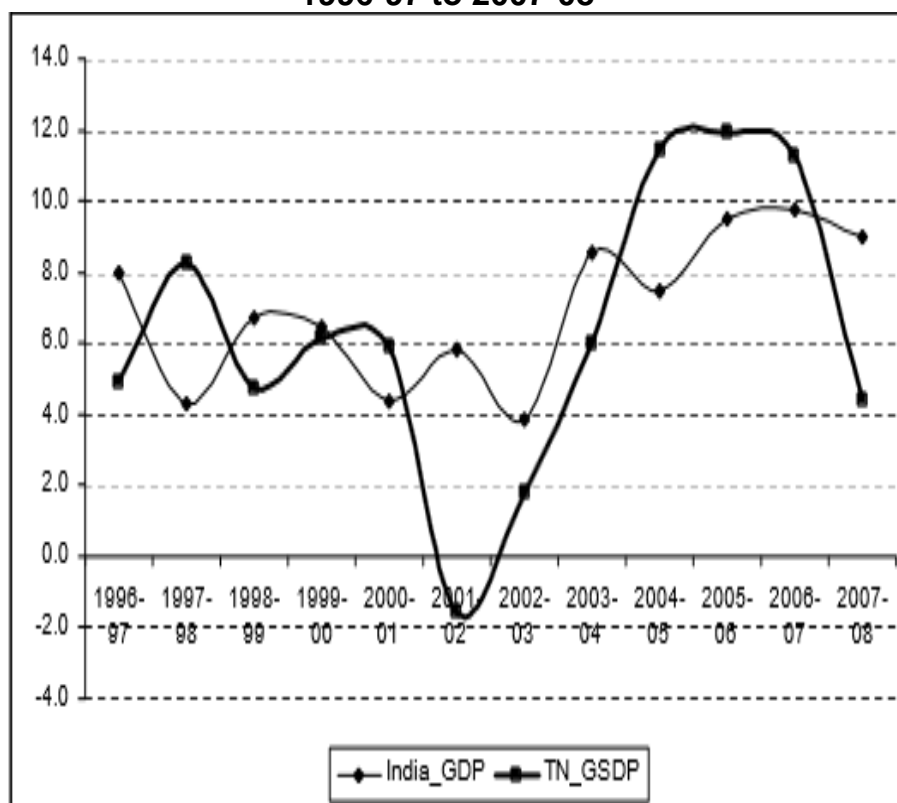
2.1 Structural Changes in Agriculture Sector

2.1.1 Growth Trends of GSDP in Tamil Nadu

It is well recognized that Tamil Nadu is one of the relatively developed and fast growing states in the country, with considerable progress achieved in various facets of development. Looking at state's performance in terms of GSDP growth rate (at constant prices) since the late nineties, during 1996-97 to 2007-08, the average annual growth rate of GSDP of Tamil Nadu was 6.26 percent (Table 2.1) and that of GDP of the country was 6.97 percent (not shown). In comparative terms, growth rate of GSDP of Tamil Nadu has been more than the GDP growth in many years but the reverse is also true for some years.

There was a fall in the growth rate of GSDP of Tamil Nadu in the early part of the period 1996-2007. This fall was more than that of India's GSDP and growth rate has greater volatility than India's GDP growth rate (Fig 2.1).

Fig 2.1: Trends of GSDP in Tamil Nadu and GDP in India: 1996-97 to 2007-08



2.1.2 Sectoral Growth Pattern

Different sectors play a crucial role in the economic system. Without the sectoral contribution to the economy we cannot achieve the economic growth. Sectors like agriculture, manufacturing, tertiary play a crucial role in the growth of economic system.

Table 2.1 shows the sectoral growth pattern in Tamil Nadu, during 1997-98 to 2008-09. The average growth in the agriculture sector was very low. Agriculture grew at an annual rate of about 3.7 percent. It is noticed that agriculture grew at 3.21 percent per annum during the Ninth Plan period. Although it registered negative growth in the first two years of the Tenth Plan period (due to drought in those years), the state achieved 4.26 percent growth rate in agriculture as against the target of 3.79 percent.

Table 2.1: Annual Growth Rates of GSDP at Constant (1999-00) Prices
(in Percent)

Sectors	1997-98*	1998-99*	1999-00*	2000-01	2001-02	2002-03	2003-04	2004-05
Agriculture	9.79	9.45	-5.60	5.16	-2.77	-23.17	-2.27	22.51
Manufacturing	-1.42	-3.21	9.92	7.53	-8.97	3.83	11.45	7.56
Tertiary of which	12.99	5.86	7.62	5.41	3.89	4.38	7.40	9.95
Communication	11.24	14.15	25.42	16.95	34.69	13.48	23.03	14.40
Trade, hotels etc.	7.74	2.31	11.55	5.78	1.07	1.97	13.52	12.57
Public Administration	16.31	20.44	14.18	2.67	1.45	-7.06	1.65	3.96
GSDP	8.20	4.73	6.11	5.87	-1.56	1.75	5.99	11.45
Sectors	2005-06	2006-07	Avg. 1997-98 to 2001-02	Avg. 2002-03 to 2006-07	Avg. 1997-98 to 2006-07	2007-08	2008-09	Avg. 2007-08 to 2008-09
Agriculture	9.59	14.65	3.21	4.26	3.73	-7.22	-2.65	-4.93
Manufacturing	16.45	11.34	0.77	10.12	5.45	4.73	1.97	3.35
Tertiary of which	10.58	11.96	7.15	8.85	8.00	8.17	7.62	7.89
Communication	17.07	16.59	20.49	16.91	18.70	19.33	19.63	19.48
Trade, hotels etc.	13.87	12.50	5.69	10.89	8.29	10.80	3.20	7.00
Public Administration	1.06	16.48	11.01	3.22	7.11	0.64	17.57	9.11
GSDP	11.89	11.29	4.67	8.47	6.57	4.41	4.55	4.48

Source (Basic Data): Government of India, Central Statistical Organisation, various issues.

* For these two years, 1993-94 price series is used to compute.

In the first two years of the Eleventh Plan period also, agriculture recorded a negative growth due to widespread floods during the north-east monsoon. The manufacturing sector grew at about 5.5 percent and the

tertiary sector at 8 percent during 1997-98 to 2006-07. Thereafter that, these sectors are declined to -4.93 percent and 3.35 percent during 2007-08 to 2008-09. There are signs that the Tamil Nadu economy has emerged out of the recession of the early years of the last decade with the overall GSDP growth during 1997-98 to 2006-07 close to 6.6 percent.

Growth rates of manufacture and tertiary sectors during the Tenth Plan period were relatively high as compared to the growth rates during the Ninth Plan period (that included the recession years). As a result, the overall economy grew faster at a rate of more than 8 percent during the Tenth Plan as compared to its growth of 4.7 percent during the Ninth Plan. However, the average annual rate of growth of GSDP declined to 4.5 percent (as against the target of 9 percent) during the last two years (i.e, first two years of the Eleventh Plan): 2007-08 and 2008-09. The fall in the overall GSDP growth was mainly due to the negative growth of agricultural sector. The other sectors also recorded decelerated growth rates compared to previous years, which might be because of the global economic slowdown.

Fig 2.2: Sectoral Growth in Tamil Nadu

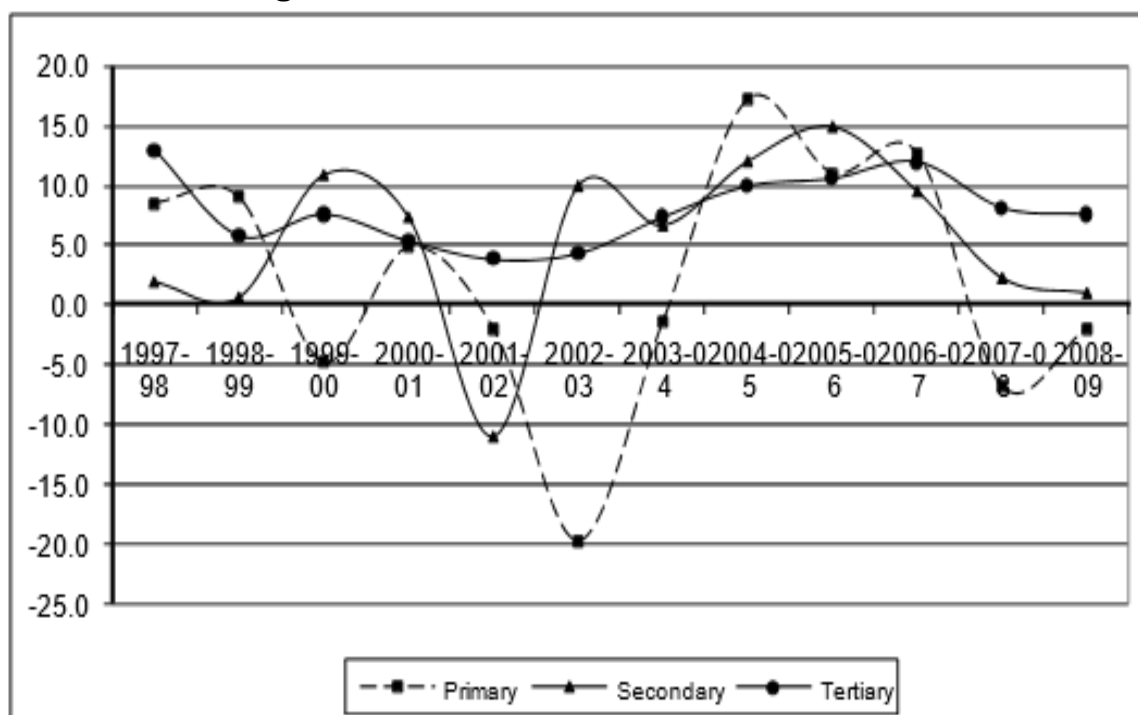


Fig 2.2 shows the sectoral growth pattern in Tamil Nadu, highlighting the high volatility of the primary sector (which comprises agriculture and allied activities). All three sectors went through a recession in-between 2000-01 and 2002-03. After that, the growth was accelerated in all sectors up to the end of the Tenth Plan (2006-07). Then, there has been deceleration in the annual growth of all sectors and particularly agriculture has registered negative growth. The formulation of a medium to long term fiscal strategy to achieve the targets of the Eleventh Plan had to take into account the changing structure of the state economy and economic slowdown in the recent years.

2.1.3 Changing Structure of GSDP

In the structure of Gross State Domestic Product (GSDP) in many states, particularly in Tamil Nadu, has been shifting away from agriculture towards manufacturing and more towards services. As indicated in Table 2.2, during the Ninth Plan Period (i.e., from 1997-98 to 2001-02), the share of agriculture in the total GSDP measured at constant prices declined from 17.7 percent to 14.8 percent (i.e., it registered about 3 percentage points decline) and the share of secondary sector also declined from 33.4 percent to 27.1 percent (i.e., it fell by about 6.3 percentage points). At the same time, the contribution of tertiary sector increased from 47.0 percent to 55.8 percent, registering an increase of 8.7 percentage points.

During the Tenth Plan period (2002-03 to 2006-07), shares of agriculture, secondary sector and tertiary sector remained more or less stable at 11 percent, 30 percent and 57 percent respectively. However, in 2008-09, the share of agriculture declined by about 2 percentage points from the end of Tenth Plan period (2006-07) and reached 9.4 percent level and the share of manufacturing also declined by about 1.5 percentage points. The share of tertiary sector increased from 56.8 percent in 2006-07 to 60.6 percent in 2008-09.

Table 2.2: Changing Structure of GSDP (in Percent)

Year	Sectors								
	Primary	Agriculture	Secondary	Manufacturing	Tertiary	Communication	Trade, hotels etc.,	Public Administration	All other Services
1997-98	19.62	17.71	33.35	25.06	47.03	2.41	14.63	4.07	25.92
1998-99	20.42	18.51	32.04	23.16	47.54	2.63	14.30	4.68	25.94
1999-00	17.37	15.03	29.57	19.78	53.06	1.93	15.31	5.66	30.16
2000-01	17.20	14.93	29.97	20.09	52.83	1.93	15.31	5.49	29.92
2001-02	17.13	14.75	27.12	18.57	55.76	2.92	15.71	5.65	31.48
2002-03	13.52	11.13	29.29	18.95	57.19	3.25	15.47	5.16	33.04
2003-04	12.58	10.27	29.47	19.93	57.96	3.78	16.86	4.95	32.37
2004-05	13.22	11.29	29.60	19.23	57.18	3.88	17.03	4.362	31.65
2005-06	13.12	11.05	30.37	20.02	56.51	4.069	17.33	4.17	30.95
2006-07	13.28	11.39	29.87	20.03	56.85	4.25	17.52	4.37	30.71
2007-08	11.85	10.12	29.26	20.09	58.89	4.86	18.59	4.21	31.24
2008-09	11.12	9.42	28.26	19.59	60.62	5.59	18.35	4.73	31.98

Source(Basic Data): Government of India, Cental Statistical Organisation, Various issues

*For these years, 1993-94 price series is used to compute

2.3 Crop Growth in Tamil Nadu

The major crops like paddy, millets (coarse cereals), pulses, oil seeds, sugarcane and cotton are raised in the State. These accounted for 60 percent of the total cropped area in the State during 2009-10 and 2010-11. Paddy, the staple food crop was principally grown in the delta districts of Thanjavur, Thiruvarur and Nagapattinam. The average growth of area under paddy witnessed a negative growth of 0.14 per during 2007 to 2010. In line with this, the yield and production had experienced a negative growth of 2.35 percent and 2.26 percent, respectively. The share of millets viz. cholam, cumbu (Jowar), ragi and maize and korrah, varahu and samai formed 25 percent of the total cereals and 20 percent of the total food grains in 2010-11. There was an increasing demand for maize grains for human consumption due to structural changes taking place in a consumption pattern in view of rising real per capita income. The diversified uses of maize, corn, starch industry, corn oil production, baby corns, popcorns and potential for exports had added to the demand for maize. Area under millets witnessed a decline by 3.4 percent compared to the previous years. The yield rate marginally came down from 2504 kgs/ha. in 2009-10 to 2467 kgs/ha. in 2010-11. The average growth of area had experienced a negative growth of 2.37 percent. Production and yield rate of millets had improved by 6.55 percent respectively in 2010-11.

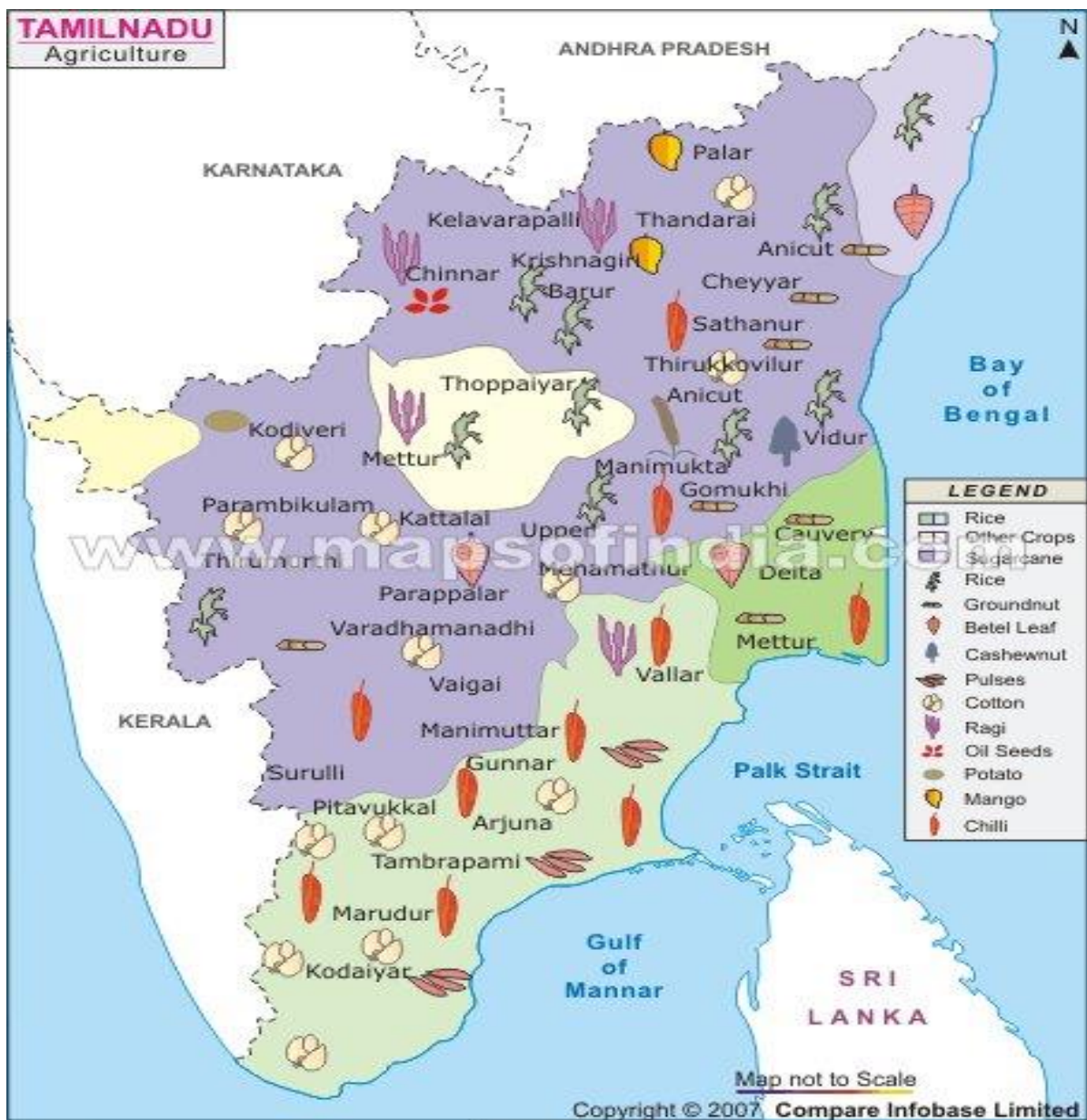
The pulses like green gram, bengal gram, black gram, horse gram are the main contributors to the pulses production in the state. The average growth of area under pulses improved by 5.12 percent. However, the yield rate and production witnessed a negative growth of 4.46 percent and 0.92 percent.

Food grains constitute a vital source for the livelihood of the common men. It accounted for 73 percent of the total crops in the State. Production and yield rate of food grains had recorded a negative growth of meagre 1.40 percent, 1.49 percent respectively during the first four years of the Eleventh Five Year Plan period.

The State ranks third in sugarcane production at all-India level. Sugar-cane is the main commercial crop under food crops grown predominantly in the selected districts of Tamil Nadu. The average growth of area, production and yield rate of

sugarcane exhibited a negative growth of 4.88 percent, 5.93 percent and 1.46 percent respectively during 2010-11.

Map 1: Crop Distribution in Tamil Nadu



Source: <http://www.mapsofindia.com/maps/tamilnadu/tamilnaduagriculture.htm>

Cotton is another commercial crop being grown in the State. The average growth of area and production of cotton registered a growth of 5.39 percent and 3.60 percent respectively. However, the yield rate of cotton decreased by 0.05 percent during 2006 to 2010.

2.4 Growth Performance of Agriculture in Tamil Nadu

2.4.1 Overall Growth in Agriculture

The agriculture sector continues to be the backbone of the State economy, providing 44 percent of the total employment in Tamil Nadu. Of the total gross cropped area of 57.53 lakh hectares, the gross area irrigated was 32.38 lakh hectares (56%) and the rest (44%) was under rainfed cultivation. During 2009-10 total agricultural income stood at Rs. 30975/- crores, registering a growth of 6.1 percent over the previous year in 2008-09. In 2010-11, the income originating from agriculture and allied activities was estimated to increase by 4.5 percent to touch Rs. 32381/- crores.

The net area sown stood at 49.54 lakh hectares in 2010-11. The land put to non-agricultural uses marginally increased from 21.76 lakh ha. in 2009-10 to 21.77 lakh ha. in 2010-11. Of the total geographical area, forest accounted for 16.3 percent (21.25 lakh ha.). The current fallow lands decreased from 11.17 lakh ha. (8.6%) in 2009-10 to 10.15 lakh ha. in 2010-11 (7.8%). The barren and cultivable land accounted for 3.8 percent in 2009-10 and 2010-11.

The gross area sown and net area sown had marginally improved by 3.2 percent and 1.3 percent in 2010-11 respectively. The cropping intensity also increased from 113.9 percent in 2009-10 to 116.1 percent in 2010-11.

The index of agricultural production is found to be moderate during 2010-11. Area increased from 78.83 ha. during 2009-10 to 81.39 ha. during 2010-11. Correspondingly, the production also increased from 116.37 tonnes to 118.10 tonnes. By contrast, the index for productivity had decreased from 113.53 kgs/ha. to 111.72 kgs/ha. Total food grain production has increased to 71.02 lakh tonnes during 2010-11. Acceleration in agricultural production is essential to ensure food security, livelihood security, and nutrition security. In this context, agricultural sector has to grow at a rate of 4 percent annually considering the dynamic factors such as rising real per capita income, growing population and income elasticity of demand for food. All the major crops such as paddy, cereals, food grains, sugarcane, cotton, oil seeds, horticulture and sericulture had fared moderately.

2.4.2 Growth Performance of Horticulture Crops in Tamil Nadu

In Tamil Nadu, agriculture contributes 12 percent of the GSDP, while the share of horticulture to the GSDP is estimated at 3.5 percent. The net sown area is 36 percent of the total geographical area (national average is 46 percent). The gross cropped area is 532,000 ha with a cropping intensity of 116.1. Irrigation covers 46 percent of the cropped area and the remaining 54 percent is rain-fed. The state accounts for nearly 6 percent of the area under fruits and 4 percent of the area under vegetables in the country. In terms of production, the State's share is nearly 10 percent in fruits and 6 percent in vegetables. The state is also a leading in the production of flowers. The total area under horticultural crops was 7.99 lakh ha. and the total production was 176.78 lakh tonnes in TE 2010-11.

2.4.3 Growth Performance of Principal Crops in Tamil Nadu

Table 2.5 represents the plan wise details of the area, production and yield of paddy, food grains, total cereals, total pulses and groundnuts. It could very well be seen that the overall output of the all the crops have a significant rise during the Tenth Five Year Plan period. The area under all crops in the state has declined and specifically the area under groundnuts has declined to the tune of 27.95 Percent in Eleventh Five Year Plan period. In the case of total pulses, the area increased to 9.41percent in Eleventh Five Year Plan period which was showing negative trend during the Tenth Five Year Plan period.

Table 2.3: Area and Production of Horticulture Crops in Tamil Nadu (TE 1980-81 to TE 2008-09)

Area: Lakh Hectare; Production: Lakh Tonnes

S.No.	Year	Fruits		Vegetables		Spices		Flowers		Medicinal Crops		All Horticulture Crops	
		Area	Produ.	Area	Produ.	Area	Produ.	Area	Produ.	Area	Produ.	Area	Produ.
1	TE 1990-91	-	-	-	-	-	-	-	-	-	-	6.04	70.87
2	TE 1991-92	1.45	30.59	1.61	40.97	1.36	1.57	0.11	0.54	0.00	0.00	4.53	73.67
3	TE 1992-93	1.63	29.67	1.51	35.93	1.75	2.08	0.12	0.58	0.00	0.00	5.01	68.26
4	TE 1993-94	1.80	36.21	1.71	45.16	1.78	2.72	0.12	0.62	0.00	0.00	5.41	84.71
5	TE 1994-95	1.86	48.19	1.75	43.98	1.65	2.73	0.14	0.71	0.00	0.00	5.4	95.61
6	TE 1995-96	1.95	49.13	1.58	39.57	1.43	1.91	0.15	0.82	0.00	0.00	5.11	91.43
7	TE 1996-97	1.95	38.56	1.69	40.02	1.60	2.24	0.16	0.95	0.00	0.00	5.4	81.77
8	TE 1997-98	2.11	50.33	1.93	50.76	1.57	2.49	0.17	0.17	0.00	0.00	5.78	103.75
9	TE 1998-99	2.21	45.09	1.86	42.58	1.71	2.65	0.17	1.3	0.00	0.00	5.95	91.62
10	TE 1999-2000	2.2	37.58	2.05	49.88	1.78	3.19	0.18	1.37	0.00	0.00	6.21	92.02
11	TE 2000-01	2.23	40.06	2.20	59.39	1.68	6.62	0.19	1.45	0.00	0.00	6.3	107.52
12	TE 2001-02	2.29	43.74	2.18	57.53	1.61	6.37	0.19	1.47	0.00	0.00	6.27	109.11
13	TE 2002-03	2.23	40.14	1.62	35.98	1.46	6.24	0.18	1.35	0.001	0.02	5.491	83.73
14	TE 2003-04	2.21	36.09	1.91	46.73	1.54	6.93	0.20	1.62	0.04	0.07	5.9	91.44
15	TE 2004-05	2.36	44.98	2.15	63.08	1.43	8.05	0.23	1.87	0.05	0.09	6.22	118.07
16	TE 2005-06	2.58	57.97	2.34	65.47	1.30	7.84	0.25	2.02	0.05	0.09	6.52	133.39
17	TE 2006-07	2.69	69.4	2.42	73.51	1.42	8.02	0.25	1.97	0.07	0.10	6.85	153
18	TE 2007-08	2.80	67.78	2.44	76.61	1.40	7.39	0.25	2.09	0.08	0.18	6.97	154.05
19	TE 2008-09	2.95	68.03	2.52	71.86	1.54	8.63	0.29	2.56	0.10	0.48	7.4	151.56
20	TE 2009-10	3.07	73.05	2.63	77.62	1.6	9.32	0.30	2.77	0.1	0.51	7.7	163.27
21	TE 2010-11	3.19	79.35	2.73	83.82	1.66	10.07	0.31	2.99	0.10	0.55	7.99	176.78

Source: Impact Study of the National Horticulture Mission (NHM) Scheme in Tamil Nadu, AERC, Chennai

Table 2.3 reveals that the total area under all horticultural crops in Tamil Nadu remarkably increased from 6.04 lakh ha during Triennium Ending 1990-91 to 7.99 lakh ha during TE 2010-11. In tune with the increase in area, the production of horticultural crops also tremendously increased from 70.87 lakh tonnes to 176.78 lakh tonnes over a period of 2 decades. Analyzing the growth of area and production of horticultural crops, the table vividly shows, that there was a steady increase in area and production

The growth rate in area and yield of horticultural crops in Tamil Nadu for the period 1990-91 to 2008-09 is depicted in Table 2.4. There was a fall in growth rate of area and yield of all horticultural crops in Tamil Nadu during the period 1990-91 to 2008-09. Again a significant growth rate of 2.5 percent in area and 4.8 percent in yield could be observed from 2000-01 to 2008-09. The table reveals that the growth rate of yield declined to 1.52 percent during 2004-05 from 3.80 percent during the period 2004-05 to 2007-08. Although the growth rate of area increased to 3.47 percent from 2.28 percent.

From table 2.5 it is clear that the area under cereals declined to 2.16 percent during the Eleventh Five Year Plan period, but the production and the yield had increased to 52.93 percent and 49.71 percent during the corresponding period.

In the case of groundnuts, the plan period-wise growth (yield) performance has a consistent increase. However, despite the decline in area during the Eleventh Five Year Plan period, the yield has been high when compared with the Tenth Five Year Plan period. Though there is an increase in the area for cotton from 32.77 percent to 36.71 percent during the Eleventh Five Year Plan period, the production and yield are not satisfactory.

The total outlay for the crop with regard to area, production and yield was very low during the Eighth and Ninth Five Year Plan periods. The pulses yield during the Eleventh Five Year Plan is the highest compared with the previous plan period.

Table 2.4: Growth Rate in Area and Yield of Horticulture Crops in Tamil Nadu

(in Percentage)

S.No.	Period	Fruits ^{\$}		Vegetables ^{\$}		Spices ^{\$}		Flowers ^{\$}		Medicinal ^{\$#}		All Horticulture Crops	
		Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield	Area	Yield
1	1980-81 to 1990-91*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.48 (1.94)	3.0 1.80
2	1990-91 to 2000-01*	4.5 (9.09)	-1.4 -(0.87)	3.5 (5.2)	0.03 (0.05)	1.1 (1.08)	8.4 (3.1)	6.1 (14.1 9)	2.6 (0.38)	NA	NA	1.9 (2.43)	1.8 (1.57)
3	2000-01 to 2008-09*	3.8 (6.76)	5.2 (4.08)	3.1 (2.08)	3.2 (3.02)	-1.7 (-1.87)	4.3 (3.36)	5.7 (7.18)	1.1 (2.35)	5.5 (2.56)	-3.6 (-0.2)	2.5 (3.11)	4.8 (4.21)
4	2000-01 to 2004-05**	1.13	3.09	-0.46	3.63	-3.22	4.48	3.82	0.08	7.82	0.56	-0.26	4.06
5	2004-05 to 2005-06**	4.46	8.23	4.23	-2.37	-4.76	3.44	4.17	-0.13	0.00	0.00	2.36	3.74
6	2004-05 to 2006-07**	4.36	10.09	3.94	1.16	-0.23	0.11	2.78	-1.04	11.21	-7.70	3.21	5.42
7	2004-05 to 2007-08**	4.27	5.98	3.16	1.69	-0.53	-1.61	2.08	0.70	11.75	5.58	2.28	3.80
8	2004-05 to 2008-09**	4.46	3.81	3.18	-0.57	1.48	-0.09	4.64	1.65	13.86	14.61	3.47	1.52

Notes:

1. *The growth rates for the decennial period are based on semi log time trend and the figures in the parentheses are respective 't' values.
2. ** Growth rates are based on annual averages. Annual Average Growth Rate = ((Ln(value year end)-Ln(value year begin))/number of years X 100.
3. \$ The growth rate of area and yield for Fruits, Vegetables, Spices, Flowers, Medicinals have not been calculated from 1980-81 to 1990-91 due to non-availability of data
4. # The growth rate for medicinal crop area and yield has not been calculated from 1990-91 to 2000-01 due to non-availability of data

Table 2.5: Cropwise and Planwise Growth in Area, Production and Yield of Major Crops in Tami Nadu (in percent)

Time Period	Paddy	Food Grains	Total Cereals	Total Pulses	Ground Nuts	Cotton
Area						
Annual Plan (1990-1992)	14.13	2.64	5.71	-8.40	14.17	7.96
8 th Five Year Plan (1992-97)	-0.49	-9.80	-7.15	-21.30	-24.14	-5.53
9 th Five Year Plan (1997-2002)	-8.88	-5.23	-9.33	15.88	-23.59	-27.93
10 th Five Year Plan (2002-2007)	27.36	13.40	17.97	-4.70	1.18	32.77
11 th Five Year Plan (2007-2012)	6.41	3.59	2.16	9.41	-27.95	36.71
Production						
Annual Plan (1990-1992)	14.07	10.27	10.91	-2.44	28.71	0.37
8 th Five Year Plan (1992-97)	-14.70	-17.08	-16.45	-32.05	-18.57	-27.82
9 th Five Year Plan (1997-2002)	-4.50	-5.12	-5.62	10.87	-11.26	-35.83
10 th Five Year Plan (2002-2007)	84.80	85.25	87.15	44.90	40.29	96.37
11 th Five Year Plan (2007-2012)	47.99	54.24	52.93	91.68	1.25	90.24
Yield						
Annual Plan (1990-1992)	-0.03	7.47	4.90	6.59	12.73	-6.90
8 th Five Year Plan (1992-97)	-14.28	-8.07	-10.00	-13.79	7.34	-23.53
9 th Five Year Plan (1997-2002)	4.79	0.13	4.11	-4.36	16.14	-10.86
10 th Five Year Plan (2002-2007)	45.10	63.33	58.66	51.97	38.63	98.94
11 th Five Year Plan (2007-2012)	39.08	48.89	49.71	75.25	40.57	40.23

Source: computed from Government of Tamil Nadu- Various issues of State Five Year Plan.

2.4.4 Growth Performance of Major Cereal Crops in Tamil Nadu

Table 2.6 depicts the Annual Compound Growth Rate (ACGR) of area of cultivation, yield and production of selected cereal crops in Tamil Nadu during 1991-92 – 2010-11. It is found from the table that, among cereal crops, maize has recorded the positive and highest growth rate of 36.45 percent per annum, which was evidently contributed by the high profitability from maize in Tamil

Nadu. It was found to be statistically significant at one percent level. Other selected cereal crops recorded decline in area as evident from negative rate of growth per annum. The largest decline in area has been recorded by ragi at the rate of -42.45 percent per annum followed by cumbu, cholam and paddy. In the case of yield of selected cereal crops, the result reveals that cumbu and cholam recorded the significant positive growth rates of 1.15 percent per annum respectively

However, in the case of cholam and ragi, the evidence provides negative growth rate of -5.37 percent per annum respectively. This is followed by paddy that registered lowest negative growth rate of -3.61 percent per annum in the case of yield. Besides, the growth performance, production reveals that maize has recorded the positive and significant growth rate of 67.10 percent per annum, which was evidently contributed by the high profitability from maize in Tamil Nadu.

The largest decline in production has been recorded by cumbu at the rate of -81.80 percent per annum followed by cholam, paddy and ragi. The state government took several efforts during the study period in order to increase the yield and production in the case of the major cereal crops by mechanization of production by utilization of farm machinery in agriculture at subsidized prices and granting loans for investment in agricultural infrastructure, supplying inputs such as fertilizers, pesticides and seeds and pricing policy for several main crops. But the analysis over the study period provides evidence that only maize has recorded positive and the highest growth rate per annum in terms of area and production in Tamil Nadu. Similarly, in the case of yield of major selected cereal crops, the analysis reveals that maize has registered the positive and significant growth performance along with cumbu. This was made possible by the high profitability from maize and cumbu. In sum, paddy has registered good performance in the state in absolute terms, as far as the other cereal crops are

concerned. But the Annual Compound Growth Rate (ACGR) reveals that the performance of maize was found to be positive and recorded the highest growth rate per annum among other cereal crops in terms of performance of area of cultivation, yield and production over the study period. Besides, cumbu provides positive and significant growth rate per annum only in case of performance of yield. Despite the fact that maize was found to acquire the highest place in terms of area of cultivation and production among other cereal crops, it cannot serve the purpose of livelihood for majority of the population in the State. Hence, priority is given to paddy cultivation. Besides, the study suggests that the farmers can also cultivate maize for the money-making purpose in Tamil Nadu because the climatic conditions of the state are ideal for the cultivation of maize.

Table 2.6: Annual Compound Growth Rates in Area, Production and Yield of Crops in Tamil Nadu (1991 – 2010) (in Percent)

Crops	Area	Production	Yield
Cholam	-6.67*	-71.15*	-5.37*
Cumbu	-16.82*	-81.80*	1.15*
Maize	36.45*	38.35*	1.15*
Paddy	-3.61*	-51.02*	-3.61*
Ragi	-42.45* -	-10.25*	5.37*

Source: Based on various issues of Government of Tamil Nadu;

* -indicates significance at 1 percent level.

2.4.5 Drivers of Growth in Agriculture

Agricultural growth is mainly depend upon the growth in crop output; diversification of agriculture towards high valued crops and livestock products and increase in value of the given output. Examining these three aspects of agricultural growth in Tamil Nadu reveal that the overall growth in area, yield and production of major crops in the State is quite impressive in the recent past. The share of principal and horticultural crops in Gross Cropped Area (GCA) is increased substantially during the last two decades which proves that the process

of diversification of agriculture towards high valued crops is in right direction, while there is a need for increasing the pace of diversification towards high valued cash crops in the state. National Food Security Mission (NFSM) and the National Horticulture Mission (NHM) have also emerged as the path-breaking interventions which have helped in agricultural diversification towards cash crops in Tamil Nadu. The growth in livestock in the state is also remarkable.

Animal husbandry and fisheries sectors are providing employment, thereby enabling the rural folk to get income besides contributing to State income sizably. Their contribution to the Gross State Domestic Product stood at 2.74 percent and that to the agriculture and allied activities was at 36.45 percent. The Eleventh Five Year Plan period envisaged an overall growth of 6.7 percent per annum in livestock sector. The milk production in the State witnessed a marginal improvement (2.04 percent) from 66.51 lakh tonnes in 2008-09 to 67.87 lakh tonnes in 2009-10. The meat production decreased marginally from 1048.19 lakh kgs. in 2009-10 to 1037.88 lakh kgs. in 2010-11.

The contribution of egg production in Tamil Nadu to all-India level during 2010-11 worked out to 18 percent. Per capita availability of eggs in the state was 165 against the per capita availability of 53 eggs at all-India level in 2010-11. And State occupies the third rank in fish production in the country. So far as the increase in value of the agricultural output is concerned, it is noteworthy that the prices of agricultural commodities have increased successively over the years in the state resulting in the rise in the value of output. However, the majority of farmers do not get remunerative prices because of constraints in marketing channels and infrastructures resulting in lower value of their output.

2.4.6 Agricultural Marketing

Agricultural marketing plays an important role in fostering and sustaining the tempo of rural economic development. Agriculture is dependent on marketing

support and thereby it minimizes the risk of the farmers besides getting an assured and fair price for ensuring a remunerative return to them. The Agricultural Marketing Board, Government of Tamil Nadu were started at 1977. The main objectives of this board are regulate the agriculture business in the State run institutions, private Mandis. Regulated markets was renamed as “Department of Agricultural Marketing and Agri Business”. It is focusing on creation and strengthening of post-harvest management infrastructure for value addition of agricultural commodities, food processing and export.

Under agricultural marketing, 21 market committees and 277 regulated markets were formed and no fee is collected from the farmers. However, one percent of the sale value of the produce is being collected as market fee from traders besides licence fee collected from traders and weighmen. In addition to this, 144 godowns are functioning and this ensured the competitive and remunerative prices under market committees. Further, 15 check posts existing under market committees had been abolished for the free movement of agricultural produce. The marketing facilities were created and provided by the marketing committees in the State.

Under “Agmarketnet”, a centrally sponsored scheme, 184 regulated markets and 21 market committees were provided with internet connectivity for the effective price dissemination among farmers through Agmarketnet website.

The overall food and non-food crops sold through the Regulated Markets had witnessed a fall from 14.16 lakh metric tonnes in 2009-10 to 13.41 lakh metric tonnes in 2010-11. On an average, the market arrivals per regulated market had come down from 5788 tonnes in 2009-10 to 4912 tonnes in 2010-11. However, the total value of agricultural produce transacted (food and non food crops) by regulated markets had improved from Rs.2050 crores in 2009-10 to Rs.2296 crores in 2010-11(12percent), of which paddy alone accounted for 57 percent during 2010-11 (Table 2.7).

Table 2.7: Value of Agricultural produce transacted through regulated markets (Rs. in Crores)

S.No.	Crop	2008-09	2009-10	2010-11
1	Foodgrains	823.07	1420.52	1588.02
2	Cotton	124.16	61.41	91.62
3	Chillies	4.25	4.57	6.34
4	Sugercane	78.10	157.48	303.23
5	Oilseeds	289.45	325.24	243.85
6	Vegetables	16.91	40.50	61.27
7	Others	344.28	40.39	1.82
Total		1680.22	2050.11	2296.15

Source: Commissioner of Agricultural Marketing and Agri Business, Chennai -32

Chapter III

Natural Resource Management

Natural resources are an important source for agricultural and human development in a society. Without the natural resources cannot survive the human nature in the world. Land, water resources, soil and biodiversity which are the natural resources for agriculture are under considerable strain in the State. The demand for meeting food and water for a growing population from shrinking natural resources base has shifted the focus to enhance agricultural production in a sustainable manner.

3.1 Agro – Climatic Zones in Tamil Nadu

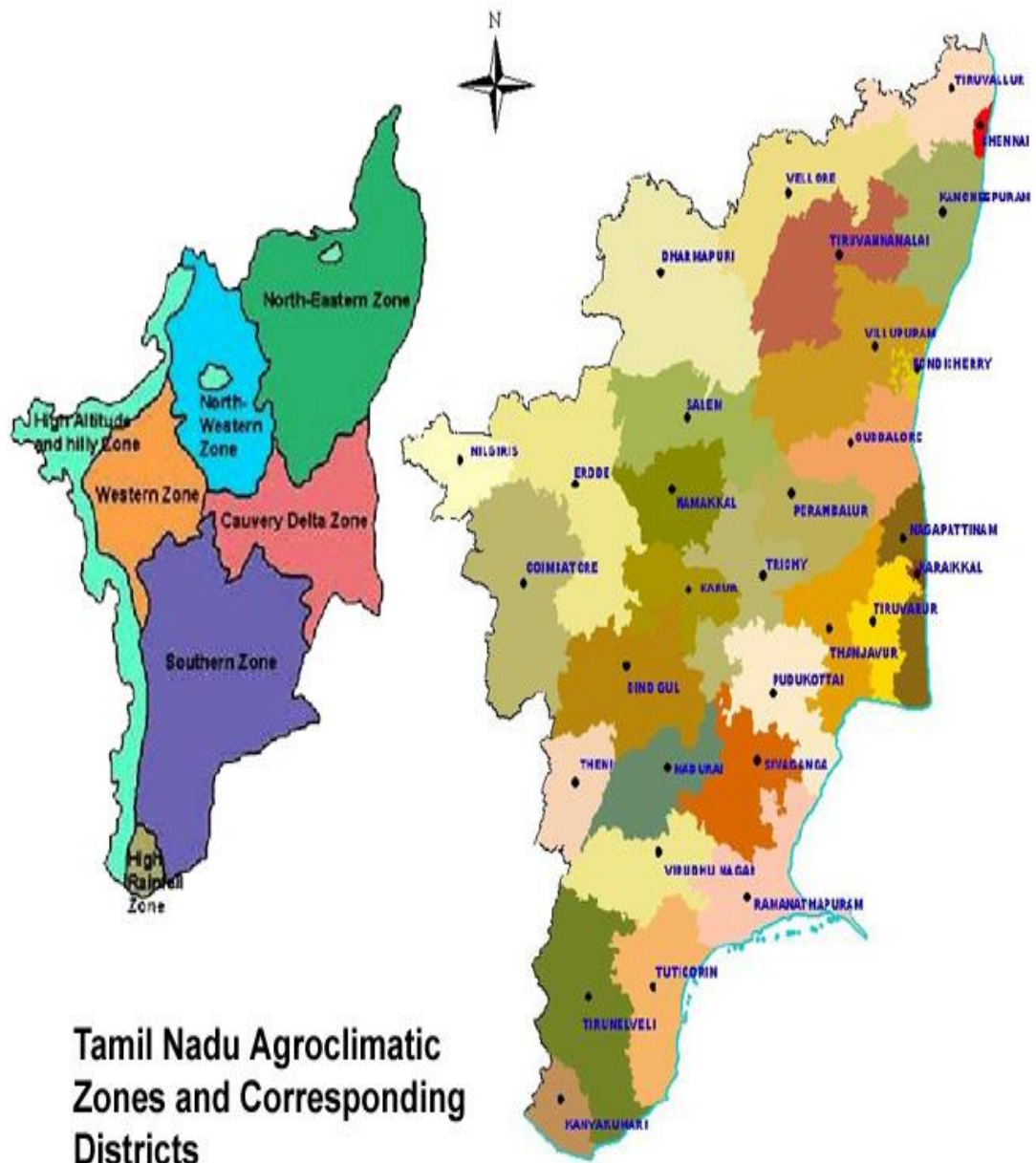
Table 3.1: Agro-Climatic Zones in Tamil Nadu

Agro-Climatic Zone	Districts Covered	Soil Type
North Eastern Zone	Kancheepuram, Tiruvallur, Cuddalore, Vellore, Villupuram and Tiruvannamalai	Red Sandy Loam Clay Loam Saline, Coastal Alluvium
North Western Zone	Dharmapuri, Krishnagiri, Salem and Namakkal (Part)	Non-Calcareous Red Non-Calcareous Brown Calcareous Black
Western Zone	Erode, Coimbatore, Tiruppur, Theni, Karur (part), Namakkal (part), Dindigul, Perambalur and Ariyalur (part)	Red Loamy Black
Cauvery Delta Zone	Thanjavur, Nagapattinam, Thiruvarur, Trichy and parts of Karur, Ariyalur, Pudukkottai and Cuddalore	Red Loamy Alluvium
Southern Zone	Madurai, Sivagangai, Ramanathapuram, Virudhunagar, Thirunelveli and Thoothukudi	Coastal Alluvium Black Red Sandy soil Deep red soil
High Rainfall Zone	Kanyakumari	Saline Coastal Alluvium Deep Red Loam
Hilly Zone	The Nilgiris and Kodaikanal (Dindigul)	Lateritic

Source: Department of Agriculture, Government of Tamil Nadu, Chennai

Based on soil characteristics, rainfall distribution, irrigation pattern, cropping pattern and other ecological and social characteristics, Tamil Nadu has been classified into seven agro-climatic zones. The seven agro-climatic zones of the State are listed in the following Table No. 3.1.

Map 2: Agro-Climatic Zones in Tamil Nadu



North Eastern Zone

The North eastern zone is located in between 8°5' and 13°2' north latitude and 76°15' and 80°22' east longitude. The zone can be broadly divided into six geographical tracts.

North Western Zone

This zone is located in between 11° and 12°55' North latitude and 77°28' and 78°50' East longitude. The climate ranges from semi-arid to sub-humid with frequent occurrence of drought. Excepting the hills, the annual rainfall ranges from 560 to 1080 mm. Hilly regions enjoy the rainfall of above 1300 mm. The maximum temperature ranges from 23° and 42°C and the minimum from 10° to 14°C. It is an interior region; the diurnal range of temperature is large particularly in summer

Western Zone

The zone is located in between 9°10' and 12° North latitude and 70°30' to 78° East longitude. The zone has undulating topography sloping towards east. The climate ranges from semi-arid to sub-humid with frequent occurrence of drought. The annual rainfall of the zone varies from 524 to 1428 mm with an average of 780 mm. The maximum temperature of the zone ranges from 26.9 to 42.1°C and the minimum from 16.2 to 24.5°C. Being an interior region, the diurnal variation in temperature is large particularly in the dry and hot seasons.

Cauvery Delta Zone

The Zone lies in the eastern part of Tamil Nadu between 10°00' and 11°30' North latitude and 78°15' and 79°45' East longitude. It is a deltaic zone. Cauvery is the river traversing the delta. The terrain is an open plain sloping gently towards east and devoid of any hills or hillocks. The altitude ranges from 6 to 250 m above MSL. The cauvery delta zone has diverse climatic conditions as the zone includes coastal belt as well as inland area. Cyclonic storms and high humidity occur in coastal belts. The coastal belt is favoured by high rainfall and when it proceeds to the

interior, the rainfall intensity decreases. The mean maximum temperature reaches 38.6°C in the month of May and the minimum of 21.0°C in December. April to August are the hot months and November to February are the cool months.

Southern Zone

The zone is located between 8 and 10°.55' North latitude and 79° 50 East longitude. The climate of the southern zone is generally semi-arid and only a small portion comes under sub-humid. Thus, frequent drought occurs. Summer is very hot. The zone comes under rain shadow area. The rainfall ranges from 700 to 1277 mm with a mean of 876.4 mm. The maximum temperature ranges between 30.0° and 37.5°C, while the minimum temperature is from 20.0° to 27.0°C. The temperature is more or less similar in most parts of this zone. However, along the Western Ghats, the minimum temperature tends to be low.

High Rainfall Zone

The zone consists of Kanyakumari district, located between 77°50' and 77°36' East longitude and 8°03' and 8°35' North latitude. The climate is sub-humid, influenced by both the south-west and north-east monsoons, because of the proximity of sea and the Western Ghats. There is not much variation in the mean monthly temperature, which varies from 23.9°C (minimum) to 36.7°C (maximum).

Hilly Zone

The hilly zone comprises the Nilgiris, the Shervarays, the Yelgiris, the Anamalais and the Palani hills. The rainfall varies from 1000 mm at the foot of the hills to 5000 mm at the peaks. The maximum temperature varies from 15°C to 24°C and that of minimum ranges from 7° to 13°C. The soil is mainly lateritic. The major crops are vegetables, potato and tropical and temperate fruit crops. At the foot of the hills, hill tribes raise minor millets. At higher altitudes, wheat cultivation is common during winter season.

3.2 Land Use Pattern

Geographical area of Tamil Nadu is 130.33 lakh hectares. It is the eleventh largest state of India. It can be observed from table 3.2 that the net area sown stood at 49.54 lakh ha. in 2010-11. The land put to non-agricultural uses marginally increased from 21.76 lakh ha. in 2009-10 to 21.77 lakh ha. in 2010-11. This was mainly due to increase in population, urbanization and industrialization. Of the total geographical area, forests accounted for 16.3 percent (21.25 lakh ha.). The current fallow lands decreased from 11.17 lakh ha. (8.6 percent) in 2009-10 to 10.15 lakh ha. in 2010-11 (7.8 percent). The barren and uncultivable land accounted for 3.8 percent in 2009-10 and 2010-11.

On the other hand, the other fallow lands increased from 15.42 lakh ha. in 2009-10 to 15.80 lakh ha. in 2010-11. The permanent pastures and other grazing lands were very meagre and shared only 0.8 percent of the total geographical area. The cultivable waste and miscellaneous tree crops amounted to 2.5 percent and 1.9 percent respectively during 2009-10 and 2010-11. When compared to the previous year (2009-10), the cultivable waste marginally increased from 3.26 lakh ha in 2009-10 to 3.31 lakh ha. in 2010-11.

The gross area sown and net area sown have marginally improved by 3.2 percent and 1.3 percent in 2010-11 respectively. The cropping intensity also increased from 113.9 percent in 2009-10 to 116.1 percent in 2010-11 in the same period.

Table 3.2: Land Use Pattern in Tamil Nadu (Area in Hectares)

Classification	1950s	1990s	2007-08	2008-09	2009-10	2010-11
Total Geographical Area	129.54 (100.0)	130.16 (100.0)	130.27 (100.0)	130.27 (100.0)	130.33 (100.0)	130.33 (100.0)
Classifications						
Forests	18.14 (14.1)	21.44 (16.5)	21.06 (16.2)	21.06 (16.2)	21.27 (16.3)	21.25 (16.3)
Barren and uncultivable land	9.73 (7.5)	4.95 (3.8)	4.92 (3.8)	4.92 (3.8)	4.90 (3.8)	4.89 (3.8)
Permanent pastures and other grazing land	3.75 (2.9)	1.25 (0.9)	1.10 (0.8)	1.10 (0.8)	1.10 (0.8)	1.10 (0.8)
Cultivable waste	8.70 (6.7)	3.25 (2.5)	3.47 (2.7)	3.33 (2.6)	3.26 (2.5)	3.31 (2.5)
Land put to non- agricultural purpose	12.70 (9.8)	19.07 (14.7)	21.69 (16.7)	21.72 (16.7)	21.76 (16.7)	21.77 (16.7)
Land under misc. tree crops & groves not included in the net area sown	2.49 (1.9)	2.25 (1.8)	2.61 (2.0)	2.59 (2.0)	2.53 (1.9)	2.52 (1.9)
Current fallow lands	11.05 (8.5)	10.57 (7.9)	9.81 (7.5)	10.13 (7.8)	11.17 (8.6)	10.15 (7.8)
Other fallow lands	6.60 (5.1)	10.93 (8.5)	14.99 (11.5)	14.97 (11.4)	15.42 (11.8)	15.80 (12.1)
Net area sown	56.38 (43.5)	56.32 (43.4)	50.62 (38.9)	50.43 (38.7)	48.92 (37.5)	49.54 (38.0)
Area sown more than once	10.31 (7.9)	10.97 (8.2)	7.53 (5.8)	7.81 (6.0)	6.79 (5.2)	7.99 (6.1)
Gross Area Sown	66.69 (51.5)	67.29 (51.7)	58.15 (44.6)	58.24 (44.7)	55.72 (42.7)	57.53 (44.1)
Cropping intensity	118.30	119.46	114.91	115.49	113.90	116.13

Source: Department of Economics and Statistics, Chennai-6

Note: Figures in parenthesis indicates percentages of total

3.3 Cropping Intensity

Cropping intensity is a measure of both quantum and spread of precipitation, soil moisture index and gross area irrigated. Tamil Nadu agriculture is water-starved so that the cropping intensity is not of higher order. The State is in dire need of economizing on scarce water resources available and they must be put to effective use. Optimization of water use can be accomplished by getting the maximum output per drop of water.

Table 3.3: Cropping intensity of Tamil Nadu– 2011-12 (in Lakh Ha.)

Area Cropped More than Once			Net Cropped Area			Cropping Intensity
Irrigated	Un-Irrigated	Total	Irrigated	Un-Irrigated	Total	
5.55	3.49	9.04	29.64	20.22	49.86	118.1

Source: Department of Economics and Statistics, Chennai-6

The cropping intensity has considerably increased over the years. Net Area Sown increased from 49.54 lakh ha. during 2010-11 to 49.86 lakh ha. during 2011-12 registering a growth rate of 0.65 percent. The improvement in area sown more than once rose by 13.12 percent. Gross Area Sown increased by 2.4 percent during this period. Cropping intensity i.e. gross area sown divided by net sown area was at 1.18 during 2011-12 compared to 1.16 during the previous year 2010-11.

3.4 Landholding Size

Over a period of time, the agricultural land is declining in Indian and Tamil Nadu. Particularly, operational holdings of the land is became decline due to various social and economic conditions in the society. Operational holding is one of the determine factors of agricultural production and productivity. The operational holdings as per Agricultural census are furnished in Table 3.4. The results of confirm the growing imbalance and asymmetry in the distribution of the size of land holdings pattern in Tamil Nadu.

The marginal and small farmers who constituted a higher proportion of 91 percent of the total farmers held a lesser extent of land holdings (59 percent), whereas medium and large farmers who formed 2.3 percent of the total farmers possessed a larger chunk of 20 percent of land holdings. Thus, the distribution of land holdings is highly skewed. It is one of the causative factors for low productivity.

Table 3.4: Landholding Pattern in Tamil Nadu (2005-06)

S.No.	Category	Number of operational Holdings (lakhs)		Area Operated (Lakh Ha.)		Average size of holdings (Ha.)	
		2000-01	2005-06	2000-01	2005-06	2000-01	2005-06
1	Marginal (< 1 ha)	58.46 (74.39)	62.28 (76.02)	21.59 (30.97)	22.86 (33.50)	0.37	0.37
2	Small (1-2 ha.)	12.26 (15.60)	12.34 (15.06)	17.12 (24.56)	17.21 (25.22)	1.40	1.39
3	Semi-Medium (2-4 ha.)	5.71 (7.27)	5.42 (6.62)	15.51 (22.25)	14.68 (21.15)	2.72	2.71
4	Medium (4-7 ha.)	1.93 (2.46)	1.70 (2.07)	10.94 (15.69)	9.58 (14.04)	5.67	5.64
5	Large (7-10 ha.)	0.23 (0.29)	0.19 (0.23)	4.56 (6.54)	3.91 (5.73)	19.83	20.58
All Size Group		78.59 (100.00)	81.93 (100.00)	69.72 (100.00)	68.24 (100.00)	0.89	0.83

Note: Figures in parentheses are percentage of total.

Source: Department of Economics and Statistics, Government of Tamil Nadu, Chennai-6

3.5 Ceilings on Landholdings

The skewed distribution of landholdings in Tamil Nadu leads to disparities in the income in the rural areas. In view of this, attempts were made in the past to distribute the excess land through land reforms. The First Five Year Plan period categorically stated that there should be an absolute limit to the size of land which any individual may hold.

Ceiling on Landholdings Act was enacted to reduce the inequality in the distribution of landholdings in the society. It was fixed by the Madras Land Reforms (Fixation of Ceiling on Landholdings) Act, 1961. The ceiling limit was lowered by the Madras Land Reform (Reduction of Ceiling on Land Holdings (Amendment) Act, 1972.

As per the new guidelines, the range of ceiling of Tamil Nadu has the limit of 24.28 hectares for dry land and for irrigated lands with two crops, the limit was 4.86 ha.; for irrigated lands with one crop, the limit is 12.14 ha.

Table 3.5: Ceiling Limits on Landholdings – Tamil Nadu (Area in Hectares)

Land holdings	Irrigated with two crops	Irrigated with one crop	Dry land
Suggested in National Guidelines of 1972	4.05 to 7.28	10.93	21.85
Actual Ceilings in Tamil Nadu	4.86	12.14	24.28

Source: http://www.indiaagronet.com/indiaagronet/AGRI_LAW/CONTENTS/Ceiling.htm

3.6 Water Resources

The total water potential of the State including groundwater is 46,540 million cubic metres (MCM). The total surface water is 24,160 MCM, including the contribution from neighbouring states of Andhra Pradesh, Karnataka and Kerala. Of the total water potential, the surface water potential is about 2.4 million ha. has almost been fully (more than 95 percent) tapped since the late sixties. Groundwater is, therefore, the only alternative source available for further development. There are 34 river basins falling into 17 basin groups in Tamil Nadu.

Table 3.6: Surface and Ground Water Resources in Tamil Nadu

Surface Water	2.4 M.ha.m
Ground Water	2.64 M.ha.m
Total	4.97 or 5.00 M.ha.m

Source: Based on various issues of Government of Tamil Nadu.

Table 3.7: Supply – Demand Gap in Tamil Nadu (M.ha.m)

Total Surface / Ground Water	5.00
Irrigation needs	5.00
Non-Agricultural needs	2.00
Total Demand	7.00
Supply-Demand Gap	2.00
Further Demand for recreation and environmental protection in the river	0.25
Total Supply-Demand Gap	2.25

Source: Based on various issues of Government of Tamil Nadu.

The dependency on ground water has increased manifold during the recent years. The ground water extraction for irrigation, domestic use and industries have resulted in lowering of water levels, long-term water level declining trend and even drying up of wells. In order to regulate the groundwater development, Central Ground Water Board and State Ground Water Board, has computed dynamic ground water resources and categorized blocks in Tamil Nadu.

The net ground water availability for irrigation purposes has been computed as the difference between net annual ground water availability and the gross ground water draft including the allocation for domestic and industrial uses for the next twenty five years. The computation indicates that balance ground water potential is not available for future irrigation development in the major part of Coimbatore, Dharmapuri, Krishnagiri, Dindigul, Nagapattinam, Namakkal, Salem, Theni, Vellore and Tiruvannamalai districts. The ground water drafts in the districts mentioned have already exceeded the total available groundwater resources for irrigation.

Based on this, a total of 142 blocks, where the level of groundwater development is more than 100 percent, with pre- or post- monsoon water level showing declining trend have been categorized as “*over exploited*” blocks. The level of groundwater development is between 90 and 100 percent and pre- or post-

monsoon water level showing declining trend have been categorized as “*critical*” one. The level of groundwater development in 57 blocks is between 70 percent and 90 percent with pre- or post- water level showing declining trend. In some blocks the level of groundwater development is less than 70 percent but pre- or post- monsoon water level is showing a declining trend. They have been categorized as “*semi-critical*”.

The level of ground water development in 145 blocks is below 70 percent with both pre- and post- monsoon water level not showing declining trend. They are categorized as “*safe*”. The groundwater available in the phreatic zone is totally saline in 8 blocks in the State, which have been omitted from the classification mentioned above.

3.7 Weather and Climate

The geographical location of Tamil Nadu is such that the climatic condition shows only slight seasonal variations. Due to close proximity to the sea, the temperatures and humidity remain relatively high all the year round. The climate of Tamil Nadu is tropical in nature with little variation in summer and winter temperatures. While April-June is the hottest summer period (with the temperature rising up to the 40°C mark) November-February is the coolest winter period (with temperatures hovering around 20°C), making the climate quite pleasant.

More than 75 percent of annual rainfall in India is received from South West Monsoon. However, the rainfall received during North East Monsoon (>50 percent) in the State has an added advantage and helps in the production of food crops than South West monsoon rainfall (>30 percent).

The rainfall during South-West Monsoon (July-September) in 2010-11 recorded at 383.6 mm was (20.2 percent) higher than the normal rainfall of 319.2 mm and 21 percent more than 2009-10 level. The rainfall was excess in 13 districts and normal in 19 districts. During the season, the highest rainfall was received in the Nilgiris district (1211.7mm) and the lowest rainfall of 109.5 mm was recorded in Thoothukudi district in the State.

During North East Monsoon (October-December), the State had recorded an average rainfall of 605.2 mm which was higher by 40.6 percent over the normal rainfall of 430.3 mm. during 2010-11. However, the rainfall was lower by 11.9 percent over the previous year of 2009-10. The rainfall was normal in 6 districts and excess in 26 districts during 2010-11. The highest rainfall of 1118.8 mm was recorded in Thiruvallur district and Krishnagiri district experienced the lowest rainfall of 405.2 mm.

The State is received an overall rainfall of 116.1 mm during 2010-11 which was higher by 28.2 percent over the normal 908.6 mm. and 24 percent higher than that of the previous year 2009-10. The total rainfall was excess in 22 districts and normal in 10 districts.

The overall improvement in area, production and productivity is depends on the ideal spatio-temporal distribution of rainfall. The State is received normal rainfall during South West Monsoon in 2009-10 and excess rainfall in 2010-11. However, the Mettur dam was opened for irrigation belatedly after the scheduled date (12th June) on 28th July in the two years under reference.

The temporal and spatial spread of rainfall had helped much to store water in the reservoirs in the State during South West Monsoon. Total rainfall during the south west, north east monsoon and hot weather period during 2010-11 was better as compared to previous year 2009-10. The precipitation during north east monsoon was encouraging during the period and facilitated cultivation of rabi crops and thereafter the rainfall was heavy and scattered during the 3rd and 4th week of November 2010. This led to the crop inundation in 26 districts and samba paddy crop raised during 2010 was severely affected.

Table 3.8: Rainfall Pattern by Season in Tamil Nadu (in mm.)

Year	South West Monsoon (June-Sept.)		North East Monsoon (Oct.-Dec.)		Winter Season (Jan.-Feb.)		Hot Weather Season (Mar.-May)		Total		Percent Deviation from Normal
	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	
2000-01	322.8	314.5	470.3	335.6	47.3	16.8	138.9	118.4	979.3	785.4	-19.8
2001-02	322.8	260.0	470.3	379.4	47.3	70.0	134.2	83.3	974.6	792.7	-18.4
2002-03	329.5	185.4	468.1	407.1	36.8	8.7	129.8	129.8	964.1	731.0	-24.2
2003-04	331.5	336.5	464.6	403.1	37.4	12.0	128.4	283.4	961.8	1034.6	7.6
2004-05	331.5	360.7	464.6	472.1	37.4	14.3	128.4	231.7	961.8	1078.9	12.2
2005-06	332.9	308.5	459.2	828.8	36.8	15.9	129.6	150.9	958.5	1304.1	36.1
2006-07	316.1	250.9	431.1	497.5	35.3	10.9	129.1	100.4	911.6	859.7	-5.5
2007-08	316.1	341.6	431.1	515.4	35.3	46.6	129.1	261.2	911.6	1164.8	27.8
2008-09	316.1	333.5	431.1	552.7	35.3	7.7	129.1	129.2	911.6	1023.1	12.2
2009-10	316.0	317.0	431.1	482.6	35.3	11.5	129.1	126.7	911.6	937.8	2.9
2010-11	319.2	383.6	430.3	605.2	31.3	36.3	127.8	140.0	908.6	1165.1	28.2

Source: India Meteorological Department, Chennai – 600 006

Chapter IV

Farm Inputs: Requirements, Availability and Prices

After 1960s, the phenomenal growth in agricultural production has been triggered by higher input use. Particularly purchased inputs as well as technology induced productivity enhancement. The key inputs which changed the complexion of agriculture include HYV (High Yielding Variety) seeds, chemical fertilizers, irrigation, pesticides, farm machinery and equipments, credit and labour.

4.1 Seeds

Seeds are one of the major inputs being supplied for the cultivation of agriculture crops. They are the crucial input for sustained growth in the farm production. Ensuring adequacy in improved seed quality and varietal diversity is also important. In order to make available adequate quantity of quality seeds at right time to the farming community, The Department of Seed Certification is implementing seed certification, seed quality control, seed testing and training schemes. The main function of seed certification is to encourage the production of adequate quantities of genetically pure and good quality seeds. Particularly, high potential, improved and hybrid varieties of different crops.

To protect the interest of the farmers, seed trade has to be constantly monitored by inspecting the seed dealer points periodically. The government must have a constant vigil on the marketing of seeds by taking seed samples in the seed lots distributed to the farming community. At present 6623 seed selling points are available in Tamil Nadu.

Seed testing is being carried out to analyse the quality of the seed lots. Factors like germination, physical purity, moisture, seed health and admixture of other distinguishable varieties are being analysed in the notified Seed Testing Laboratories as per the Handbook on “Seed Testing”

released by the Government of India. Seven notified seed testing laboratories are functioning in Tamil Nadu

Table 4.1: Distribution of seeds by various agencies (in Tonnes)

Agencies	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Government	24,468	25,370	23,550	21,186	18,922	19,582
Quasi-Government	3,608	1,963	1,632	7,58	4,861	5,335
Private Sector	66,854	55,456	50,236	48,829	56,935	41,865
Total	94,930	82,789	75,418	70,773	80,718	66,782

Source: Department of Agriculture, Chennai-5

The production and yield rate of crops mainly depend on the quality of seeds with more specific emphasis on genetic and physical purity. The desirable Seed Replacement Rate (SRR) for achieving higher productivity was 25 percent for self-pollinated crops like paddy, ragi, pulses, groundnuts, gingelly and 35 percent for cross-pollinated crops such as cholam, cumbu and cotton and 100 percent for hybrids. The quality seeds are distributed through government departments, co-operative societies, and private outlets in the State.

4.2 Fertilisers

The use of chemical fertilizers and their intensification in many areas are being reviewed. The Government is encouraging the application of appropriate fertilizers relevant to the soil and crops based on soil test recommendations.

4.2.1 Chemical Fertilizers

The balanced and the optimum use of chemical fertilizers is helps to improve the productivity of crops. In Tamil Nadu, a total number of 12062 retail outlets are engaged in fertilizer distribution. Out of that, which private retail outlets accounted for 78 percent and the rest being the cooperative societies.

The consumption of N,P,K in Tamil Nadu is found to be in the ratio of 2:1:1 as against the conventionally accepted ratio of 4:2:1 indicating imbalance in the application of these three chemical nutrients. Continuation of subsidy on urea while decontrolling phosphate and potash fertilizers further adds to the inadvertent promotion of imbalance in fertilizer use on the one hand and excessive use of nitrogenous fertilizers in the other leading to environmental pollution and lowering of profits to the farmers. It is not only confined to the use of NPK, but also need based application of nutrients like sulphur, zinc, iron and boron. It is become essential for exploiting of high yield varieties. The major constraints for adopting rational crop nutrition schedules are:

- Inadequate availability of straight fertilizers of nutrients other than NPK and Zinc
- Less exposure of extension agencies towards rational crop nutrition schedules
- Lack of strong policy support on balanced fertilizer use
- Inadequate soil testing facilities; and
- Lack of awareness among farmers.

Soil health is to be preserved. The soil test based application of fertilizer is being advocated in the State. For analyzing the soil samples, there are 30 soil testing laboratories and 16 mobile soil testing laboratories functioning in the State. During 2009-10, out of 11.33 lakh soil samples taken, 9.75 lakh soil samples were analyzed in the State. Apart from this, the soil test is being done through agri-clinics with mini soil testing facilities in all the 385 blocks at a cost of Rs.11.93 crores under National Agricultural Development Programme (NADP). However, the farmers were advised to apply quality inputs and soil health cards were issued to 21.75 lakh farmers. The application of inorganic fertilizers (NPK) was calculated on the basis of data received from Agricultural department.

The total application of chemical fertilizers had come down from 12.65 lakh tonnes in 2008-09 to 12.14 lakh tonnes in 2009-10; however, it

marginally improve to 12.29 lakh tonnes in 2010-11. The per hectare fertilizer consumption rose from 160 kgs /ha.in 2009-10 to 197 kgs/ha. in 2010-11.

Table 4.2: Consumption of Chemical Fertilizers in Tamil Nadu (in Lakh tonnes)

Nutrients	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Nitrogenous	5.59	5.86	5.43	6.47	6.25	6.43
Phosphorous	2.56	2.69	2.28	2.55	2.64	2.80
Potash	2.84	2.70	3.04	3.63	3.25	3.06
Total	10.99	11.25	10.75	12.65	12.14	12.29
Per hectare Consumption(kgs.)	184	187	166	166	160	197

Source: Department of Agriculture, Government of Tamil Nadu, Chennai-5

4.2.2 Organic Manure

Micro organisms are essential for the soil health and they help to prevent the depletion of soil nutrient. Owing to intensive cropping, the organic matter content in the soil went down from 1.20 percent in 1971 to 0.68 percent in 2008 in the State. The organic matter improves the soil fertility and increases crop yield rate. To increase crop productivity, balanced use of organic fertilizer is being advocated in the State. Composting of farm waste using pleurotus vermicomposting, application of bio-fertilizers and green manures were popularized in the cropping system. Under the scheme, a minikit worth of Rs.120/- containing five kilogram of urea, one kilogram of pleurotus and a technical pamphlet is being distributed to the farmers with free of cost.

The green manure corps like sunhemp, daincha, kolinji and seabania are helpful in fixing atmospheric nitrogen and help to remove salinity and acidity of soil. In the State, for the promotion of green manure cultivation, 250 MTs of green manure seeds were produced and distributed with 25 percent subsidy. On the other hand, for the application of vermi compost, a financial assistance of Rs.1200/- per demonstration totalling 300 demonstrations was provided to conduct training to 15000 farmers at a cost of Rs.11.55 lakhs. The seven micro nutrients like iron, copper, zinc,

manganese, boron, molybdenum and chlorine are critical in nature. The micro nutrient deficiency in soil was tested in 19 soil testing laboratories and 9 mobile soil testing labs in the State.

4.2.3 Bio-fertilizer

Bio-fertilizer component is vital for the Integrated Nutrient Management in the sense of eco-friendly and cost effective input. The biofertilizer packets are produced in six Biofertilizer Production Centres located at Cuddalore, Ramanathapuram, Salem, Kudumiyamalai, Sakkottai and Trichy. They distributed through Agricultural Extension Centres. Bio-fertilizers like Azospyrillum and Rhizobium help in fixing atmospheric nitrogen into the soil suitable for the growth of crops like paddy, millets and groundnuts. The bio-fertilizer is best suited for the growth of pulses. The bio-fertilizer production units (Six Nos.) in the State have the capacity of producing 1660 MT of 80 lakh packets comprised of 200 gm. each per packet. The area covered under bio-fertilizer increased from 2.87 lakh ha. in 2009-10 to 3.39 lakh ha. in 2010-11.

4.2.4 Plant Protection

Under plant protection, the area treated against pests for food crops and non-food crops was 27.53 lakh ha. and 27.94 lakh ha. in 2009-10 and 2010-11 respectively. Of the estimated demand of 6000 MT dust, 5000 kilo litres of liquid and 2500 MT of technical grade material, 4143 Mt of dust, 4515 kilo litres of liquid and 2393 Mt of technical grade material were distributed during 2009-10. During 2010-11, 3507 MT (Dust), 4526 kilo litres (liquid) and 2550 MT (technical grade material) were distributed in the State.

4.2.5 Bio-Control Agents

Increasing demand for organic products and higher returns have made the farmers to incline towards organic farming for which usage of biocides and bio-control agents are essential. Bio-control agents are produced through the Government owned 12 Bio-Control Agents Production Centres

and distributed to the farmers under various subsidy schemes to control pests like rice leaf folder, sugarcane internode borer, coconut black headed caterpillar, coconut rhinoceros beetle, cotton bollworm, groundnut red hairy caterpillar and Prodenia.

4.3 Farm Mechanization

The States with a greater availability of farm power show higher productivity as compared to others. The details of agricultural implements and machinery in Tamil Nadu are furnished in Table 4.3. It could be observed from the table that a variety of agricultural machinery and implements are available to meet the requirements of the farming community.

Table 4.3: Agricultural Machinery and Implements in Tamil Nadu - 2004

S.No.	Item	Number
1	Ploughs	
	Total	1085330
	Wooden	755183
	Iron	330147
2	Bullock Carts	155857
3	Sugarcane Crushers	
	Total	7957
	Worked by Power	1407
	Worked by Bullocks	6550
4	Tractors (Crawler Tractors, Hand Tractors and Four wheeled Tractors)	77223
5	Oil Engines (used for Irrigation and other Agricultural purposes)	237031
6	Oil Ghanis	6963
7	Plant Production Equipments	
	Total	124241
	Sprayers – dusters operated manually	79172
	Sprayers – dusters operated by Power	42685
	Sprayers – dusters operated by Tractor	2384

Source: 18th Livestock Census – 2007, Department of Animal Husbandry and Veterinary Services, Chennai-6.

4.4 Irrigation

Irrigation is a vital input at different stages of cultivation of crops. The total irrigation potential in the country improved from 81.1 million ha. in

1991-92 to 108.2 million ha. in March 2010. Of the State's surface water potential of 853 TMC, 261 TMC was contributed by neighbouring States and was utilized fully. Of the 385 blocks in the State, 139 blocks were over-exploited, 33 were critical, 67 were semi-critical and 11 were saline in nature. The balance of 136 blocks is considered to be safe in the State. So far, under artificial recharge of ground water through dug works, 19150 recharge structures were constructed by the beneficiaries of both small and marginal farmers. The net area irrigated marginally improved from 28.6 lakh ha. in 2009-10 to 29.1 lakh ha. (1.6 percent) in 2010-11. The canal irrigation slightly came down from 7.6 lakh ha. to 7.5 lakh ha. in the same years, respectively. The area under tank irrigation witnessed a marginal increase from 5.0 lakh ha to 5.3 lakh ha. during the reference period. The gross area irrigated went up from 32.4 lakh ha to 33.48 lakh. ha (3.3percent). The irrigation intensity also improved from 113.3 percent to 115.1 percent. The gross area irrigated to gross area sown had slightly gone up from 58.12 percent to 58.23 percent. The net area irrigated to the net area sown witnessed a marginal increase from 58.5 percent to 58.7 percent in the respective years.

Table 4.4: Irrigation indicators in Tamil Nadu: 2007-08 to 2010-11

Items	2007-08	2008-09	2009-10	2010-11
Total Rainfall (mm)	1164.8	1023.1	937.8	1165.1
Net Area Irrigated (Lakh ha.)	28.6	29.3	28.6	29.1
A. Canals	7.5	7.6	7.6	7.5
B. Tanks	5.1	5.4	5.0	5.3
C. Wells	15.9	16.2	15.9	16.2
D. Others	0.1	0.1	0.1	0.1
Gross Area Irrigated (Lakh ha.)	32.5	33.9	32.4	33.48
Irrigation intensity (percent)	114.0	115.7	113.3	115.1
Net Area Irrigated as percent to Net Area Sown	56.6	58.1	58.5	58.7
Gross Area Irrigated as percent to Gross Area Sown	55.92	58.26	58.12	58.23

Source: Department of Economics & Statistics, Government of Tamil Nadu Chennai - 6

4.5 Agricultural Wages and Classification of Agricultural Labourers

Statistics regarding daily wages paid to agricultural labourers are being collected every month from 385 villages, at one village per block. The agricultural labourers are classified into two groups, such as

- Field labourers and
- Other agricultural labourers

Field labourers comprise of ploughmen, sowers, pluckers, transplanters, weeders, reapers and harvesters. Other agricultural labourers denote those who are engaged in watering of fields, carrying loads, digging wells and other agriculture related works.

Table 4.5: Average Rates of Daily Wages paid to Different Categories of Agricultural Labourers 2011-12 (in Rupees)

Tamil Nadu	Plough men		Sowers & Pluckers of seedlings		Transplanters & Weeders		Reapers & Harvesters		Other Agri. Operations	
	With Bullock	Without Bullock	Men	Women	Men	Women	Men	Women	Men	Women
	335.84	210.52	184.22	95.28	169.53	92.22	201.55	101.22	207.24	94.01

Source: Department of Economics and Statistics, Government of Tamil Nadu, Chennai-6

4.6 Credit and Insurance

Availability of credit and agricultural insurances are important drivers of growth in agriculture. However, the formal credit is readily available to elite class people such as large and wealthy farmers who are trusted by the institutional lenders because of their grater repayment capacity; on the other hand, the access of poor marginal and small farmers to institutional credit is quite limited (Swain, 2001). If we look at the disbursement of institutional credit in Tamil Nadu, State Cooperatives, Rashtirya Krishi Vikas Yojana (RKVY), Kisan Credit Card (KCC) Scheme and Agricultural Technology

Management (ATMA) are some of the major programs through which credit has been made available to the farmers in the State.

4.6.1. Crop Insurance

Under crop insurance, all farmers including share-croppers, tenant farmers growing insurable crops and availing Seasonal Agricultural Operations (SAO) on compulsory basis and all other farmers growing insurable crops like non-loanee farmers who opt for the scheme on voluntary basis are covered.

Objectives:

- To provide insurance coverage and financial support to the farmers in the event of failure of crops as a result of natural calamities, pests and diseases.
- To encourage farmers to adopt progressive farming practices, high value inputs and higher technology in agriculture.
- To help stabilize farm incomes particularly in disaster years.
- The Crop Insurance Scheme covers the food crops (cereals, millets and pulses), oilseeds, sugarcane, cotton, annual commercial/annual horticultural crops. The State provides 50 percent as premium subsidy for both loanee and non-loanee farmers. In addition to the State subsidy, the Government of India also provides five percent subsidy to small and marginal farmers.

The total number of farmers covered under the scheme improved from 9.41 lakhs in 2009-10 to 9.65 lakhs in 2010-11. The total sum insured which was Rs.2740.9 crores had increased to Rs.3213.2 crores during the respective years. Implementation of Crop Insurance Schemes in Tamil Nadu portrays the exemplary efforts taken by the Department of Agriculture, Government of Tamil Nadu by its resounding success among the farmers.

Table 4.6: Crop Insurance: 2005-06 to 2010-11

Category	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Area Covered (Lakh Ha.)	2.13	4.40	8.58	9.95	11.50	11.56
No. of farmers covered	119967	315387	557481	857432	941305	964595
Sum insured (Rs. Lakhs)	25816.50	50437.30	95084.34	223628.77	274093.95	321315.33
Premium (Rs. Lakhs)	549.13	1163.59	2066.71	5510.18	6516.62	8733.24
Total claims (Rs. Lakhs)	4827.34	943.61	27955.50	84221.89	12996.87	32361.51
Claims paid (Rs. Lakhs)	4827.34	943.61	26761.78	84221.89	12996.87	32361.51

Source: Agriculture Insurance Company of India Ltd., Chennai - 10

The State Government is making strenuous efforts to fine-tune the Crop Insurance Schemes by introducing interim compensation to insured farmers, reducing the insurance unit area to revenue village level, uniform seasonality discipline, on account payment, timely payment of claims etc., which will definitely motivate the farmers to take up risks in agriculture and stabilize the income of the farmers at the time of distress. The Crop Insurance Schemes is one of the main schemes in crop insurance.

4.6.2 National Agricultural Insurance Scheme

The main objective is to provide insurance coverage to the farmers for the notified crops. It provides financial support to the farmers in the event of failure of crops as a result of natural calamities. The encourage the farmers to adopt progressive farming practices and high value inputs and help them to stabilize their farm income. Particularly in disaster years has been implemented in Tamil Nadu since Kharif season 2000 onwards.

Paddy, millets, pulses, oilseeds, cotton, sugarcane, annual / commercial crops are insured under the scheme. The scheme is operated in notified areas (block/ firka level) for notified crops. All loanee farmers growing notified crops are enrolled compulsorily while non-loanee farmers are enrolled on voluntary basis.

The present premium subsidy pattern is given in the Table 4.7.

**Table 4.7: Details of Beneficiaries: National Agricultural Insurance Scheme
(in Percent)**

Details of Beneficiaries		Govt. of India Subsidy	Govt. of Tamil Nadu Subsidy	Total subsidy
Loanee Farmers	Small & Marginal Farmers	5	45	50
	Other Farmers	--	50	50
Non-Loanee Farmers	Small & Marginal Farmers	5	50	55
	Other Farmers	--	50	50

Source: Agriculture Insurance Company of India Ltd., Chennai - 10

As the present insurance scheme is being operated on area approach depriving the farmers of certain benefits under the scheme, Government has proposed to redesign the scheme for the benefit of individual farmers.

4.6.3 Compensation under National Agricultural Insurance Scheme

In the event of crop loss due to natural calamities, Agricultural Insurance Company pays compensation upto 100percent for food and oilseed crops and 150percent for annual and commercial crops, if the claim is less than the premium collected. If the claim exceeds the premium amount, then the exceeding amount is equally shared between Central and State Governments. During 2011-12, a sum of 7975.19 lakhs of rupees was disbursed as compensation to 2.32 lakh farmers by the State Government.

4.6.4 Weather Based Crop Insurance Scheme

The compensation extended under National Agricultural Insurance Scheme (NAIS) implemented from Kharif 2000 onwards is calculated based on the yield results of crop cutting experiments. However, the crop loss due to seasonal changes has not been accounted for. Therefore to overcome the shortcomings, This Scheme was introduced on `pilot basis. This scheme is being implemented to mitigate the hardship of the insured farmers against the likelihood of financial loss on account of anticipated crop loss due to adverse weather conditions. The critical stages of a crop such as

sowing, vegetative, flowering and harvest stages are insured for weather parameters like excess / deficit rainfall, temperature, relative humidity, consecutive dry days, wind speed, etc. The scheme is applicable to both loanee and non-loanee farmers and all notified crops in the notified districts are insured. This scheme is implemented by AIC, ICICI Lombard GIC, IFFCO-TOKIO GIC, Chola mandalam GIC, and HDFC Ergo GIC.

Chapter V

Agricultural Education, Research and Extension

5.1 Agricultural Education

Food and nutrition are the two important aspects which warrant importance in the present day context. Amidst the challenges of shrinking resources and escalating cost of inputs, the productivity of food grains has to be doubled and the farmers' income tripled. Tamil Nadu Agricultural University is spearheading its triple major activities of Education, Research and Extension converged to work in synergy to bring forth *Second Green Revolution* in agriculture.

Nevertheless, a growth rate of 4percent in agriculture is essential to raise the GDP by 9percent by the end of the Twelfth Five Year Plan period. All the research strategies are planned to achieve this target without any shortfall. Research on the development of new varieties and technologies are programmed to meet the present needs of the farmers.

All the state of the art technologies are used to propagate scientific technologies to farming community such as, village meetings, newspapers, radio, television, mass contact programmes, exhibitions and melas. The latest communication facilities like internet and mobile phones are used for disseminating the knowledge to farmers through web portals and short message services. Knowledge input on day to day market intelligence is updated for the benefit of the farming community. Location specific technology input imparted through training and on- farm demonstrations by Krishi Vigyan Kendras enable knowledge penetration to reach the unreached.

5.2 Agricultural Research Benefits

Agricultural Research activities are carried out in all the 11 colleges, 36 research stations and 14 Krishi Vigyan Kendras. The outcome of the research is manifested by the release of (a) Twelve Varieties / Hybrids like,

TNAU Maize Hybrid CO 6, TNAU Sugarcane Si 8, TNAU Coconut ALR (CN) 3, TNAU Papaya CO 8, TNAU Coccinia CO 1, TNAU Bottle Gourd Hybrid CO 1, TNAU Ash Gourd Hybrid CO 1, TNAU Mushroom CO (TG) 3, TNAU Malai vembu MTP 1, Kufri Neelima potato, TNAU Blackgram VBN 7 and TNAU Coconut VPM 4. (b) Five Agricultural Implements namely, Arecanut harvester, Tractor operated multipurpose hoist, Improved coconut tree climber, Pulse Line Marker and Aerial access hoist for coconut harvesting and (c) Three Management technologies viz., Subsurface drip fertigation system, Biocolour from beetroot and STCR based IPNS for agricultural and horticultural crops.

5.3 Research Programmes for upcoming years

High yielding, disease resistant varieties of rice, sorghum and cumbu varieties are being developed. Evolution of nutritionally superior ragi varieties with high calcium, zinc and iron content is under progress. Development of medium duration (130–135 days) and long duration (180 days) redgram hybrids based on cytoplasmic genetic male sterile lines; development of high yielding varieties of greengram and blackgram with synchronous maturity and resistance to mungbean yellow mosaic virus are in progress in pulses breeding. In oil seed crops, breeding for high oil and drought tolerant varieties in sunflower and groundnut are in progress.

Integrated farming system is given the major thrust area for increased income generation to the farmers. To enhance the crop productivity and to improve the livelihood of the dryland farmers, precision farming technologies like, summer ploughing, compartmental bunding, broad bed furrow, sowing with the seed drill, intercultural operation, seed hardening and seed treatment, micronutrient are adopted. These technologies are being implemented by imparting training to the dryland farmers.

Technologies are being developed to sustain the crop productivity under global warming situation. Technologies to enhance the water holding

capacity in rainfed lands and to mitigate the mid-season drought will be identified. To overcome the labour scarcity, mechanization will be promoted to reduce the cost of cultivation and increase the profit.

Use of biofertilizer to supply various nutrients to the crop, use of microbes in value addition, research on bioenergy will be taken up. Establishment of model seed production demonstration farm will be taken up in identified districts. Seed production of pulses and oilseeds under farmers' participatory mode will be taken up. Training to enhance the efficiency and capacity building for seed entrepreneurs will be imparted.

Crop growth promoters such as Pulse wonder, Sugarcane Booster, Coconut tonic, Maizemax and Cotton plus will be popularized on a large scale for pulses, sugarcane, coconut, maize and cotton respectively.

Resource characterization of different categories of farmers on farming systems in Western and North western zones of Tamil Nadu, alternate cropping strategy as a contingent plan and agro-techniques for various situations in field crops, good agricultural practices aiming for better resource use efficiency, conservation agriculture in cropping systems will be optimized. High yielding and pest resistant vegetables will be screened.

Mechanization in rainfed farming will be given importance. Machines for land shaping, seed drills, plant protection equipments, harvesters etc., will be popularized among the farmers. Development of papaya hybrids with improved fruit quality and resistance to Papaya Ring Spot Virus (PRSV) is in progress. Standardization of high density planting (HDP), Ultra High Density Planting (UHDP) and fertigation practices will continue to assume importance in mango, banana and papaya.

Under the Environmental Sciences, the research focus will be on utilization of wastewater from paper mills, tanneries and distilleries for agriculture and other end users, utilization of solid wastes from agriculture, domestic and gelatin industries for organic manure production and utilizing it as organic inputs. Similarly, solid waste utilization from poultry litter towards

organic farming, bioremediation of contaminated soils in different agro-ecological zones of Tamil Nadu. Developing remediation technologies for improving salt affected soils and carbon sequestration and budgeting in plantations of fast growing trees will be taken.

5.4 Extension Activities

5.4.1 Production of Audio Visual Aids

Tamil Nadu Agricultural University has proposed to strengthen the Audio Visual Extension material for effective Farm Crop Management System (FCMS) for farmers and extension officials' use and other campaigns.

5.4.2 Establishing Community Radio Stations by TNAU

Community Radio is an effective medium for transferring the location specific farm technologies to farmers on a larger scale. Tamil Nadu Agricultural University has proposed to set up Community Radio stations in 28 districts in a phased manner over a span of three years. The weather conditions, daily market prices of agricultural commodities, success stories of farmers, scientists' advice on different cropping patterns will be covered apart from environmental protection, health and education.

5.4.3 Krishi Vigyan Kendras activities

Through Krishi Vigyan Kendras, 109 On-Farm Testing (OFT) of newly released varieties and technologies, 200 Front Line Demonstrations were conducted and popularised, 3362 Trainings were given to extension officers, rural youths and, Self-Help Groups. Farm advisory service provided to 11076 farmers.

The System of Rice Intensification (SRI) is a tremendous success with 36.8 percent increase in yield. The average yield recorded under SRI was 7432 kg/ha whereas under conventional practice, it was only 5482 kg/ha. Besides, 30 percent water saving was also achieved.

Tamil Nadu Precision Farming Project is a State sponsored mega demo project implemented through Turnkey mode and is spread over 53,885 ha. Doubling of crop yield and high quality of farm output have created a revolution in vegetable cultivation.

Sustainable Sugarcane Initiative improves the productivity of water, land and labour, all at the same time, while reducing the overall pressure on water resources. The technology package has been standardized. The yield increase is 60 to 90 tons per hectare.

Management of Invasive Papaya mealy-bug through parasitoid

Outbreak of papaya mealy bug, *Paracoccus marginatus* was noticed during 2008 on papaya, mulberry, tapioca, jatropha, vegetables, fruits, cotton, plantation crops, spices and flower crops in different parts of Tamil Nadu causing extensive damage going upto 90 percent. Management of this pest through classical biological control by importing parasitoid viz., *Acerophagus papaya* from USA through NBAIL (National Bureau of Agriculturally Important Insects), ICAR, Bengaluru proved to be effective. So far, about 35 lakh parasitoids have been produced and released by TNAU in various parts of Tamil Nadu which effectively controlled the mealy bug.

5.4.4 Drip Fertigation in Red Gram

One of the ways of improving productivity of red gram is by growing it under controlled irrigation by using drip fertigation system. The technology has been standardized. The yield increase was from 1350 kg to 1850 kg/ha..

5.4.5 National Agricultural Innovation Programme

Tamil Nadu Agricultural University is the lead centre for five Consortium projects implemented in India, viz., developing e-resources for B.Sc.(Ag), establishment and networking for market intelligence, developing value chains for flowers, and industrial agro-forestry and agribusiness planning

and development. Tamil Nadu Agricultural University is also the co-operating centre for eight consortium projects viz., value chain in mango and guava, policy analysis and gender, mass media for agro information, value chain in flowers, biomass based decentralized power generation, wild honey and milling industry, soil organic carbon dynamics and risk assessment and insurance products.

5.4.6 Tamil Nadu Irrigated Agriculture Modernization and Water Bodies Restoration and Management Project

It is a multidisciplinary project funded by the World Bank. The project has been implemented in 63 selected sub-basins of Tamil Nadu to cover an *ayacut* area of 6.83 lakh ha. Under this project, technology demonstrations have been taken up by TNAU for SRI technology of rice and for cultivation of low water requiring crops such as garden land pulses, maize, groundnuts, sunflower, sesame and cotton.

5.4.7 Food Processing

The Post-Harvest Technology Centre at TNAU is involved in developing food processing technologies and also providing training to rural men and women for working in processing units. The PHTC has trained 1780 people in the last four years.

5.4.8 Seed Centre

The Seed Centre takes up production and distribution of quality seeds for all crop varieties of TNAU. Seed production is taken up in 32 centers for 175 varieties of different crops; it is supplied breeder and certified seeds of various crops. The centre is producing breeder seeds, foundation seeds and certified seeds. It is sufficient to change the seeds once in three years. Hence, it was proposed to produce 33 percent of the certified seeds during 2012-13, It will be raised to 50 percent before the terminal year of Twelfth Five Year Plan period. Priority will be given to pulses and oilseed crops.

5.4.9 Automatic Weather Stations (AWS)

These stations were installed in 224 blocks, one in each block in Tamil Nadu. With the funds received from NADP second phase, 161 additional Automatic Weather Stations will be established so as to complete in all the 385 blocks. To take decision on farming, based on weather parameters, medium term forecasts (for the next 4 days) at block level are made using the data acquired on 10 parameters at hourly intervals from the Automatic Weather Stations. The forecast products will be made available through TNAU Agriportal (<http://agritech.tnau.ac.in> and in the website <http://tawn.tnau.ac.in> for the use of all block level officers.) The block level officers will develop suitable weather based agro-advisories to the farmers of their block and pass on to the farmers through their field level functionaries as well as mass media. The university will impart training for three days to all the block level officers in developing the weather based agro advisories. Training has been imparted to 766 agricultural extension officers. Yield increase in different crops ranged between 8 - 15 percent and farm income by 10 – 18 percent by practising weather based farming.

5.4.10 Trade and Intellectual Property

The Department of Trade and Intellectual Property was established on 1st April 2010. As on date, 7 inventions of TNAU have received patent, 21 inventions have been filed and more than 18 inventions have been identified for filing.

5.4.11 Agribusiness Development

Agribusiness Incubator has so far commercialized 12 technologies including Coconut Tonic, Panchagavya, Egg removing device, SRI power weeder, *Pseudomonas* and *Trichoderma*.

5.4.12 Market information and intelligence

Tamil Nadu Agricultural University operates the Domestic and Export Market Intelligence (DEMIC) unit (www.tnagmark.tn.nic.in) and provides forecasts of prices of agricultural produce before sowing and also prior to harvest.

5.4.13 Daily Market Intelligence

e-Extension centre of TNAU in Collaboration with Centre for Development of Advanced Computing (C-DAC) is providing Daily Market Information to the farmers in time through internet and mobile phone. It is being also published in Tamil and English daily newspapers. The news is broadcast through radio and television. About two lakh farmers were benefited. The predicted price has about 95 percent accuracy. The registered farmers receive daily market information through SMS over mobile phones apart from information on wholesale and retail prices of 160 commodities, details of 1,500 wholesalers with address and phone numbers.

5.4.14 Agri Market Intelligence and Business Promotion Cell

TNAU will associate in effective functioning of the Agri market Intelligence and Business Promotion Cell, Thiruchirappalli for providing market information to farmers. For effective extension along with all the stakeholders, focused effort will be made to have intensive contact with the farmers.

Chapter VI

Animal Husbandry, Dairying and Fisheries

6.1 Animal Husbandry

The animal husbandry and fisheries sector is very crucial role in the economic development particularly rural area. The animal husbandry and Fisheries sectors provide employment to a sizeable section of the rural folk to get income besides contributing to State income. Their contribution to Gross State Domestic Product stood at 2.74 percent and to agriculture and allied activities, their contribution was 36.45 percent. Period envisaged an overall growth rate is to 6.7 percent per annum in livestock sector during Eleventh Five year plan period.

6.2 Livestock Population

The Livestock Census helps to hammer out formulation of rational policies for promoting farm practices and welfare schemes for livestock. The livestock population was 307.59 lakhs in Census 2007 as against 249.42 lakhs in Census of 2004. The cattle and buffalo population increased from 107.99 lakhs in 2004 Census to 131.98 lakhs in 2007. The goat population in the State steadily went up between 1994 Census and 2007. Likewise, the poultry population leap frogged from 865.91 lakhs in 2004 to 1281.08 lakhs in 2007, registering an increase of 47.95 percent. The state was ranked second in poultry population and egg production in the country. The share of total livestock population and poultry population in the State accounted for 5.81 percent and 19.75 percent respectively in the all-India population. Livestock Census details of the State are given in Table 6.1.

To augment milk production, breeding activities are being carried out intensively through Tamil Nadu Livestock Development Agency (TNLDA). The cattle population in the State increased from 90.47 lakhs (1997 Census)

to 111.89 lakhs (2007 Census) which formed 36.38 percent of the total livestock population. Owing to the State's Breeding Policy and health care activities, the exotic and crossbred population rose to 136 percent in 2004 Census. However, the indigenous and native pure cattle population declined from 68.68 lakhs in 1997 Census to 38.06 lakhs in 2007 Census.

Table 6.1: Livestock Population - Tamil Nadu (Census wise) (No. in lakhs)

Census Period	Cattle	Buffalos	Sheep	Goats	Others	Total	Poultry
1989	93.53 (-9.77)	31.28 (-2.62)	58.81 (6.21)	59.20 (12.85)	20.85 (14.18)	263.67 (0.68)	215.70 (17.97)
1994	90.96 (-2.75)	29.31 (6.30)	56.12 (-4.57)	58.65 (-0.93)	21.75 (4.32)	256.79 (-2.61)	238.54 (10.59)
1997	90.47 (-0.54)	27.41 (-6.48)	52.59 (-6.29)	64.16 (9.39)	24.76 (13.84)	259.39 (1.01)	365.11 (53.06)
2004	91.41 (1.03)	16.58 (-39.51)	55.93 (6.35)	81.77 (27.45)	3.73 (-84.94)	249.42 (-3.84)	865.91 (137.16)
2007	111.89 (22.40)	20.09 (21.17)	79.91 (42.87)	92.75 (13.43)	2.95 (-20.91)	307.59 (23.32)	1281.08 (47.95)

Source: Department of Animal Husbandry and Veterinary Services, Chennai – 6
(Figures in brackets indicate percentage change over the previous Census.)

6.3 Milk Production and Per Capita Availability

For the growing population and urbanization, increasing per capita income and changing consumption pattern, the need of the hour is to improve the milk production and per capita availability of milk in the State. The average increase in milk production in the State stood at 2.00 percent from 2006-07 to 2010-11 which was lower than that of the average at the all-India level (5.4 percent). The milk production witnessed a marginal improvement (2.04 percent) from 66.51 lakh tonnes in 2008-09 to 67.87 lakh tonnes in 2009-10. However, due to health care activities, it had further gone up to 68.31 lakh tonnes 0.65 percent in 2010-11. As against the ICMR milk requirement of 250 gms. per day, the per capita availability of milk per day in the State improved marginally from 275 grams in 2008-09 to 278 grams in 2009-10 and it marginally declined to 269 gms. during 2010-11.

Table 6.2 gives details of milk production and per capita availability.

Table 6.2: Milk Production and Per Capita Availability

Year	Production* (Lakh Tonnes)		Percentage share of Tamil Nadu	Per Capita Availability** (Grams per Day)	
	Tamil Nadu	All India		Tamil Nadu	All India
2005-06	54.74	971	5.6	231	241
2006-07	62.77	1009	5.5	263	251
2007-08	65.40	1079	6.1	271	260
2008-09	66.51	1122	5.9	275	266
2009-10	67.87	1164	5.8	278	273
2010-11	68.31	1218	5.6	269	281

Source: 1. Statistical Hand book of Economics and Statistics Department, Chennai -6.

2. Economic Survey, Government of India, 2011-12.

*Milk Production: Revised from 2006-07 based on 18th Livestock Census Population as per Government of India guidelines.

**Upto 2010, 2011 Human Population Census and its projection were taken up for calculation..

6.4 Animal Health Care

The State undertakes livestock health care and animal care activities and thereby prevents animals from the attack of fatal diseases. With a view to preventing economic loss to farmers on account of morbidity of animals and to providing healthy meat and increasing milk yield, animal health care activities. The health care activities like vaccination, deworming, artificial insemination and treatment to animals are carried on through Veterinary Institutions and Mobile Units in the State. The vaccination for the prevention of disease like Haemorrhagic Septicemia Black Quarter, Anthrax, Foot and Mouth disease, Enterotoxaemia, Sheep Pox, Ranikhet 'K', Antirabies were provided. The number of vaccinations increased by 14.9 percent from 569.80 lakhs in 2009-10 to 539.75 lakhs in 2010-11. The number of deworming went up by 7.5 percent from 251.06 lakhs to 269.97 lakhs in the respective years. Artificial insemination improved from 38.05 lakhs to 44.04 lakhs (15.74percent). The total number of calves born climbed up by 7.84 percent from 14.41 lakhs to 15.54 lakhs during these years. The calving rate has also slightly increased from 40.25 percent to 40.84 percent. Under the '*Intensive Health Care Programme*', a sum of Rs.40.00 lakhs was sanctioned and utilized for deworming the sheep during 2009-10.

Table 6.3: Performance of Animal Health Care Activities (Lakh Numbers)

Item	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Animals treated	202.41	189.73	196.28	197.02	202.52	223.26
Vaccination done	449.91	512.85	496.39	548.99	469.80	539.75
Deworming done	186.01	203.37	220.04	231.00	251.06	269.97
Castration done	6.44	6.72	6.62	6.57	7.62	7.72
A.I. Performed	32.87	33.59	34.79	35.80	38.05	44.04
Calves born	11.40	13.04	12.01	13.45	14.41	15.54

Source: Department of Animal Husbandry and Veterinary Services, Chennai – 6.

6.5 Meat Production

For the purpose of supply of quality and hygienic meat to consumers, registered slaughter houses are being established in the State. The total number of registered slaughter houses increased from 116 in 2009-10 to 121 in 2010-11. The estimated total number of animals slaughtered through the registered and unregistered slaughter houses had gone up from 44.99 lakhs to 49.02 lakhs in the respective years. However, the estimated total quantity of meat production decreased from 1048.19 lakh kgs. in 2009-10 to 1037.88 lakh kgs, in 2010-11.

Table 6.4: Meat Production in Tamil Nadu

Item	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11*
Registered Slaughter Houses (Nos.)	109	110	110	107	116	121
Animals Slaughtered (lak.)						
Sheep	15.71	15.82	13.43	12.83	12.76	15.45
Goat	13.94	20.97	21.69	22.12	22.16	23.78
Cattle	1.03	1.08	1.14	1.18	1.12	1.01
Buffaloes	0.55	0.62	0.64	0.73	0.77	0.60
Pig	0.16	0.12	7.92	8.01	8.09	8.18
Total	31.39	38.61	33.82	44.87	44.99	49.02
Meat Production (Lak tons)						
Mutton	171.74	173.31	164.32	153.26	145.69	169.37
Chevon	171.80	231.04	262.06	264.95	275.32	265.56
Beef	86.09	107.36	135.50	133.83	124.03	110.54
Cara Beef	63.33	67.95	66.29	71.58	83.85	66.88
Pork**	6.15	4.98	321.53	381.06	419.30	425.53
Total	499.11	584.64	949.70	1004.68	1048.19	1037.88

*Provisional.

**Pork production revised based on Government of India guidelines. Hence meat production also revised.

Source: Department of Animal Husbandry and Veterinary Services, Chennai - 6

6.6 Poultry Development and Egg Production

Poultry had undergone a transformation from backyard unit to the present vibrant and dynamic enterprise. There are eight Poultry Extension Centres and two Poultry Disease Diagnostic Laboratories functioning in the State for the development of poultry. The scientific breeding activities were carried on through these Poultry Extension Centres as a model farm in addition to providing technical advice to the farmers in the prevention, diagnosis and control of infection and parasitic diseases.

Table 6.5: Egg Production and Per Capita Availability

Year	Production (Millions)	Per capita availability (Nos.)
2006-07	8044	123
2007-08	8394	128
2008-09	8810	133
2009-10	10848	162
2010-11	11514	165

Source: 1. Statistical Handbook, DoES, Government of Tamil Nadu
2. Department of Animal Husbandry and Veterinary Services,
Chennai -6

The poultry industry is more sustainable in the production hub districts of Namakkal, Salem, Erode and Coimbatore. To protect the poultry from fatal Ranikhet disease, the State provided vaccination on specified days at the Veterinary Institutions and Sub-Centres weekly and in the camps under *Kalnadai Padukappu Thittam*. Likewise, the State had provided two weeks vaccination drive against the disease during the month of February in the review years. As per Livestock Census 2007, the poultry population comprised 268.80 lakhs of backyard poultry and 1012.28 lakhs of commercial poultry. The poultry population increased by 47.95 percent from 865.91 lakhs in 2004 Census to 1281.80 lakhs in 2007 Census. Of the total poultry population, vaccination had gone up from 303.21 lakhs in 2009-10 to 399.88 lakhs in 2010-11.

The Contribution of egg production in Tamil Nadu to all-India level worked out to 18 percent during 2010-11. Per capita availability of eggs in Tamil Nadu was 165 against 53 eggs at all-India level in 2010-11.

6.7 Feed and Fodder Development

Feed and fodder are the major factors for enhancing farm animal milk production and yield rate. To increase the quantity and quality of livestock products like milk, egg and meat, good quality and adequate quantity of green fodder is required. The cost towards feed and fodder accounts for a major share of 70 percent of the total production cost. Green fodder is not available throughout the year. Hence, dry fodder, mash and pellet become a substitute for green fodder.

As per 2007 (provisional) Livestock Census, the deficit of green fodder was estimated at 42.60 percent to total demand. However, dry fodder availability is adequate during normal monsoon period. The total area under fodder cultivation increased from 680.27 hectares in 2009-10 to 1045.70 hectares in 2010-11. The number of fodder seed production units increased from 7 to 10 in the respective years. The production of fodder slips had come down from 190.96 lakhs to 177.87 lakhs during the respective years. Likewise, the production of fodder seeds also diminished from 2529 kgs. in 2009-10 to 1773 kgs. in 2010-11. However, the seedlings improved from 0.09 lakhs to 0.15 lakhs (66.67percent).

The distribution of fodder slips slid from 169.75 lakhs in 2009-10 to 146.69 lakhs in 2010-11. Likewise, the seeds distribution decreased from 400 kgs. to 360 kgs. in the respective years. The distribution of seedlings had also declined from 0.083 lakh in 2009-10 to 0.025 lakh. The number of minikits distributed under Central Minikit Testing Programme (CMTP) decreased from 27619 to 20897.

Table 6.6: Fodder Production

Particulars	2006-07	2007-08	2008-09	2009-10	2010-11
Total area under cultivation (ha.)	961	881	1004	680	1046
Fodder seed production (units)(Nos.)	7	7	7	7	7
Production of fodder slips (lakhs)	23.64	74.41	141.07	190.96	177.87
Production of fodder seed (mts)	4.06	3.61	0.17	0.25	0.18
Production of seedlings (lakh)	0.16	0.07	0.07	0.09	0.15
Minikit distributed (Nos.)	20015	19046	17555	27619	20897

Source: Department of Animal Husbandry and Veterinary Services, Chennai - 6

6.8 Livestock Insurance

The centrally sponsored Livestock Insurance Scheme is being implemented in 15 districts of the State by the Tamil Nadu Livestock Development Agency. It aims to safeguard the farmers against the eventual loss of animals especially cattle and buffaloes. Under the scheme, fifty percent of the premium is provided as government subsidy and the rest is collected from the beneficiaries. The total number of milch cattle and buffaloes covered under insurance expanded from 89,649 numbers in 2009-10 to 92,589 numbers in 2010-11. The funds provided for the scheme was Rs.600 lakhs and Rs.200 lakhs respectively during the years. During 2011-12, Rs.500 lakhs was earmarked for the scheme and proposed to be implemented in all the districts of the State.

6.9 Fisheries

Tamil Nadu is one of the coastal States in India in the east coast having a coastal line of 1076 kms. The State supplemented by 41,412 sq.kms. of continental shelf, has 13 coastal districts with 591 fishing villages consisting of 8.92 lakh fishery population of which 2.60 lakh fishermen (29percent) are actively engaged in marine fishing activity. Under inland fisheries, fishing population is at 2.21 lakhs in the State. Tamil Nadu occupies the third rank in fish production in the country.

6.9.1 Fish Production

Fish contains a great deal of protein and helps to contribute significantly to human growth and thereby assures nutritional security. The

fish production consists of both marine and inland fish and fish products. Of the total fish production, the marine fish production shared 71 percent and inland 29 percent during 2010-11. Likewise, of the marine fish production, the demersal varieties and pelagic varieties shared 55 percent and 45 percent respectively.

The total fish production marginally went up from 5.71 lakh tonnes in 2009-10 to 5.97 lakh tonnes in 2010-11. Of this, marine fish production rose from 4.01 lakh tonnes to 4.25 lakh tonnes, the increase being 5.98 percent. Likewise, the inland fish production also marginally improved from 1.70 lakh tonnes to 1.72 lakh tonnes in the respective years. The total fish production of around 6 lakh tonnes in 2010-11 is estimated to contribute Rs.7860 crores. The per capita production of a fisherman works out to Rs. 75000 to Rs.80000. The per capita consumption of fish improved from 8.900 kgs. in 2009-10 to 8.956 kgs. in 2010-11. The demand for fish increased due to a change in the consumption pattern of the growing population in the State. However, the fish resources in the inshore area had been over-exploited. Hence, there is a scope for off-shore resources which are yet to be tapped to the optimal level. To meet out the growing demand, the State took measures through Tamil Nadu Fisheries Development Corporation (TNFDC) for the conservation of fishery wealth and to manage resources for sustainable fish production. Apart from this, the National Mission for Protein Supplement (NMPS) was implemented with an allocation of 3.34 crores for the improvement of protein supplement to the population of the country. The State has taken steps to sustain fish production as well as to improve the socio-economic standards of the fishing community.

Of the total 13 marine fishing districts, Ramanathapuram alone had produced 86452 tonnes during 2010-11 which accounted for 20.4 percent of the total fish production, the increase being 4.9 percent over the previous year. The share of Nagapattinam and Thoothukudi accounted for 16.6 percent and 12.5 percent with a production of 70393 tonnes and 53188

tonnes respectively. The production in other districts are Pudukottai (43757 tonnes), Kanyakumari (42525 tonnes), Chennai (34283 tonnes) and Cuddalore (25532 tonnes) in the State.

Table 6.7: Fish Production in Tamil Nadu (in percent)

Year	Inland	percent change	Marine	percent Change	Total	percent change
2007-08	1.65	3.12	3.93	0.25	5.58	1.09
2008-09	1.66	0.61	3.97	1.02	5.63	0.90
2009-10	1.70	2.41	4.01	1.01	5.71	1.42
2010-11	1.72	1.18	4.25	5.98	5.97	4.55

Source: Commissioner of Fisheries, Chennai 6.

6.10 Fish Export

Fish is a rich source of foreign exchange. Tamil Nadu occupies a predominant position in fish culture. It is one of the major exporters of fish in the country. The fish export is carried on through Thoothukudi and Chennai ports in the State. The value of fish exported from Tamil Nadu is 30 percent of the value of its total production. The major fish varieties viz. frozen shrimp, frozen cuttle fish, fresh fish, frozen squid, dried fish and others including chilled and live items are exported. The export of frozen shrimp accounted for a major share of more than 50 percent. The export of this variety improved from 37373 tonnes in 2009-10 to 48556 tonnes in 2010-11, the increase being 30 percent. The total value of the export of frozen shrimp also accelerated from Rs.1984 crores to Rs.2150 crores in the respective years (Export value is Rs.572/kg.). Likewise, the total quantity of exports of all varieties had gone up by 16.8 percent from 73773 tonnes in 2009-10 to 86182 tonnes in 2010-11. The total value of fish export had witnessed a boost from Rs. 2000.55 crores to Rs.2860.19 crores during the years respectively. The State shared 10.6 percent of fish exported and 26.2 percent of the value of fish exported in the country during 2010-11.

Table 6.8: Share of Export in the total Fish Production

Item	2009-10		2010-11	
	Export (Tonnes)	Value (₹ in crores)	Export (Tonnes)	Value (₹ in crores)
Frozen Shrimp	37373	1384	48556	2150
All Varieties	73773	2000.55	86182	2860.19
Total fish production	570919	-	596530	-
Balance for Consumption	497146	4000	510348	5000
Total Value		6000		7860

Source: Commissioner of Fisheries, Government of Tamil Nadu, Chennai 6.

Chapter VII

Post-Harvest Management and Value Addition

7.1 Post-harvest Technology

Post-harvest technology helps to meet the food requirements of growing population by eliminating avoidable losses in making more nutritive food items from low grade raw produce by proper processing and fortification and by diverting a portion of food material as fodder to cattle by way of processing and fortifying low grade food and organic wastes and by-products into nutritive animal feed. It has potential to create rural industries. In India, 72.2 percent of the population lives in the villages and 56.6 percent who depend on agriculture have experienced that the process of industrialization has shifted the food, feed and fibre industries to urban areas. This process has resulted in capital drain from rural to urban areas, decreased employment opportunities in the rural areas, balance of trade in favour of urban sector and mismatched growth in economy and standard of living including the gap between rural and urban people. It is possible to evolve appropriate technologies, which can establish agri-based rural industries. The purpose of post-harvest processing is to maintain or enhance quality of the products and make it readily marketable. Losses of food crops refer to many different kinds of losses produced by a variety of factors. These include weight loss, loss of food value, loss of economic value, loss of quality or acceptability and actual loss of seeds themselves.

7.2 Food Processing and Post-Harvest Management Scenario

Augmentation of agricultural production needs a concurrent development of post-harvest support mechanism including normal and cold storage facilities, packaging facilities, agro-processing industries, crop sterilization and sanitation facilities and an effective marketing reach to global markets. Food processing adds value to the agricultural, horticultural,

livestock and fisheries products by using various techniques like grading, sorting and packaging which enhance their shelf life. It leads to diversification of agricultural activities, improves value addition opportunities and creates surplus for export of agro food products.

In Tamil Nadu, about 188 L.MT of fruits and vegetables are produced. Due to heavy post-harvest losses, there exists a considerable gap between gross production and net availability to the consumers. The post-harvest loss is estimated at 30 to 40 percent in fruits and vegetables, which is primarily due to non-adoption of post-harvest management techniques. The post-harvest losses start in the farm and travel along procurement chain and entire marketing channel. Adoption of post-harvest technology and growth of food processing industries are inter-related as post-harvest management increases the shelf life of fruits and vegetables and feed more to the agro-processing industries.

Factors contributing to the development of Food Processing Sector:

- Vast source of agricultural/ horticultural raw material to food processing industries,
- Transformation of conventional farming to market-led commercial farming,
- Emerging domestic market in the form of large urban middle class with its changing food habits,
- Change in consumption patterns driven by the processed food markets,
- Government assistance for setting up and modernizing food processing units and creation of infrastructure,
- Increasing Foreign Direct Investment (FDI) in food business sector,
- Conducive food processing policy environment and
- Availability of huge scientific and research talent pool.

The current focus of research in food processing is to evolve technologies to reduce post-harvest losses, minimize it in processed foods, and evolve energy efficient and safe technologies for novel methods of preservation. The introduction of new dairy, poultry and fish products,

perceptible shift in eating habits and increase in income have resulted in a change in demand for the processed foods especially for animal products.

7.3 Past and Current Trends in Food Processing Sector

Department of Agricultural Marketing and Agri Business is the State Nodal Agency for the Ministry of Food Processing Industries (MoFPI), Government of India. The Ministry of Food Processing Industries (MoFPI) decided to decentralize the implementation of food processing schemes in the Eleventh Five Year Plan period through banks/ financial institutions to provide a thrust and wider coverage for food processing industries in the country and simultaneously decentralize the procedures for appraisal, grant of assistance and monitoring standards.

Being a State nodal agency for MoFPI, the Department undertakes activities like: processes Projects on Food Industry, Entrepreneur Development Programme (EDP), Food Processing Training Centres, Seminars and Exhibitions, Infrastructure for Food Processing Courses and Projects.

7.3.1 Food parks for processing

Food Parks include food processing units such as fruits and vegetables processing, rice mill, flour mill, bakery unit, dairy products, milk products, animal feed, flakes and fast food. Besides State-of-the-art laboratory, hi-tech cold storage, captive power plant, effluent treatment plant with all other ancillary facilities are mandatory for these parks. Farmers will get ready market for their produce and processing companies will get continuous supply of raw material. Food parks are poised to become catalysts for the socio-economic development of the region.

7.3.2 Agri Export Zones (AEZ)

With globalization and liberalization of Indian economy, international trade is playing a significant role in the growth of national and state economies. To increase the share of exports from Tamil Nadu, two more

AEZs are to be promoted with modern pack house and gamma irradiation facilities to control the incidence of pests and diseases and also to enhance the shelf life of farm produce.

7.3.2 Terminal Markets

In order to encourage private investment for development of marketing as well as value addition, the Department of Agricultural Marketing and Agri. Business is making efforts to establish modern terminal markets with all value addition facilities in Public-Private Partnership (PPP) mode near metro areas of Chennai and Madurai districts.

7.3.4 National Mission on Food Processing (NMoFP)

The Ministry of Food Processing Industries (MoFPI) has proposed to launch a new Centrally Sponsored Scheme (CSS) in the ratio of 75:25 by Government of India and State Governments. During Twelfth Five Year Plan, the National Mission on Food Processing is to be implemented through States. The basic objectives are : to augment the capacity of food processors working in unorganized sector and upscale their operations through capital infusion, technology transfer, skill upgradation and handholding support. The self-help groups working in food processing sector and facilitate them to emerge as Small and Medium Enterprises (SME) status to ensure the standards of food safety and hygiene to the globally accepted norms. The food processing industries is to adopt HACCP and ISO certification norms and to provide better support system to the organized food processing sector.

7.3.5 Food Technology and Value Addition

The priority areas of food technology and value additions are research and development, quality control and capacity building. Research and development is needed to encourage both fundamental and applied research and keep abreast of global standards. Quality certification

infrastructure in terms of labs and protocols for quality certifications have to be upgraded to world standards. Following schemes are proposed on education and capacity building in food processing and to address the issues of paucity of chilling infrastructure for milk and milk products, lack of modern slaughter houses, lack of value addition and infrastructure of fisheries export.

7.4 Post-Harvest Management

7.4.1 Clean Meat Production

Setting up of mini slaughter units in 1600 villages ensuring quality and safety meat to the consumers. The generation of waste in present situation underlines the need for effective waste treatment. Effluent treatment plant needs to be established in all the 385 blocks for safe disposal of waste from meat and animal products.

7.4.2 Creation of Post-Harvest Cold Storage Facilities for Meat and Eggs

There is need for creation of post-harvest cold storage facilities on PPP mode to ensure food safety. Establishment of post-harvest centres in Fisheries at Chennai, Nagapattinam and Ramanathapuram districts of Tamil Nadu is proposed with the following components

- Establishment of fish products incubation centre;
- Establishment of vocational training centre;
- Establishment of certification; centre and
- Establishment of post-harvest centre in fisheries.

Chapter VIII

Summary and Conclusions

This report presents the state agricultural profile of Tamil Nadu. The profile is presented in terms of important indicators like the performance and challenges of the different sectors of agriculture, viz., natural resource management, farm inputs and management, agricultural research, education and extension, animal husbandry, dairying and fisheries sector. Besides, post-harvest management in agriculture for the state has been discussed in detail.

Summary

The First chapter gives a brief introduction about Tamil Nadu.

Tamil Nadu is the eleventh largest state in India by area and the seventh most populous state. It is the second largest state economy in India during 2012. The State possesses varied types of agro-climatic conditions ranging from hot tropical through sub-tropical to temperate climate. Uneconomic size of a very large number of marginal and small farms, low economic status of the farmers and the low literacy level among farmers affect the full adoption of scientific farming and hence the agricultural production. Large extent of land (about 24 lakh hectares) is considered as waste land in the State. This provides opportunities for land reclamation and development of horticulture and plantation crops in the State and acceptable adoption of Hi-Tech like precision farming. The density of population is 555 which is on the high side and greater than the national average by about 150 points. The population of the state is rising considerably.

Performance and Challenges of Tamil Nadu agriculture has been discussed in Chapter Two.

Tamil Nadu is one of the most socially developed and economically progressive States in the country. It is progressing faster in terms of per capita income and Human Development Indicators (HDI).

Tamil Nadu's performance in terms of GSDP growth rate (at constant prices) since the late nineties reveals, the following three features: (1) there was a fall in the growth rate of GSDP of Tamil Nadu in the early part of the decade (1996-2007), (2) this fall was more than that of India's GDP and (3) Tamil Nadu's GSDP growth rate has greater volatility than India's GDP growth rate (Fig 2.1).

During 1996-97 to 2007-08, the average annual growth rate of GSDP of Tamil Nadu was 6.26 percent and that of GDP of the country was 6.97 percent. In comparative terms, growth rate of GSDP of Tamil Nadu has been more than the GDP growth in many years but the reverse is also true for some years.

The structure of Gross State Domestic Product (GSDP) in Tamil Nadu, has been shifting away from agriculture towards manufacturing and more towards services sector.

The major crops like paddy, millets (coarse cereals), pulses, oil seeds, sugarcane and cotton are being raised in the State. These accounted for 60 percent of the total cropped area in the State during 2009-10 and 2010-11.

Food grains constitute a vital source for the food and livelihood security. It accounted for 73 percent of the total crops in the State. Production and yield rate of food grains had recorded a negative growth of 1.40 percent, 1.49 percent respectively during first four years of Eleventh Five Year Plan period.

Chapter Three deals with the natural resource management of the State like agro-climatic conditions, land use pattern, water resource of the state.

Based on soil characteristics, rainfall distribution, irrigation pattern, cropping pattern and other ecological and social characteristics, Tamil Nadu has been classified into seven agro-climatic zones. Due to increase in population, urbanization and industrialization, the land put to non-agricultural uses marginally increased from 21.76 lakh ha. in 2009-10 to 21.77 lakh ha. in 2010-11. The cultivable waste and miscellaneous tree crops amounted to 2.5 percent and 1.9 percent respectively in 2009-10 and 2010-11. When compared to the previous year (2009-10), the cultivable waste marginally increased from 3.26 lakh ha in 2009-10 to 3.31 lakh ha. in 2010-11.

The cropping intensity has considerably increased over the years. Cropping intensity i.e. gross area sown divided by net sown area was at 1.18 during 2011-12 compared to 1.16 during the previous year 2010-11.

The results of successive agricultural census confirm the growing imbalance and asymmetry in the distribution of the size of holdings. The marginal and small farmers who constituted a higher proportion of 91 percent of the total farmers held a lesser extent of land holdings (59percent), whereas medium and large farmers who formed 2.3 percent of the total farmers possessed a larger chunk of 20 percent of land holdings. Thus the distribution of landholdings is highly skewed. It is one of the causative factors for low productivity.

As per the new guidelines, the range of ceiling of Tamil Nadu has the limit of 24.28 hectares for dry land and for irrigated lands with two crops, the limit was 4.86 hectares, for irrigated lands with one crop, the limit is 12.14 hectares.

The total surface water potential of the State is 24,160 MCM, including the contribution from neighbouring states of Andhra, Karnataka and Kerala. Of the total water potential, the surface water potential of about 2.4 million hectares has almost been fully (more than 95 percent) tapped since the late sixties. Groundwater is, therefore, the only alternative source available for further development

The climate of Tamil Nadu is tropical in nature with little variation in summer and winter temperatures. While April-June is the hottest summer period (with the temperature rising up to the 40°C mark), November-February is the coolest winter period (with temperatures hovering around 20°C), making the climate quite pleasant.

The State received an overall rainfall of 116.1 mm during 2010-11 which was higher by 28.2 percent over the normal 908.6 mm. and 24 percent higher than that of the previous year 2009-10.

Details about farm inputs and management are explained in Chapter Four.

Seed is one of the important inputs to the agricultural development. The

Department of Agriculture, Government of Tamil Nadu is playing an important role in ensuring the seed quality and quantity from time to time through the Department of Seed Certification. The main functions of the Department are seed quality control, seed testing and conducting training schemes.

In order to make available adequate quantity of quality seeds at right time to the farming community, the Department of Seed Certification is implementing Seed Certification, Seed quality control, Seed testing and Training schemes. Seed testing is being carried out to analyse the quality of the seed lots. Factors like germination, physical purity, moisture, seed health and admixture of other distinguishable varieties are being analysed in the notified Seed Testing Laboratories as per the Handbook on “Seed Testing” released by the Government of India

The use of chemical fertilizers and their intensification in many areas are being reviewed and the Government is encouraging the application of appropriate fertilizers relevant to the soil and crops based on soil test recommendations.

The consumption of N,P,K in Tamil Nadu is found to be in the ratio of 2:1:1 as against the conventionally accepted ratio of 4:2:1 indicating imbalance in the application of these three chemical nutrients. It is not only confined to the use of NPK but also need based application of nutrients like sulphur, zinc, iron and boron which have become essential for exploiting of high yield varieties. The total application of chemical fertilizers had come down from 12.65 lakh tonnes in 2008-09 to 12.14 lakh tonnes in 2009-10; however, it marginally improved to 12.29 lakh tonnes in 2010-11. The per hectare fertilizer consumption rose from 160 kgs in 2009-10 to 197 kgs in 2010-11.

To increase crop productivity, balanced use of organic fertilizer is being advocated in the State. Composting of farm waste using pleurotus vermicomposting, application of bio-fertilizers, green manures were popularized in the cropping system. In the State, for the promotion of green manure cultivation, 250MTs of green manure seeds were produced and distributed with 25 percent subsidy. On the other hand, for the application of vermi compost, a financial assistance of Rs.1200/- per demonstration totalling 300 demonstrations was provided to conduct training to 15000 farmers at a cost of Rs.11.55 lakhs.

The biofertilizer packets are produced in six Biofertilizer Production Centres located at Cuddalore, Ramanathapuram, Salem Kudumiyanmalai, Sakkottai and Trichy and distributed through Agricultural Extension Centres. The bio-fertilizer production units (Six Nos.) in the State have the capacity of producing 1660 MT of 80 lakh packets comprising 200 gm. each per packet. The area covered under bio-fertilizer increased from 2.87 lakh ha. in 2009-10 to 3.39 lakh ha. in 2010-11..

The irrigation intensity also improved from 113.3 percent in 2009-10 to 115.1 percent in 2010-11. The gross area irrigated to gross area sown had slightly gone up from 58.12 percent to 58.23 percent. Likewise, the net area

irrigated to the net area sown witnessed a marginal increase from 58.5 percent to 58.7 percent in the respective years.

The disbursement of institutional credit in Tamil Nadu, State Cooperatives, Rashtirya Krishi Vikas Yojana (RKVY), Kisan Credit Card (KCC) Scheme and Agricultural Technology Management (ATMA) are some of the major programs through which credit has been made available to the farmers in the State.

Implementation of Crop Insurance Schemes in Tamil Nadu portrays the exemplary efforts taken by the State Government and Department of Agriculture by its resounding success among the farmers. The total number of farmers covered under the scheme improved from 9.41 lakhs in 2009-10 to 9.65 lakhs in 2010-11. The total sum insured which was Rs.2740.9 crores had increased to Rs.3213.2 crores during the respective years.

The status of agriculture research, education and extension of Tamil Nadu agriculture were discussed in detail in Chapter Five.

Tamil Nadu Agricultural University is spearheading its triple major activities of Education, Research and Extension converged to work in synergy to bring forth *Second Green Revolution* in agriculture. Research on the development of new varieties and technologies are programmed to meet the present needs of the farmers. The latest communication facilities like internet and mobile phones are used for disseminating the knowledge to farmers through web portals and short message services. Knowledge input on day to day market intelligence is updated for the benefit of the farming community. Location specific technology input imparted through training and on-farm demonstrations by Krishi Vigyan Kendras enable knowledge penetration to reach the unreached.

The Post-Harvest Technology Centre at TNAU is involved in developing food processing technologies and also providing training to rural men and women for working in processing units.

Tamil Nadu Agricultural University operates the Domestic and Export Market Intelligence (DEMIC) unit ([www. tnagmark.tn.nic.in](http://www.tnagmark.tn.nic.in)) and provides forecasts of prices of agricultural produce before sowing and also prior to harvest.

Chapter Six deals with the Animal husbandry, dairying and fisheries sector of Tamil Nadu.

The livestock population as per the 18th Quinquennial Census 2007 was 307.59 lakhs as against 249.42 lakhs in 17th Quinquennial Census of 2004. The share of total livestock population and poultry population in the State accounted for 5.81 percent and 19.75 percent respectively in the all-India population.

The milk production in the State witnessed a marginal improvement (2.04percent) from 66.51 lakh tonnes in 2008-09 to 67.87 lakh tonnes in 2009-10. However, due to health care activities, it had further gone up to 68.31 lakh tonnes in 2010-11 by 0.65 percent. As against the ICMR milk requirements of 250 gms. per day, the per capita availability of milk per day in the State improved marginally from 275 grams in 2008-09 to 278 grams in 2009-10 and estimated to be 269 gms. during 2010-11.

Contribution of Tamil Nadu in egg production to all-India level during 2010-11 worked out to 18 percent. Per capita availability of eggs in Tamil Nadu was 165 against the per capita availability of 53 eggs at all-India level in 2010-11.

In order to safeguard the farmers against the eventual loss of animals especially cattle and buffaloes, the centrally sponsored Livestock Insurance Scheme is being implemented in 15 districts of the State by the Tamil Nadu Livestock Development Agency.

Tamil Nadu is one of the coastal States in India in the east coast having a coastal line of 1076 kms. The state occupies the third rank in fish production in the country. The fish production consists of both marine and

inland fish and fish products. Of the total fish production, the marine fish production shared 71 percent and inland 29 percent during 2010-11. The state occupies a predominant position in fish culture and it is one of the major exporters of fish in the country. The total value of fish export had witnessed a boost from Rs. 2000.55 crores to Rs.2860.19 crores during the years respectively. The State shared 10.6 percent of fish exported and 26.2 percent of the value of fish exported in the country during 2010-11.

Finally, Post-Harvest Management techniques, training programmes are explained in Chapter Seven.

Department of Agricultural Marketing and Agri Business is the State Nodal Agency for the Ministry of Food Processing Industries (MoFPI), Government of India. Being a State nodal agency for MoFPI, the Department undertakes activities like processes Projects on Food Industry, Entrepreneur Development Programme (EDP), Food Processing Training Centres, Seminars and Exhibitions, Infrastructure for Food Processing Courses and Projects.

Food Parks include food processing units such as fruits and vegetables processing, rice mill, flour mill, bakery unit, dairy products, milk products, animal feed, flakes and fast food. Besides State-of-the-art laboratory, hi-tech cold storage, captive power plant, effluent treatment plant with all other ancillary facilities are mandatory for these parks. To increase the share of exports from Tamil Nadu, two more AEZs are to be promoted with modern pack house and gamma irradiation facilities to control the incidence of pests and diseases and also to enhance the shelf life of farm produce.

The Ministry of Food Processing Industries (MoFPI) has proposed to launch a new Centrally Sponsored Scheme (CSS) in the ratio of 75:25 by GOI and State Governments to augment the capacity of food processors working in unorganized sector and upscale their operations through capital infusion, technology transfer, skill upgradation and handholding support; to

support established self-help groups working in food processing sector and facilitate them to emerge as Small and Medium Enterprises (SME) status to ensure the standards of food safety and hygiene to the globally accepted norms, to facilitate food processing industries to adopt HACCP and ISO certification norms and to provide better support system to the organized food processing sector.

Conclusions

The growth of agriculture, as measured by the index of agricultural production is found to be moderate during 2010-11. Acceleration in agricultural production is essential to ensure food security, livelihood security, and nutrition security. Agricultural sector has to grow at a rate of 4 percent annually considering the dynamic factors such as rising real per capita income, growing population and income elasticity of demand for food.

All the major crops such as paddy, cereals, food grains, sugar cane, cotton, oil seeds, horticulture and sericulture had fared moderately. The irrigation management and intensive use of high yielding variety seeds, chemical fertilizers, organic manure, bio-fertilizers and application of latest farm technologies enabled the performance of agriculture to be encouraging. Despite this, the performance of agriculture sector is hobbled by diminishing average operational holdings, skewedness in distribution of farmers vis-à-vis number of operational holdings, and vagaries of monsoon. Quantum of agricultural output heavily depends upon the occurrence of ideal spatio-temporal distribution of rainfall to a great extent.

The share of principal crops and horticultural crops in gross cropped area has increased substantially during the last two decades. It proves that the process of diversification of agriculture towards high valued crops is in right direction, while there is a need for increasing the pace of

diversification towards high valued cash crops in the state. National Food Security Mission (NFSM) and the National Horticulture Mission (NHM) have also emerged as the path breaking interventions which have helped in agricultural diversification towards cash crops in Tamil Nadu. The growth in livestock in the state is also remarkable.

The improvement in water use efficiency is urgently required for irrigation expansion and for reducing the excess pressure on ground water in water stressed areas of the state. More priority should be given to rain water harvesting and effective water management through promotion of micro-irrigation methods.

So far as the increase in value of the agricultural output is concerned, it is noteworthy that the prices of agricultural commodities have increased successively over the years in the state resulting in the rise in the value of output. However, the majority of farmers do not get remunerative prices because of constraints in marketing channels and infrastructures resulting in lower value for their output.

Non-availability of workforce for agriculture during season

This is indeed a major problem for a variety of reasons. The most important of them are: (a) the increasing non-availability of local agricultural labour, which is largely being employed in Mahatma Gandhi National Rural Employment Guarantee Scheme and (b) the increasing bargaining power of the local and specialized labour. The MGNREGS has now attracted most of the local agricultural labour that prefer to work for the program related activities. The labour in the last few years has become increasingly powerful because of the increasing demand for them on the one hand and their bargaining power on the other because of shortage of agricultural labourers. This may escalate into a crisis in the

future, unless some drastic attempts are made by the government and labour associations to resolve the crisis.

Lack of adequate post-harvest infrastructure

There is a clear need to increase the focus on post-harvest infrastructure, especially pack houses, cold storages, refrigerated vans and market infrastructure. They have to be provided at the project site considering the special nature of exportable fruits and flower markets.

The marketing channels are not well developed

The development of marketing channels has to be undertaken by the local, regional and national governments on a wider scale throughout the country. Newer, modern marketing practices may be ushered in, with the encouragement and support of the government and even international funding organizations.

Strategies for Improving Marketing

It is understood from the study that the farmers must have support in marketing their horticultural products and the strategies for improving marketing could be the following:

- The substantial gap between farmers' share in consumers' prices has to be narrowed;
- A number of marketing practices can be encouraged but with focus on regulated marketing; farmer –consolidator – trader – commission agent -wholesaler – retailer – consumer; markets regulated by marketing committees;
- A model of transparent cold chains and linkage with farmers may be adopted;
- There is need to provide infrastructure for local markets and help set up NDDB type markets; and
- Different markets in one location may continue to provide competition.

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