

9.1 CROP HUSBANDARY

“It is in the agricultural sector that the battle for long term economic development will be won or lost”

-Professor Gunnar Myrdal, a Noble Laureate

Land and Climate

The total area of Tamil Nadu is 1,30,058 sq.km. (50,154.7 sq.m), which forms about 4% of the total land area of the country. Tamil Nadu has a long coastline, nearly 1000 kms. in length representing 12% of the entire coast line in the country. Apart from Western Ghats that separate Tamil Nadu from Kerala, Tamil Nadu has another mountain chain, the Eastern Ghats. The Eastern Ghats and Western Ghats meet in Tamil Nadu and run along its eastern and western borders.

Traditionally, the State has been divided into five physiographic divisions viz., *Kurinji* (mountainous area), *Mullai* (forest), *Palai* (arid zone), *Marudham* (fertile region) and *Neidhal* (coastal area).

As Tamil Nadu has a tropical climate, loss of water due to evaporation is considerable. Due to its proximity to the sea, the summer is less hot and winter is less cold. In plains, the maximum daily temperature is 44.4°C and minimum daily temperature is 11.8°C. In hill stations the maximum temperature is 25.5°C and the minimum temperature is 4.4°C. The State is exposed to both South West and North East Monsoons. Most of Tamil Nadu is located in the rain shadow region of Western Ghats and hence receives limited rainfall from South West Monsoon. The coastal districts receive more rainfall from North Eastern monsoon but its contribution is irregular since the rainfall is caused primarily by cyclonic storms in Bay of Bengal. The North Eastern Monsoon (Oct-Dec) contributes 47.4% of rainfall while South West (June- Sep) accounts for only 33.3%. The remaining 19.3% occurs during the transition period from Jan-May. High intensity of rainfall during monsoon periods sometimes brings heavy floods in the rivers and causes damage to crops, properties and lives affecting the economy of the State. On the other hand, failure of monsoon also causes crop loss, affects lives of cattle and human population. Cyclonic storms in the coastal belt occur during North East monsoon almost every alternate year bringing heavy rainfall in the coastal belt once or twice which is not beneficial but causes inundation of crops, drainage congestion etc.

Agro-Climatic Zones

The Planning Commission, GOI introduced a new paradigm for agricultural planning and launched a project of agro-climatic regional planning (ACRP) under which the country has been divided into 15 agro-climatic regions. Tamil Nadu is covered by 3 agro-climatic regions, the Southern Plateau & Hills Zone, the East Coast Plains & Hills Zone and the West Coast Plains and Hill Region. To minimize heterogeneity in agro-climatic factors, the State is further divided into 7 sub-regions or zones, based on the soil, rainfall, length of growing period and potential evapo-transpiration, since the problems and prospects of a region could be understood if the region is more homogenous.

Agro-climatic Zones of Tamil Nadu

Zone No.	Name of Zone	Districts	Altitude (m)	Annual rainfall (mm)	Annual PET (mm)
I	North Eastern	Kanchipuram, Tiruvallur, Cuddalore, Villupuram, Vellore, Tiruvannamalai	100-200	1105	1700
II	North Western	Dharmapuri, Salem, Namakkal	200-600	875	1727
III	Western	Erode, Coimbatore, Karur (part), Namakkal (part), Dindigul (part), Theni (part)	200-600	715	1622
IV	Cauvery Delta Zone (CDZ)	Tiruchi, Perambalur, Pudukottai (part), Thanjavur, Nagapattinam, Tiruvarur, Cuddalore (part)	100-200	984	1932
V	Southern	Madurai, Sivagangai, Ramanathapuram, Virudhunagar, Tirunelveli, Toothukudi	100-600	857	1825
VI	High Rainfall	Kanniyakumari	100-2000	1420	1816
VII	Hilly and High Altitude	Nilgiris, Kodaikanal	2000	2124	1213

Soils

In Tamil Nadu 94 soil families were identified and classified according to soil taxonomy into six orders. Among the six orders inceptisol formed 50% of the total geographical area followed by alfisols (30%). Soil depth is not a limiting factor for crop growth in Tamil Nadu except shallow soils which occur in 14 percent of the total geographical area of the State. The texture of surface soil of the State shows that 18 percent area has sandy surface soil, 53 percent has loamy surface soils and 22 percent has clayey surface soil. Land suitability data shows that for cultivation of rice 31 percent of the area in the State is suitable.

The major groups into which soils of the State can be classified are as follows:

Classification of Soils

Soil Group	Districts	Area; slope	Suitable Crops
Alluvial (Entisols)	These soils are transported and found in the deltaic or in coastal areas. <i>Sandy coastal alluvium</i> soils occur along the sea coast as a narrow belt in the districts of Kancheepuram, Cuddalore, Thanjavur, Ramnad, Tnv., Tuticorin & KKI distts. while the <i>river alluvium</i> soils are transported soils found on river banks and in	<i>River alluvium</i> - 21 lakh ha (16.2%)- The soils are characterized by alternate layers of fine and coarse sand. <i>Coastal alluvium</i> - 9.8 ha (7.6%)- (they are formed by the rivers and are overlain with sand blown from sea beaches) As these soils occur on mostly flat lands with 0-1 % slope, erosion is min.	<i>River alluvium</i> - Rice, sugarcane, banana <i>Coastal alluvium</i> - Cashew, casuarina, rice & pulses

	deltaic areas in districts of Kancheepuram, Cuddalore, Tiruchi, Thanjavur, Tnv. & Ramnad. Major portion of Cauvery alluvium lies in Thanjavur distt.		
Red (Inceptisols, Alfisols)	<p><i>Red loam-</i> Kancheepuram, Vellore, TV Malai, Cuddalore, Villupuram, Salem & parts of Tiruchi distt.</p> <p><i>Red sterile-</i> Tiruchi, Pudukottai, Madurai & Ramanathapuram distts.</p> <p><i>Red sandy-</i> Madurai, Ramanathapuram & Tnv. Distts.</p> <p><i>Deep red-</i> Kkl., Tnv., Ramnad, Mdu distts.</p> <p><i>Shallow red-</i> Cbe. & Mdu distts.</p>	<p>These soils are mainly associated with granites and are rich in iron bearing minerals such as limonite & magnetite. They cover an area of 79,853 sq. km. (61.7%). The red soils are further classified into 5 groups based on their texture & depth, i.e., red loam (4 lakh ha.), red sterile (0.63 lakh ha.), red sandy ((0.76 lakh ha.), thin red (1.57lakh ha.) & deep red loam (1.02 lakh ha.)</p> <p>Slope ranges from 1 to 5 %. The soils are susceptible to various kinds of erosion.</p>	<p>Soils are cultivated with a wide variety of crops incl. groundnut, sorghum, maize, cumbu, pulses, banana, coconut, sugarcane (Not suitable for rice as water will percolate)</p>
Laterite (Alfisols, Ultisols)	<p>High level laterites are found in high rainfall areas- Nilgiris & other hilly areas</p> <p>Low level laterites are found to a smaller extent in Thanjavur, Cuddalore, Ramnad, Sivagangai, Pdk., Tuticorin & TV Malai distts.</p>	<p><i>High level laterites (Ultisols)</i> are mostly formed from charnockites in hills & occur mainly in Nilgiris & other hills with heavy rainfall on slopes varying from 5 to 50 %; accordingly erosion is very severe. <i>Low level laterites (Alfisols)</i> are formed from Cuddalore sand stones or granites in plains & occur on slopes of 1 to 3 %.</p> <p>Laterite soils cover an area of 3753 sq. km. (2.9%)</p>	<p><i>High level laterite</i> (in hilly regions) are cultivated with tea, coffee, plantation crops like cardamom</p> <p><i>Low level laterites</i> are cultivated with cashew, groundnut, gingelly, redgram & other minor millets</p>
Black (Vertisols)	<p>Black soils generally occur in semi-arid conditions with annual precipitation of 500-1000 mm- Coimbatore, Erode, Salem, Dharmapuri, Tiruchi, Sivaganga, Ramnad, Cuddalore, Tirunelveli & Virudhunagar distts. These soils are found in large areas in Ramnad & Cuddalore distts.</p>	<p>These soils have a high clay content & develop cracks during summer exhibiting the characteristic property of swelling on wetting & shrinking on drying. They occur on slopes of 1-3 %. Though these soils occur on gently sloping lands, erosion & run-off losses are maximum due to poor infiltration capacity of the soils. These soils cover an area of 15122 sq. km. (11.6%) in the State</p>	<p>Cultivated with cotton, sunflower, chillies, sorghum, pulses & rice.</p>

Importance of Agriculture, Progress, Problems and Constraints

Agriculture development is a precondition for overall economic development of a country or state. Rapid growth in agriculture is essential not only to achieve self-reliance at nation/state level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels.

Agriculture is the mainstay of the Indian economy. It contributes nearly 25% of GDP and about 70% of the country's population is depend on agriculture for their livelihood. The agricultural output, however, depends on monsoon.

The green revolution has changed the face of Indian agriculture since Independence. The foodgrains production which stood at a mere 50 million tonnes at the time of Independence has increased 4 fold, i.e., to 212 million tonnes in 2001-02. The output then and now (in 2001-02) may seen at a glance from the following Table:

(in million tonnes)

Crop	At the time of Independence	In 2001-02
Total Food grain production	50	212
Rice	21	93
Wheat	6	72
Pulses	8	13
Oilseeds	5	21
Sugarcane	57	300
Cotton (million bales)	3	10

It is now time to usher in a second Green Revolution that would bring in a new element of dynamism in agriculture. The President of India, Dr.A.P.J.Abdul Kalam, with Thiru.A.Sivathanu Pillai has written in "*Envisioning an Empowered Nation*":

"First Green Revolution transformed India to self-reliance from 'ship to mouth' situation; the Second Green Revolution will ship foodgrains and products to many nations".

Tamil Nadu has made great strides in the sphere of agricultural development. Food grain production has increased to over 86 Lakh Metric Tonnes (LMT) in 2001-02 as compared to less than 43.5 LMT in fifties. Similarly, the groundnut production has doubled during past five decades. There has been substantial increase in sugarcane production and it crossed over 33 LMT during 2001-02 as compared to 3.3 LMT during fifties. In spite of reduction in area, cotton production has increased to over 3.9 lakh bales during nineties. Agriculture has to grow still faster to meet the growing domestic demand for farm products and to tap export opportunities.

Though agriculture contributes to less than 13 percent to the Net State Domestic Product, it absorbs more than $\frac{1}{2}$ the State's working population. Agriculture farm income accounts for about $\frac{1}{2}$ of the rural household income in the State. For the poorest rural quintile (approx. 1.5 million households with about 7.5 million people), more than $\frac{3}{4}$ th of income is derived from agriculture, with agriculture wage labour accounting for $\frac{1}{2}$ of the household income. Given the importance of agriculture in incomes of the poor in Tamil Nadu, labour intensive growth in agricultural output could play a major part in further reducing rural poverty directly via higher farm yields to small producers and higher real wages to agricultural labourers. Conversely, if agriculture stagnates or agricultural output declines, poverty in Tamil Nadu could significantly worsen.

Some important features and long term constraints of Tamil Nadu's agriculture are: (a) its dependence on spatial and temporal distribution of the monsoon, (b) the fact that 95 per cent of surface water and 70 per cent of ground water has already been exploited, and (c) the growing pressure on land. While advances in seed-fertilizer-water technology have contributed to increased production and productivity at State level, the pattern of agricultural growth is not uniform between regions, crops and categories of farmers. The new technologies have not permeated into dry land region and unirrigated crops and, as a result, a number of crops remain untapped to their full potential, and the dry land regions remain underdeveloped and backward. The incidence of poverty in the State is still found high, the problem being predominant in the dry land region. The growth rate of rural employment has come down steeply to 0.5 % between 1993-94 and 1999-2000 from 1.7 % per annum between 1983-84 and 1993-94. Thus, there is economic compulsion to raise employment in agriculture.

Declining Share of Agriculture in GSDP/ Growth rate- As economic development proceeds, it is quite an expected phenomenon that the relative share of agricultural sector in the overall GDP of any country or region should decline. This has happened in TN agriculture also due to accelerated growth in non-agricultural sectors especially in service sector, which accounted for more than 50% of NSDP during 1999-2000. But there are two major concerns: (i) the growth rate of NSDP from agriculture sector at constant prices has declined from 6.02% in 1960s to 1.23% in 1990s; (ii) in spite of decline in share of agricultural sector from about 44% in total income in 1960-61 to nearly 22% in 1993-94 and about 12 % in 2002-03 (QE) and in 2003-04 (AE), about 50% of the State's population is still dependent on agriculture which implies that nearly 50% of the people share only 12% of GSDP. (As during 2001-02 to 2003-04 the State witnessed drought, it would be more appropriate to compare the contribution of agriculture to GSDP / NSDP in 2000-2001 which was 16%; in the computation of contribution of agriculture to GSDP / NSDP, forestry, fishing, mining and quarrying have not been taken into account).

Sectoral Distribution of Net State Domestic Product

Year	Primary	Secondary	Tertiary	Total
1950-51	53.27	13.72	33.01	100
1960-61	51.98	17.98	30.43	100
1970-71	39.86	26.12	34.02	100
1980-81	24.85	34.49	40.66	100
1990-91	22.20	34.53	43.27	100
2001-02	16.65	34.04	49.31	100

Shrinking land resource/ Land use pattern Land use pattern in Tamil Nadu over the past five decades throws light on the nature of the problem confronting the future development of agriculture. The availability of land for agricultural purpose has been shrinking under constant and increasing pressure on finite land resources. Land put to *non-agricultural purpose* increased from 9.8% in 1950s to 14.56% in 90s, and 20.12% in 2002-03 which is mainly due to the urbanisation and industrialisation. This has led not only to diversion of fertile agricultural lands for non-agricultural purposes but also the transfer of water and labour from agriculture to non-agricultural purposes. The area under *forest* has shown an increase from the 50s from 14% to 16.5% in the 90s but this is well below the national goal of 33% to maintain the ecological balance.

Land Use Pattern in Tamil Nadu (area in lakh ha.)

	Classification	1970s	1980s	1990s	2000-01	2001-02	2002-03
1	Forest	20.05 (15.40)	20.76 (16.00)	21.44 (16.48)	21.34 (16.4)	21.32 (16.4)	21.32 (16.4)
2	Barren and unculturable land	7.05 (5.40)	5.57 (4.30)	4.95 (3.80)	4.75 (3.7)	4.77 (3.7)	4.78 (3.7)
3	Land put to non-agricultural uses	16.00 (12.40)	17.95 (13.80)	19.07 (14.73)	19.86 (15.3)	19.98 (15.4)	20.12 (15.5)
4	Permanent pastures and other grazing land	1.98 (1.50)	1.45 (1.10)	1.25 (0.95)	1.23 (1.00)	1.18 (0.9)	1.18 (0.9)
5	Cultivable waste	4.15 (3.20)	3.08 (2.40)	3.25 (2.53)	3.52 (2.7)	3.87 (3.00)	3.89 (3.0)
6	Land under miscellaneous tree crops and groves	2.15 (1.70)	1.82 (1.40)	2.25 (1.78)	2.55 (2.0)	2.71 (2.1)	2.78 (2.1)
7	Current fallow	12.02 (9.20)	16.18 (12.40)	10.57 (7.95)	11.34 (8.7)	10.26 (7.8)	15.03 (11.6)
8	Other fallow	5.31 (4.10)	7.03 (5.40)	10.93 (8.45)	12.28 (9.4)	14.09 (10.8)	14.91 (11.5)
9	Net Area Sown	61.35 (47.50)	56.22 (43.20)	56.32 (43.34)	53.03 (40.8)	51.72 (39.8)	45.90 (35.3)
10	Area sown more than once	13.21	10.55	10.97	10.35 (8.0)	10.56 (8.1)	6.01 (4.6)
11	Gross cropped area	74.56	66.77	67.29	63.38 (48.8)	62.26 (47.97)	51.91 (40.0)
12	Cropping intensity (%)	121.56	118.80	119.46	119.48	120.38	113.09
13	Total (geographical) area	130.06	130.06	130.16	129.91	129.91	129.91

Source: Season and Crop Reports published by Directorate of Economics and Statistics (Figures given in brackets are in %)

The *gross cropped area* has declined from 73.8 lakh hectares in 1970-71 to 65.47 lakh hectares (average of triennium ending 1999-00) and further declined to 51.91 lakh hectares in 2002-03. While the *net area sown* increased in the 50s to 70s due to large scale public and private investment in irrigation, there has been a declining trend during 80s and 90s and the net area has further declined to 35.3% in 2003-03. (The decline in area during 2001-02 to 2003-04 is due to failure of monsoon) The percentage of net area sown is 82, 58, 58 and 56 in Punjab, Kerala, Maharashtra and Karnataka respectively. The decline in the net area sown over the years is the result of increase in area put to non-agricultural uses and of fallow lands. This indicates that the increase in agricultural production has come through improvement in productivity of crops.

The *cropping intensity* is a measure of the intensity of land use and is expressed as a ratio (%) of gross area sown to net area sown. This has been hovering in the last five decades around 118-119% in the State as compared to the all India position of 133% in 1996-97.

Wasteland area, which comprises permanent and current fallows, has been on the increase. It increased from 17.65 lakh ha in 50s to 21.50 lakh ha in 90s. For all India, only 7.6% area is fallow. The area under current fallows during 2001-02 and 2002-03 was 10.26 L.ha and 15.03 L.Ha .respectively. These are lands kept fallow between 1 to 5 years due to various factors like failure of monsoon, non-availability of

timely inputs and lack of purchasing power of farmers. The area under other fallows is increasing. The fallow area is the highest in Tamil Nadu.

The area under *permanent pastures* and other *grazing land* halved in 90s from the 50s, posing a challenge to livestock security and resulting in shortage of green fodder for livestock. The *decline in area under pastures and grazing lands* has also led to increasing pressure on cultivable lands for cultivating fodder crops.

Depletion of water resources: For sustaining food production security as well livelihood security, water is needed. Land and water are inseparable in this context and "*Land use decisions are water use decision, and vice versa*" (Swaminathan 2002). Tamil Nadu State has already exploited 97.5 % of surface irrigation. The irrigation intensity is around 120 %. Water is a serious limiting factor as the State has harnessed the available surface water potentials. The net area irrigated rose from 21.11 lakh ha. in 1950s to 27.75 lakh ha. in 1990s, yet the State's per capita irrigation potential in per capita terms is only 0.08 ha. compared to the all India average of 0.15 ha. Now the State is fully dependent on the ground water resources for providing irrigation to additional acreage and even to stabilize the existing area under irrigation. Agriculture is the single largest consumer of water in the State consuming 75% of the State's water resources. (A more detailed treatment of the subject is in the sub chapter "Irrigation Command Area Development and Flood Control".)

The dependence of Indian agriculture on rainfall is well known. Rainfall affects not only rainfed agriculture but also irrigated agriculture to some extent. Tamil Nadu experienced drought both during Southwest and Northeast monsoon season consecutively for the past few years. The problem was compounded by lack of flow in the rivers. Tamil Nadu is a lower riparian State. There are considerable spatial and temporal variations in rainfall. The rainfall received during the last six years is given below:

Year	Rainfall (in mm)
Normal	925.0
1998	1036.4
1999	837.3
2000	847.5
2001	774.7
2002	748.4
2003	867.8

According to the assessment of ground water potential in January 1998 by the Ground Water Resource Estimation Methodology 1997, a balance Ground Water potential of 3303.44 MCum. was available in the State. When this estimate is projected to January 2003, the balance ground water potential available for future development is 3142.27 MCum.. This balance potential is distributed in 97 safe blocks, 105 semi critical blocks and 37 critical blocks. About 138 blocks are over exploited showing large scale ground water development exceeding the recharge potential.

Lack of focus in research on dry crops/ dry land technology- The other major important factor responsible for agricultural stagnation is the lack of research focus on dry land crops and investment in agricultural development in dry lands.

Smaller size of holdings: Land holdings- Constantly rising demography pressure on land is a serious cause for concern. The marginal and small farm holdings accounts for 89% of the total holdings and the area operated by them 52% of the total area. The per capita availability of land has been continuously declining

and the availability of cultivable land is even worse. Land is not only an important factor production, but also the basic means of subsistence for majority of the people in the State of Tamil Nadu.

Together with the shrinking area under cultivation, the pattern of land ownership is also unfavourable for agricultural development. The average size of holdings has declined from 1.25 ha in 1976-77 to 0.95 ha in 1995-96. [The available cultivable land per rural resident has declined from 0.22 ha/capita to 0.15 ha/capita between 1971/72 and 1997/98]. The all India figure for average area owned per household is 1.59 ha. This reflects the pressure of population on land. The share of total land operated by small and marginal farmers has increased from 42 percent to 52 percent during the same period. The growth in number and extent of small and marginal farmers is a major hurdle in promoting capital investment in agricultural sector and hence modernizing agriculture sector. Fragmentation of land results in uneconomic land holdings.

The marginal and small farm holdings account for 89 percent of the total holdings and the area operated by them accounts for 52 percent of the total area.

Number of holdings in Tamil Nadu (in lakhs)

	Classification	53-54	70-71	76-77	80-81	85-86	90-91	95-96
1	Marginal (< 1 ha)	42.98	31.25	39.51	50.15	54.48	58.48	60.4
2	Small (1 to 2 ha)	8.26	11.09	11.28	12.09	12.6	12.75	13.05
3	Semi-medium (2 to 4 ha)	6.66	6.96	6.83	6.58	6.49	6.18	6.33
4	Medium (4 to 10 ha)	2.61	3.25	3	2.69	2.61	2.27	2.27
5	Large (≥ 10 ha)	0.64	0.59	0.46	0.4	0.39	0.31	0.34
	Total	61.15	53.14	61.12	71.91	77.07	79.99	82.34

[Source: Agricultural Census reports]

Area of holdings in Tamil Nadu (in lakh ha)

	Classification	53-54	70-71	76-77	80-81	85-86	90-91	95-96
1	Marginal (< 1 ha)	8.49	13.21	16.07	19.07	20.18	21.18	22.91
2	Small (1 to 2 ha)	12.03	15.78	15.86	17.1	17.72	17.94	18.32
3	Semi-medium (2 to 4 ha)	18.57	19.14	18.76	18.22	17.78	16.87	17.29
4	Medium (4 to 10 ha)	15.55	18.93	17.63	15.55	15.08	13.01	12.72
5	Large (≥ 10 ha)	11.74	10.03	7.96	7.14	7.2	5.74	7.37
	Total	66.38	77.09	76.28	77.08	77.96	74.74	78.62

Average size of holdings in Tamil Nadu

	Classification	53-54	70-71	76-77	80-81	85-86	90-91	95-96
1	Marginal (< 1 ha)	0.2	0.42	0.41	0.38	0.37	0.36	0.38
2	Small (1 to 2 ha)	1.46	1.42	1.41	1.41	1.41	1.41	1.40
3	Semi-medium (2 to 4 ha)	2.79	2.75	2.75	2.77	2.74	2.73	2.73
4	Medium (4 to 10 ha)	5.96	5.83	5.77	5.78	5.78	5.72	5.60
5	Large (\geq 10 ha)	18.34	16.94	17.28	17.97	18.78	18.44	21.68
	Total	1.09	1.45	1.25	1.07	1.01	0.93	0.95

[Source: Agricultural Census reports of T.N.]

Land degradation and Soil quality: Land is an important natural resource for agriculture. The use and abuse of these resources determine the sustainability of agriculture. Land degradation refers to changes in quality of soil, water, terrain, biotic resources and other characteristics that result in loss of biological or economic productivity of the land. Land degradation adversely affects agricultural production. Forests and tree cover play an important role in watersheds. Degradation of forests and other natural habitats for expansion of agriculture, industrial and urban use and river valley projects threaten the sustainability of watersheds. Crop yields are dependent on certain soil characteristics- soil nutrient content, water-holding capacity, organic matter content, acidity, top soil depth and soil biomass and so on. Degradation constitutes erosion, compaction and hard setting, acidification, declining soil organic matter, soil fertility depletion, and biological degradation and soil pollution.

Unsustainable agricultural practices and water management, urbanization, industrial and mining activities, increased livestock pressure, uncontrolled logging and illegal felling are the major factors for land degradation.

Soil erosion- Soil erosion is by wind or water. Accelerated erosion is also due to the consequences of human activities. Erosion causes depletion of fertility through the removal of the valuable and fertile surface soil. In Tamil Nadu erosion is observed in around 13 lakh ha.

Salinity and alkalinity- The adverse effect of salinity in soil is that it hinders crop growth and results in reduction in crop yield. The estimated extent of soils affected by salinity and alkalinity is estimated at 2.48 L.ha. besides 1.23 L.ha. suffering from acidic soils.

Water logging and marshy land- Excess water hinders plant growth by reducing aeration, which in turn decreases the water absorption and nutrient uptake by roots. The coastal regions of Tamil Nadu face heavy damages due to water logging. The command areas in major irrigation projects experience waterlogging problem. In Tamil Nadu 44,820 ha. is estimated as marshy lands. About 14 percent of the area in Tamil Nadu is under very poorly drained soils. Another 16 percent is under moderately well drained to well drained soils and 15 percent is somewhat excessively drained soil. In Tamil Nadu, soil drainage is not a major problem for crop production except in sandy marine land areas.

Gullied/ Ravine lands- The gullies are the first stage of excessive land dissection followed by their networking which lead to the development of ravine land. The ravines are extensive system of gullies developed along nullas, streams and

river coarse. It has been estimated that Tamil Nadu has 22,550 ha. under gullied / ravine lands.

Wastelands are degraded lands that can be brought under vegetative cover.

Category- wise wasteland extent in TN

Sl. no.	Category	Area in sq. km.
1	Gullied/ Ravinous land	226.12
2	Land with or without scrub	7697.91
3	Water logged/ Marshy land	415.80
4	Saline/ Alkaline area	2479.73
5	Shifting cultivation area	0.53
6	Degraded notified forest land	9634.25
7	Degraded pastures/ Grazing land	168.94
8	Degraded land under plantation crops	221.96
9	Total degraded area (TDA)	20845.24
10	Total geographical area (TGA)	130058.00
11	TDA as % of TGA	16.03

[From *Atlas of the Sustainability of Food Security- MSSRF & WFP*]

Decline in soil organic matter- The soil health is deteriorating. The organic matter content in the soil has gone down from 1.20% in 1971 to 0.68% in 2002 in Tamil Nadu, because of less use of organic inputs.

Imbalanced fertilizer use - The growth in fertiliser use in Tamil Nadu has declined over years and there are wide disparities. There is a continuing imbalance in use of N, P, K fertilisers.

Compound growth rate in fertiliser use in Tamil Nadu (lakh tonnes/ year)

Year	Nitrogen	Phosphorous	Potassium	Total
1970-79	0.070	0.027	0.084	0.181
1980-89	0.049	0.073	0.060	0.182
1990-99	0.031	0.027	0.004	0.062

[Source: Agro-Stat 2001]

More over *micronutrient deficiency* is wide spread as evidenced in the increase in the percentage of soil exhibiting deficiency of micronutrients over years. This is another reason for the stagnating agricultural productivity. Decontrol of fertilizer prices, poor adoption of macro and micro nutrient management technology by the farmers, inadequate soil testing facilities, insufficient reorientation and Human Resource Development in soil testing service are the major reasons for the imbalanced fertilizer use.

Change in cropping pattern- There has been a significant change in the cropping pattern over the last five decades. The proportion of area under food crops reduced marginally between the 50s and 70s and there was a sharp fall thereafter. Several factors are responsible for changes in the cropping pattern such as availability of irrigation facilities, changes in food habits, profitability of crops and implementation of several developmental programmes by public sector and adoption of capital-intensive modern technologies. In the earlier years, the farmers switched over from coarse cereals to paddy and later to sugarcane and groundnut on commercial considerations or having regard to food habits of the people or adopting

contract farming. This change, particularly to water-intensive crops like sugarcane & paddy has brought in its wake its own problems.

Area under important Crops [Annual average in lakh ha]

	Crop	70s	80s	90s (1990-99)	2000-01	2001-02	2002-03
	Food grains						
1	Rice	26.41	21.73	21.52	20.80	20.59	15.20
2	Cholam	7.28	6.37	4.35	3.31	3.17	3.19
3	Cumbu	4.24	3.06	1.96	1.29	1.25	1.02
4	Ragi	2.83	1.86	1.36	1.27	1.25	1.04
5	Millets	18.46	14.50	12.02	7.33	7.07	7.09
6	Cereals	45.03	36.23	33.54	28.13	27.66	22.29
7	Pulses	5.67	6.17	6.92	6.88	6.85	6.63
	Total	50.71	42.40	46.46	45.36	44.93	38.94
	Non Food grains						
1	Sugarcane	1.47	1.92	2.82	3.16	3.21	2.61
2	Cotton	2.89	2.29	2.36	1.70	1.64	0.76
3	Groundnut	10.03	9.11	9.81	6.99	6.62	5.02
4	Others	9.46	11.05	6.07	6.27	5.86	4.58
	All crop-Total	74.56	66.77	67.52	63.38	62.26	51.91

[Source : Compiled from various year Season & Crop Report of Government of T.N.]

Slow-down in growth rate of yield- The slow down in growth rate of area, yield and production of major crops is responsible for stagnation in Tamil Nadu agriculture. While evolution of yield increasing technologies and their transfer to fields facilitated increase in productivity of crops and there was a significant acceleration in growth of production, particularly in the post green revolution period due to improvement in yield facilitated by seed-fertiliser-water technology, there has been a decline as compared to 1980s in growth rate of yield of most of the important crops such as paddy, millets, pulses, cotton and sugarcane. The growth rate in rice yield was 6.23% per annum during 1980s and it declined sharply to 0.83% during the 1990s. The growth rate in yield of pulses which was 3.44% during 1980s slipped to zero growth during 1990s. The area under the major crops except paddy and sugarcane have recorded negative growth rate during 1990s. Consequently the total production of all major crops except paddy and sugarcane have recorded negative growth in 1990s.

Slow down in annual growth rate (%) of yield and production of major crops

Crops	Area		Production		Yield	
	1980s	1990s	1980s	1990s	1980s	1990s
Paddy	-2.53	1.06	3.55	1.90	6.23	0.83
Millets	-1.71	-5.00	2.39	-4.21	2.39	0.86
Pulses	3.76	-2.98	6.79	-2.98	3.44	0.00
Food grains	-1.43	-1.26	3.42	0.83	4.92	2.12
G'nut	2.32	-3.77	5.06	-0.5	2.68	3.4
Cotton	3.00	-2.56	7.63	-2.37	4.5	0.24
S'cane	1.92	3.69	3.76	2.83	1.8	-0.84

Slow growth in yield of dryland crops (kg/ha)

Crops	1960s	1970s	1980s	1990s	2000
Cholam	748	775	611	927	824
Cumbu	608	667	614	973	1169
Ragi	927	801	1011	1640	1701
Samai	454	481	504	881	809
Varagu	1048	1090	1026	1183	1302
Redgram	460	462	551	554	677
Black gram	331	319	352	454	420
Cotton	142	202	64	214	231
G'nut	1101	906	778	1183	1477
Gingelly	317	321	283	318	385

[Source: TNAU]

The yield of most of the dry land crops except cumbu and ragi have not increased significantly over the last 40 years.

Yield gap- The yield gap is another major issue contributing to agricultural stagnation in the State. Studies carried out in TNAU on the yield gap indicates considerable yield gap between on-farm trials and yield realized by farmers both in irrigated and rain-fed areas. Except paddy, there is significant yield gap in most of the crops. The yield gap is almost 50% of the potential yield of cholam, ragi, gram and cotton. It is because the adoption of new technology has not been uniform and widespread due to existence of large number of constraints which are environmental, physical, economic, social and cultural in nature

Yield Gap in major crops

Crop	Potential Yield (kg/ha)	Average Yield (Kg/ha)	Yield Gap (Kg/ha)
Paddy (I)	6000	5275	(-) 725
Cholam (I)	6000	3008	(-) 2992
Ragi (I)	4750	2527	(-) 2223
Redgram	1500	667	(-) 833
Black gram	1270	389	(-) 881
Groundnut (I)	2850	2481	(-) 369
Sugarcane (I)	146000	109000	(-) 37000
Cotton (I)	730	426	(-) 304

['I' stands for irrigated]

[Source: TNAU]

Profitability of crops- The profitability of major crops at constant prices has declined sharply over the years thus leading to the declining investments at farm-level. The major component of cost of production of agricultural crops is labour whose relative cost in terms of crop outputs have increased sharply over the last 30 years.

Profitability of crops and price parity between major crop outputs and wage rate

Crop	Profitability of crops (Rs./ha) at 1980-81 prices				Kgs of crop output required to purchase 1 man-day of labour			
	70-71	80-81	90-91	99-00	70-71	80-81	90-91	99-00
Paddy	2164	1785	1472	748	4.44	3.45	7.02	16.55
G'nut	3627	2965	2478	1145	2.20	2.52	2.39	6.52
S'cane (Gur)	12579	11268	9429	6788	2.66	2.41	4.38	8.67
Cotton	3042	2574	1967	1240	1.18	1.89	2.50	5.34

Source: TNAU Coimbatore

Capital formation in agriculture- Capital is provided by public and private sectors and in agriculture, investment in land, farm assets and inputs and intermediate products are provided largely by private sector individually by farmer himself or parastatals, such as NABARD, National Horticulture Board and Banks and other financial agencies. Public sector formation covers infrastructural facilities such as river dams, irrigation network, marketing and storage, roads and communications, research, training and development in farm related problems. Thus productive capacity of agriculture is facilitated through capital formation.

According to a definition by UN Statistical Office, domestic capital formation is a part of current output and imports which is not consumed but set apart as addition to the stock of capital goods. This is gross capital formation and by deducting from the amount towards depreciation, obsolescence and accidental damages to fixed capital, net capital formation is calculated. All goods produced for use in future productive processes such as plants and machinery, farm land, barn and other construction works, production of stock of raw materials, semi-finished goods are classified as capital goods.

The capital formation in agriculture has declined in % terms during the period between 1980-90 & 1997-98 from 5% of gross capital formation to 4.8%. The share of public capital formation has declined sharply from 1.4% to 0.6%.

Capital formation in agriculture

Year	Capital formation in agriculture as % to CGF (Public + Private)	Capital formation in agri. as % to CGF (Public)
1989-90	5.0	1.4
1994-95	3.4	1.1
1997-98	4.8	0.6

Seed availability- Seed availability and seed replacement rates (SRRs) for most of the crops remained inadequate and below the desired levels. There is also mismatch in availability and demand of seeds of different varieties.

Slow rate in technology transfer- The presently operated Government extension agency dependant technology transfer is insufficient to match the technology explosion and the required rate of their diffusion to the farmers.

Thus, several factors have been responsible for stagnation in Tamil Nadu agriculture. The most important issues that need urgent attention are: (a) decline in cropped area (b) increase in fallow land (c) stagnation in cropping intensity (d) yield gap (e) decline in growth rate of yield of major crops in recent years and (f) slow

growth in yield of dry land crops. The per unit area productivity of the crop is much lower as compared to that of the other major crop producing countries.

Strategy

The strategy to achieve the objective of sustainable increase in agricultural production would have the following elements:

- Bringing large extent of wasteland under green cover under the Comprehensive Wasteland Development Programme.
- Massive expansion of dryland and wasteland development programmes integrating them with watershed development programmes and making them as people's movement adopting a Participatory Rural Appraisal (PRA) approach (Watershed Development and Management has been dealt with in the sub chapter "Soil and Water Conservation")
- Adoption of alternate cropping pattern with emphasis on growing less water intensive, more remunerative crops
- Adoption of SRI technology for paddy cultivation with lesser water
- Precision farming and large scale adoption of micro irrigation to ensure judicious use of water and adoption of water harvesting measures
- Decision Support System for Fertiliser Recommendation (DSSIFER) as part of precision farming
- Organic farming, need based application of macro and micro nutrient and INM
- Popularisation of Vermicompost technology, popularisation of INM/IPM/ adoption of traditional technologies such as Pancha Gavya, Mutka guard etc
- Popularization of Leaf Colour Chart (LCC) based nitrogen management in rice
- Speedy transfer of technology
- Increasing biomass by technologies like in-situ ploughing
- Technology Mission approach for pulses, oilseeds, cotton and maize.

In the context of the limited scope for increasing the net area sown, the only way to augment agricultural production is by **increasing the productivity**. This is possible through water use efficiency and agricultural technology development. If the green revolution is to yield sustained benefits, it has to become ever green.

We need an evergreen revolution which implies raising farm productivity in perpetuity without associated ecological or social harm (M.S.Swaminathan 1996). This calls for technologies based on integrated natural resources management. The biophysical endowments of an area will have to be taken into consideration while tailoring technologies for a given equal system. *A farming systems approach rather than a commodity centred approach, as was adopted in the development of the green revolution technologies, will be essential for achieving an ecologically sustainable ever green revolution (M.S.Swaminathan 1996).*

Dr.M.S.Swaminathan, in his article under the caption 'Greater focus on Agriculture needed' has written:

"We are also witnessing the beginning of a new chapter in the technological transformation of our farming techniques. The gene revolution triggered by molecular genetics, genomics and proteomics, is just beginning to make an impact. Biotechnology, precision farming, drip and sprinkler irrigation, improved post harvest technology and the use of space, information and communication technologies are all opening up uncommon opportunities for launching our country on the path of an

every green revolution, designed to enhance productivity in perpetuity without associated ecological harm.”

The strategy for stepping up production will have to include

- Increasing the coverage of high yielding varieties
- Popularizing improved seed technology
- Optimizing application of inputs like fertilizer
- Increasing use of bio-fertilisers, activating IPM measures
- Integration of organic manures with inorganic fertilizers to maintain sustainable crop production and enhance soil fertility
- Development of high yielding varieties with resistance to multiple pests and diseases, better responsiveness to high input use and stable yield for increasing the production and productivity of pulses
- Correction of deficiencies in crop plants arising from secondary and micronutrient elements

Organic manures are a valuable nutrient source. However, there is apprehension about the adequacy of their supply, quality, efficiency and economics. Integration of organic manures with inorganic fertilizers will be necessary to maintain sustainable crop production and enhancing soil fertility.

Mixed cropping and crop diversification- Diversification is important for food security as it is likely to increase sustainability of production and of livelihood and encourages a more balanced diet among the people. The higher the level of diversification, the more unsustainable the food production. In the survival oriented dry land agriculture, intercropping system is essential to buffer against the total failure of crops and also to distribute the risk. Crop rotation, growing of leguminous crops and mixed cropping are preferable to letting lands lie fallow.

The higher the level of diversification, the more sustainable the food production. A more diversified crop base is likely to include leguminous crops. Leguminous crops [gram, tur, other pulses, groundnut, soybean, fodder crops] fix atmospheric nitrogen in the soil and replenish soil fertility. Certain crops like rice and sugarcane have very high water requirements. Mono-cropping of these crops would result in very high water utilization and ground water exploitation. A more diversified cropped area is likely to result in a more rational water use and also reduces the production risk in rain-fed agriculture, both from deficient as well as excess rainfall. Diversification is an insurance against crop failure. It also reduces the price or income risk for the farmer.

There is a better chance of diversification in subsistence farming compared to commercial farming. In commercial farming, to achieve economies of scale and to provide larger supplies of a crop, farmers are encouraged to take up mono-cropping. The area around sugar-mills is a case in point. Farmers had to grow sugarcane for supply to sugar-mills. However, it is better to set up a number of agro-processing units of different scales for local production and consumption and give incentives to small farmers to produce a variety of crops in rotation.

[from *Atlas of the Sustainability of Food Security-* MSSRF & WFP]

The Union Finance Minister has also emphasized in his speech for Budget 2004-05 that the time had come to encourage the farmers to diversify into areas such as horticulture, floriculture and oilseeds and this was proposed to be done in the case of horticulture by launching a National Horticulture Mission and in the case of oilseeds by promoting superior seed-technology and through an appropriate policy of price support.

Alternate cropping plan- Development of alternate cropping plan / contingency plans for the different agro-climatic zones of Tamil Nadu has to be taken up and propagated to take care of the fluctuations in rainfall and maximise the agricultural production in the State. TNAU has developed a suitable model setting out the existing cropping pattern and the pattern for normal, moderate drought & severe drought scenarios for command areas, tank-fed areas, well-irrigated areas and rain-fed areas for all the seven agro-climatic zones including the hilly and high altitude zones of Nilgiris & Kodaikanal hills. The forecast for monsoon will have to be publicized for the SW monsoon by the 15th of May and for NE monsoon by the 15th of September after a proper assessment is made jointly by the experts of TNAU and IMD. *Based on the forecast, the alternate cropping plan as set out in Annexure may be recommended/ disseminated to the farmers by the extension wing of the Agriculture Department. The availability of the inputs will also have to be ensured based on the cropping plan.* Change from paddy and sugarcane to less water intensive crops like pulses, oil-seeds and horticulture, in view of the uncertainty of availability of water has become imperative.

Increasing cotton area & production- The mills require a large quantity of cotton at a cheaper rate- at present, they incur heavy expenditure on transport from neighbouring States. The farmers, therefore, need to be motivated to increase the area under cotton and adopt the latest technology by intensive demonstration & demonstration of 'seed village concept', transfer/ popularization of technology & arranging marketing through 'millers and producers meet'.

Increasing productivity of maize- There is a gap of 6.3 lakh tones in maize production. The production can be increased by adoption of appropriate management technology and increase in area coverage. Area expansion can be taken up in the new Delta region of CDZ where the soil is suitable for maize and the water availability is uncertain for paddy.

Dryland farming- About 50 percent of the gross cropped area falls under rainfed condition. It is, therefore, necessary not only to evolve new varieties and technologies for dry land agriculture but also effectively promote the adoption of varieties or technologies through renewed, redesigned extension activities especially for the dry land areas. Millets, pulses, oilseeds and tree crops continue to be the most important components of farming system in dry land agriculture. The released varieties in these crops were more oriented for garden land conditions rather than for dry land situations. Rainfed areas are also found to be suitable for cultivation of number of medicinal, aromatic and dye yielding plants at a time when the global demand for the such products are increasing substantially. Therefore it is imperative for the system to promote the cultivation of these crops through introduction of suitable varieties with specific required traits for harnessing the potential. Dual-purpose cultivars responsive to low inputs with early maturity need to be developed in these crops. The development of high yielding varieties with resistance to multiple pests and diseases, better responsiveness to high input use and stable yield for increasing the production and productivity of pulses should receive attention. In oilseeds, breeding efforts are focused on increasing the oil content of the seed, better resistance to biotic and abiotic stresses and reduction in duration of the crops. The demand and supply gap is high for cotton, therefore cotton production strategy has to be encourage the cotton cultivation in non-traditional areas especially in rainfed areas with water saving technologies like drip irrigation. Cotton cultivation can also be promoted on a commercial or contract farming basis.

There is need for modernizing dry land farming technology laying accent on developing and popularizing drought-resistant hybrid crop varieties, evolving appropriate water harvesting techniques and activating the extension component of

special projects in dry land areas. Dry crops such as jojoba oilseed plants, neem, tamrind, pomnelli, dry land hybrid sago plants, Kattamanakku, Paradise tree, and such other crops may be grown which would yield good income with export potential. Development of high yielding varieties and hybrids in oil seeds, pulses and other vegetable crops should receive greater attention.

Agricultural Extension- The Agricultural scenario has undergone a complete transformation in the last two decades. The Training and Visit (T&V) system coming into existence in the wake of the green revolution has been in operation for more than two decades. Its performance has not been commensurate with the investment made and expectations fostered. Both for this reason and for the reason that the agricultural situation is changing rapidly, revamping the extension system has now become a necessity. Emerging economic scenario dictates focussed attention on key issues and rendering of integrated cost effective services by the research and extension systems. To meet this demand the efficiency and effectiveness of both the systems would need considerable improvement, this would involve modifications to organizational structure and methods of functioning.

Technology transfer- In the present era of knowledge and information and with new challenges emerging in the context of opening up of economy for the world trade and agriculture, there is a need for greater speed and efficiency in the process of dissemination of information and transfer of technology (TOT) to farmers. It is necessary to revamp the existing agricultural extension system in such a way as to *reach the unreached* as well as to provide timely information on meteorological, technology, management and market aspects. A coordinated approach between the TNAU and the State Agriculture Deptt. in dissemination of technology & other extension activity is called for. *A single window system of extension delivery is needed.*

(a) *Large scale demonstrations* and training of farmers on dry land technologies are needed. Hi-tech training in agriculture for both officers and field level extension staff of the department of agriculture, horticulture and agricultural marketing is necessary.

(b) *Group extension approach*, i.e., through farmers' inter-action groups-SHG's, Water Users' Associations, TANWA groups, Village Development Associations, may replace the contact farmers approach to extension popularised by the T & V system. NGOs could mobilize farmers into these organizations.

(c) Use of *Information and Communication Technologies* will be extremely useful for dissemination of information to farmers.

(d) Constructing an Agricultural Technology Platform (ATP) and adding it to newly proposed technology flow system of 'District ATP centres (DATPC) and Village Internet Dhaba (VID)' as well as to Virtual University' (in touch screen mode as an education as well as technology transfer component) will enable faster technology flow to the farmers. This ATP will have the components of crop planning (including TNAU's alternate cropping strategy for normal, moderate drought and severe drought years), DSSIFER, VDK, SHC, IPM, Water Management, Market Intelligence, Weather Forecast etc. To start with, TNAU has proposed that this may be launched in Thanjavur district.

Biotechnology- In context of a holistic agricultural development, role of *biotechnology* is going to be of vital importance. It offers uncommon opportunities for improvement in genetic potential of plants by introduction or removal of genes that regulate a specific trait. (The sub chapter "Biotechnology" and the portion in this sub-chapter on Horticulture may also be seen).

Organic farming & balanced use of fertilizers- Vermi-compost contains beneficial micro-organisms such as *Azotobacter* and *Azospirillum* which help in fixing atmospheric nitrogen into the soil and also *phosphobacteria* which help in solubilising the insoluble phosphorous compounds thus releasing phosphorous for the crops to feed. It is necessary to carry out dissemination on a large scale of vermi-composting technology among farmers to improve soil health & enhance crop-productivity on a large scale. Initially, farmers, particularly small & marginal farmers may have to be provided vermicomposting production inputs like vermibed and earthworms on subsidy and the officials of Agriculture Department and farmers trained on technology.

In order to promote organic agriculture and horticulture farming, TNAU's Green Village Programme may be taken up.

Balanced and conjunctive use of *organic and inorganic fertilizers* and *INM* and eco-friendly *IPM* for reducing crop loss is necessary. Use of fertilizers and chemicals in agricultural production was a necessity to produce more to meet the growing population. The yield plateau in some crops, extensive use of chemicals for some crops, residues reported in food chain and environmental hazards have brought up the issue of reverting to ancient agriculture "organic farming" in irrigated agriculture. Shifts in the dependence on fertilizers and chemicals paved way for concentrating on *Integrated Nutrient Management (INM)*, *Integrated Pest Management (IPM)*, *Integrated Weed Management (IWM)*, and *Integrated Farming System (IFS)* which aim at partially eliminating the use of fertilizers and chemicals. The future strategy should be to strengthen the INM supply and management system as this will be the only viable approach for sustaining food security both from irrigated and rainfed areas.

The soil organic matter may be enhanced by (a) promotion of manure making at farm level- (b) promotion of green manuring- © promotion of Integrated Intensive Farming System (IIFS)- IIFS with a host of enterprises based on crop-livestock -fish-apiculture in appropriate combinations in different types and sizes of land holding supports a variety of non-farm activities.

Balanced fertiliser use may be promoted by (a) site specific or village level fertiliser recommendation based on village level fertility index (VLF1). For the above purpose, *Precision-farming* tools like DSSIFFER and Visual Diagnostic Kit (VDK) may be employed. DSSIFER (developed by the TNAU) is a computerised software in which all the soil test calibrations evolved from research efforts are embedded to generate site and situation specific fertiliser programme. Besides, it also has components for generating recommendation for problem soil management and water quality appraisal and management. VDK (developed by TNAU for 20 major crops), is an interactive computer software which enables identification of nutrient disorders when the crop is in the field and adoption of mid-term corrections to avoid yield losses; (b) *TNAU designed Soil Health Card (SHC)* which is based on reliable indicators of soil health (soil health cards issued by STLs in the State have some shortcomings) in place of the existing SHC so that the farmer is motivated to understand his farm soil and manage it towards sustaining its fertility and productivity.

Some of the practices followed but only on a limited scale by organic farmers in Tamil Nadu for the crops of rice, groundnut, sugarcane, banana, cotton, vegetables, turmeric, coconut are:

Nutrient Management - Vermicomposts
Composted Crop residues
Animal manures

	Green manures, green leaf manures
	Spraying of Panchakavya (mixing with irrigation also)
	Application of tank silt
	In situ incorporation of crop residues
	Bio-fertilisers
	Oil cakes, neem cakes
Moisture cons. -	Mulching with residues of same crop (banana, coconut, sugarcane, jasmine)
	Water harvesting techniques, percolation ponds
	Pitcher irrigation for fruit crops
Seed treatment -	Spray Panchakavya
	Plant extracts with cow urine
	Neem cake, mulching, ducks rearing in paddy fields

These need to be popularized extensively. The future strategy should be to strengthen the INM supply and management system as this will be only viable approach for sustaining food security both from irrigated and rainfed areas. The major components of the system, which need attention, are:

- Recycling solid waste and crop residues by proper method of composting
- Encouraging vermiculture among the village folk
- Encouraging legumes as a part of crop rotation for grain and fodder purpose
- Popularising bio-fertilisers to augment N and P supply
- Promoting balanced use of chemical fertilizers (NPK) based on soil testing, correction of secondary and micronutrient deficiencies in soil
- Promoting appropriate soil, water nutrient management that maximise nutrient use, need immediate attention.

All the STLs need to be equipped with computers and DSIFER & VDK software and the soil testing personnel trained in use of DSSIFER and VDK. Also, SHGS, NGOs and unemployment graduates may be trained on establishing agri-clinics and adding DSSIFER and VDK as a tool to generate site and situation specific recommendations.

Agro-ecological zoning is essential to make precise recommendation domains to achieve high probability of success in any alternate cropping plan and management technology application. Digitizing the existing soil maps and by superimposing the soil fertility capability class, moisture index and length of growing period, delineating sub-zones within an agro-climatic zone will be the effective management domain for technology transfer. A pilot project has already been completed for Erode and Coimbatore districts by TNAU.

System of Rice Intensification (SRI) technology- It is a new technology developed in Madagascar during 1980s to boost rice yields which comprise six innovative approaches:

- Early transplanting of rice seedlings, i.e., between 8 to 12 days with seedlings having only two tiny leaves
- Careful transplanting of seedlings, avoiding trauma, in just 15-30 minutes of removal from nursery
- Wider spacing of 25*25 cm. or more with a single seedling per hill
- Fertilisation with more of organic compost and less of inorganic fertilizers
- Water management with alternate wetting and drying of the rice field
- Early and frequent weeding of up to 4 times with rotary hoe

The SRI technology results in considerable saving of water compared to the requirement for normal rice cultivation which is 1240 mm. This technology will enable

the normal area to be maintained during water scarcity periods in the Rabi (Samba) season.

Precision farming is defined as the application of information technologies and principles to identify, analyse and manage spatial and temporal variability associated with all aspects of agricultural production for the purpose of improving crop performance and environmental quality. Precision farming is also referred to as as prescription farming, site-specific farming, smart farming and GPS (Global Positioning System).

Precision farming is generally understood to mean a system that involves precise application of fertilizers, pesticides and irrigation through drip and sprinkler systems. Instead of applying these inputs uniformly across an entire field, these would be applied precisely when and where needed in the field. The requirement would be arrived at based on analysis of soil conditions and will enable an ideal mix of cost and productivity. It is necessary to take up precision farming on a large scale.

Water Use

There is need for caution in regard to ground water development and exploitation; drawl of ground water is more than recharge in many areas. Water users organization and on-farm development help in judicious water allocation and management.

The measures necessary for water use efficiency may be listed as follows:

- Improvement of the water use efficiency by progressive reduction in conveyance and application losses
- Adoption of better water management practices/ techniques through farmers' organisations
- Promotion of adaptive research and development to ensure more cost effective and efficient execution and management of irrigation systems through better water management practices
- Implementation of the **conjunctive use of ground and surface water** towards optimal utilisation of water resources and to have its development environmentally sustainable as well. The ground water should be utilized to the maximum during the monsoon period and surface water can be used when the water level goes beyond certain limit below ground level.
- **Skimming fresh water in saline ground water regions**- In situations of sea water intrusion in coastal regions, it may be useful to selectively skim fresh water accumulated due to recharge from rainfall instead of disturbing the saline water by installation of skimming wells on a modified structure along the coastal belt of Tamil Nadu.
- Bridging the gap between the potential created and its utilisation by strengthening the Command Area Development Programme, institutional reforms and promoting farmers' involvement in irrigation management
- Restoration and modernization of old irrigation systems

Public Investment in Agriculture and Rural Infrastructure

It has been pointed out in the Economic Survey 2003-2004 of GOI that agriculture and rural infrastructure sectors have been witnessing a deceleration in public investment since the Eighth Five Year Plan. This is mainly because of the severe resource crunch faced by the States. Compounding the problem was shortfall in the priority sector lending to agriculture by the SCBs. It is against this background that the Government of India announced a scheme for setting up of RIDF in 1995-96. Under the scheme, domestic commercial banks contribute to the Fund to the extent

of their shortfall in their lending to the priority sectors. The main objective of the Fund is to provide loans to State Governments and State-owned corporations to enable them to complete on-going rural infrastructure projects. The Fund is being operated by NABARD. The corpus of RIDF I-IX amounted to Rs.34,000 crore at end-March, 2004. The allocation during 2003-2004 was Rs.5,500 crore under RIDF-IX. Cumulative sanctions and disbursements under RIDF tranches I to IX amounted to Rs.34,678 crore and Rs.21,067 crore, respectively at the end of March 2004. As on March 31, 2004, RIDF loans amounting to Rs.14,004 crore were outstanding from various State Governments. Concerned over the significant shortfalls in the disbursement of RIDF funds, the scope of RIDF lending was extended to cover soil conservation, rural market yards, inland water ways, fish jetties, cold storages, godowns and more recently rural health centers, primary school buildings, mini hydel plants, citizen information centers under information technology in addition to irrigation projects and rural roads. Under RIDF IX, Government of India had advised NABARD to sanction loans for projects which directly benefit the farmers. Accordingly, 60 percent of sanctions from the corpus of Rs.5,500 crore provided under RIDF IX was earmarked for flood protection, irrigation, agriculture and allied activities and system improvement and mini yield hydel power projects. Interest rate on loans under RIDF had been reduced from 13.0 percent in 1995-96 to 11.5 percent in 2000-01 and further to 8.5 percent in 2002-03. Considering the declining trend of interest rates, the lending rates in respect of undisbursed amount of RIDF tranches IV to IX was restructured with effect from November 1, 2003 with the approval of RBI. Accordingly, State Governments would be required to pay 7 percent in respect of undisbursed amount of RIDF IV to VII and Bank Rate plus 0.5 % point in respect of RIDF VIII and IX. The banks would be paid 6 percent in respect of the undisbursed amount of RIDF IV to VII uniformly and varying rates of interest between the Bank Rate and Bank Rate minus 3 percentage points in respect of RIDF VIII to IX. The rates of interest on deposits in the case of RIDF VIII and IX will continue to be linked to the shortfall in lending to agriculture.

Assistance under RIDF has resulted in the addition of 78.8 lakh hectares of irrigation potential and 1,46,535 kilometres of roads by the end of November, 2003, according to the Economic Survey 2003-04 of GOI.

In the Interim Budget for the year 2004-05, an announcement was made regarding the setting up of Lok Nayak Jai Prakash Narayan Fund (LNJPNF), also called Agricultural Infrastructure and Credit Fund (AICF) with NABARD with a corpus of Rs.50,000 crores spread over three years (April 2004 to March 2007). The objective of the Fund is to create mechanism for efficiently aggregating resources from various providers of long term financing, facilitating resource flow from the market and channelising for agriculture / rural infrastructure creation. The Fund will thus be utilized for enhancing the efficiency, productivity and profitability of Indian agriculture so as to augment the income of rural households by strengthening infrastructure necessary for agriculture, agri-exports, diversification and value addition. It was indicated that consequent to the operationalisation of the LNJPNF, the RIDF mechanism would be discontinued. [However, in the speech of the Union Finance Minister for Budget 2004-05, it has been indicated that the RIDF would be revived and that RIDF guidelines have been revised].

Projected Food requirement and area coverage under different crops in 2020

The estimated food requirement of various food crops by 2020 based on the projected population (assuming a growth of 1.3% per annum between 2001 and 2010 and at 1.1% between 2010 and 2020 and adopting the per capita requirements indicated by ICMR with average productivity during the last 5 years and the land area

required by 2020 is given in the Table below (from the draft *Land Use Policy for Tamil Nadu* by Task Force under Dr. Sivanappan).

Projected food requirement and area under different crops by 2020

Sl. no.	Item	Requirement in 2020 (lakh tonnes)	Av. Productivity (5 years) (kg./ ha)	Area required in 2020 (lakh ha.)
1	Rice	91.68	3370.00	27.20
2	Cholam	9.16	995.33	9.21
3	Cumbu	5.46	1372.33	3.93
4	Maize	1.17	1588.67	0.75
5	Ragi	4.52	2015.00	2.24
6	Other cereals	2.10	878.00	2.39
7	<i>Total cereals</i>	<i>114.09</i>	<i>1703.22</i>	<i>66.99</i>
8	Pulses	23.39	436.67	53.65
9	Oils	11.38	1690.33	6.73
10	Sugar	10.91	10923.67	9.98
11	Vegetables	79.52	25426.67	3.12
12	Fruits	10.13	23283.33	0.44
13	Fodder	819	20000.00	40.96
14	Forest	-	-	15.59
	<i>Total</i>			<i>197.46</i>

The projected land requirement for non-agricultural purposes by 2020 is shown in the table below.

Projected land requirement for non-agr. use by 2020

Sl. No.	Use	Total area required by 2020 (lakh ha)
1	Housing	3.60
2	Schools	1.62
3	Roads	3.59
4	Industries	0.15

It may be seen from the above tables that the requirement of area for the projected agricultural production and the need of area for fodder and non-agricultural use exceeds the existing geographical area of the State.

The Task Force has suggested the land use pattern as set out in the Table below.

Suggested Land Use Pattern in 2020

Sl. No.		Area in 1990s (in lakh ha)	Area (in lakh ha) in 2020
1	Geographical area		130.16
2	Forest	21.44	30.00
3	Barren and Uncultivable Land	4.95	4.95
4	Land put to non-agricultural uses	19.07	25.00
5	Cultivable waste	3.25	1.25
6	Permanent pastures and other grazing land	1.25	3.00
7	Land under miscellaneous tree crops and groves	2.25	2.45
8	Current fallow	10.57	1.54
9	Other fallow	10.93	1.93
10	Net Area Sown	56.32	60.00
11	Gross cropped area	67.29	78.00
12	Cropping intensity (%)	119.46	130

Tenth Plan

During the Tenth Plan period, Tamil Nadu State is committed to achieve rapid economic growth. In the process, the State is aiming at an annual growth of 4 % in agriculture and 8 % in horticulture for sustainable agricultural development, employment generation and poverty alleviation.

The State aims at bringing second green revolution in dryland agriculture, while sustaining the tempo of agricultural development in irrigated agriculture. The task ahead is very big and challenging and a higher growth rate in agriculture is called for to meet the challenges related to food security, employment and eradication of rural poverty. The State depends upon the ability of agricultural administration for strategic intervention in terms of technology transfer, resource development and institutional support.

In order to rejuvenate the agricultural growth, the focus for the Tenth Plan will be on production and productivity by adopting appropriate cropping patterns, scientific nutrient water management techniques, modernization and expansion of irrigation facilities and effective marketing of farm products. As a necessary precondition for “an ever green revolution” one of the points of Chief Minister’s 15 point programme, is a broad-based agricultural policy involving small and medium farmers, driven by technological change and appropriate marketing facilities.

Thrust Areas -Tenth Plan period

- Speedy transfer of technology to unleash the untapped potential of various agro-climatic regions of the State
- Soil and Water conservation to prevent degradation of soil productivity and lengthening crop-growing season for optimum crop productivity
- Efficient use of limited irrigation water without leading to problems of soil salinity, alkalinity and ground water over-exploitation
- Integrated Nutrient Management (INM) that reduces the need for chemical fertilizers, improves the soil health and minimizes environmental pollution by conjunctive use of organics, inorganics and bio-fertilisers
- The IPM approach helps in maximizing the production at a minimum cost and simultaneously obviate adverse effects like environmental pollution, pesticide residues in food, resurgence of pests etc.
- Modernising dry farming technology, laying accent on developing and popularizing drought resistant hybrid crop varieties, evolving appropriate water harvesting techniques and activating the extension component in dry land areas
- Expansion of area under fruits, vegetables, flowers, and medicinal Plants to meet the needs of domestic as well as upcoming market need. The State will set up a ‘Mission for Horticultural Development in Tamil Nadu’ to give an impetus to cultivation, processing, value addition and marketing of horticultural products. Establishment of agro-economic export zones would encourage exports
- Implementing ‘Wasteland Development Programme’ in a big way through watershed development. Under this programme, 18.5 lakh ha. will be developed for Planting rainfed agro-forestry and fruit trees. Further it has been proposed to develop one lakh ha. of wasteland into orchards with drip and sprinkler irrigation involving corporate sector and reclaiming 0.5 lakh ha. of salt affected lands
- To improve the production and productivity of pulses, Pulses Village concept, with water harvesting and cultivation of high value but low water requiring

pulse crops will be taken up. Introduction of pulses crops like red gram in the wasteland development programme will be attempted

Department wise outlay for Crop Husbandry Sector

Sl. No	Department	Tenth Plan Outlay (Rs. in crores)		
		Ongoing	New	Total
1	Agriculture	677.69	74.63	752.32
2	Horticulture	107.15	22.00	129.15
3	Agri.Engineering	85.58	8.15	93.73
4	Agro Fed	0.50		0.50
5	Sugar Devt.	9.00		9.00
6	RCS	15.30		15.30
	Total	895.22	104.78	1000.00

Annual Plan 2002-03 and 2003-04

As against the budgetted outlay of Rs.6474.27 lakhs and Rs.17928.12 lakhs, an amount of Rs.6106.00 lakhs and Rs.22056.75 lakhs was spent during 2002-03 and 2003-04 respectively.

The area and production of crops during 2000-01, 2001-02, 2002-03 (based on S & C Report) and 2003-04 (estimates) are set out in the Table below.

(Area in lakh ha and Production in lakh tonnes)

Crop	2000-01		2001-02		2002-03		2003-04 (estimate)	
	Area	Prodn	Area	Prodn	Area	Prodn	Area	Prodn
Paddy-Kuruvai	3.16	12.95	3.11	12.18	1.85	6.23	1.09	3.51
-Samba	15.69	53.85	15.06	45.15	12.04	25.82	10.52	23.56
-Navarai/Kodai	1.95	6.86	2.42	8.50	1.27	3.72	2.54	8.43
Paddy -Total	20.80	73.66	20.60	65.84	15.17	35.77	14.15	35.50
Cholam, Cumbu, Ragi	5.88	7.36	5.67	6.63	5.26	4.40	8.06	9.37
Other Millets	1.41	2.00	1.34	1.69	1.79	2.39	2.43	3.43
Other Cereals	0.04	0.02	0.06	0.02	0.07	0.04	0.09	0.05
Pulses	6.88	3.13	6.85	2.71	5.63	2.00	6.26	2.67
Total food grains	35.01	86.17	34.52	76.89	27.92	44.60	30.99	51.02
Sugarcane	3.15	32.61	3.21	33.19	2.61	24.17	1.85	19.71
Other food crops	7.20	NW	7.20	NW	6.47	NW	NC	NC
Total food crops	45.36	NW	44.93	NW	37.00	NW	NC	NC
Cotton (in bales of 170 kg lint each)	1.70	3.17	1.64	2.30	0.76	0.84	1.04	1.80
Groundnut	6.99	13.58	6.63	12.50	5.02	7.17	6.35	11.18
Gingelly	1.04	0.65	0.84	0.46	0.64	0.28	1.18	0.62
Coconut (lakh nuts)	3.23	0.32	3.36	0.33	3.46	0.29	NC	NC
Total Non-Food crops	18.03	NW	17.33	NW	14.91	NW	NC	NC
Total Food and Non-Food crops	63.38	NA	62.26	NW	51.91	NW	NC	NC

NW- Not worked out due to non-availability of yield rate

NC- Not covered in forecast. NA-Not applicable.

Production Projections for 2004--2005

On the assumption that the seasonal conditions and rainfall would be normal, the target for area and production for 2004-2005 set by the Agriculture Department is as follows:

Crop	Target for 2004-05			
	Area-Kharif (April-Sept)	Area-Rabi (Octl-Mar)	Total Area (in L.Ha)	Production (in L.MT)
Paddy	6.00	14.00	20.00	75.00
Millets	8.50	2.50	11.00	14.85
Pulses	2.39	5.11	7.50	3.38
Cotton(L.Bales)	1.19	1.31	2.50	5.62
Sugarcane(gur)	1.75	1.25	3.00	35.00
Total oil seeds	5.95	4.05	10.00	17.00
Groundnut	–	–	8.19	14.95
Total	25.78	28.22	54.00	

B. Input Supply

Seeds: The department has proposed to distribute:

- i. Certified seeds of Paddy to cover 17% of total area of the paddy (18000 MT).
- ii. 400 MT. of Millet seeds as programmed under Centrally sponsored schemes to cover 7% of the area under millets.
- iii. 2600 MT. of certified seeds of pulses to cover 12.5 % area.
- iv. 375 MT. of cotton seeds to cover 10% of rain fed and irrigated area
- v. 8780 MT. of groundnut seeds to cover 5% of the area
- vi. 114 MT. of Gingelly seeds to cover 15% of the area.
- vii. 75 MT. of Sunflower seeds to cover 50% of the area
- viii. 120 MT. of Castor seeds to cover 30% of the area
- ix. 8 MT. of Soyabeans for 20% of the area.
- x. 9.95 LMT. of NPK Fertilisers (5.40 N/ 2.31 P/ 2.24 K)
- xi. 125 MT. of Green Manure seeds
- xii. 1250 MT. of Micro Nutrients Mixtures
- xiii. 1400 MT. of Bio- Fertilizers (70 packets each of 200 gms.)
- xiv. 500 MT. of Blue Green Algae inoculums
- xv. 500 MT. of Azolla.

Plant Protection

With a view to safeguard the Agro eco system, the use of Plant protection chemicals is discouraged and Integrated Pest Management technology is propagated, besides application of bio pesticides, bio control agents and eco-friendly chemicals. Integrated Pest Management demonstrations are laid out in Pulses, Cotton and Oilseeds to train the farmers to discourage the use of plant protection chemicals. In addition, 1400 Nos. Farmers Field Schools are laid out under Integrated Cereals Development Programme - Rice, Cotton Mini Mission - II and Accelerated Maize Development Programme.

Programmes

Food grain Crops

1. Crop Yield Competition

The main objective of the Crop Yield Competition is to inculcate healthy spirit among the farmers to increase the productivity of crops by adopting advanced scientific techniques. The Crop Yield Competition is conducted at State and district level for the notified crops and cash prizes are awarded. The enrolment fee for paddy and groundnut crops for State level is Rs.100 and for other crops is Rs.50/-.

Similarly, the enrolment fee for paddy and groundnut crops for District level is Rs.50/- and for other crops is Rs.25/-

The prize amounts given are as follows:

Crop	State level		District level	
	1 st prize	2 nd prize	1 st prize	2 nd prize
Paddy and Ground nut	25,000	15,000	8,000	4,000
Other crops	8,000	4,000	4,000	2,000

A sum of Rs.19.01 lakhs and Rs.15.26 lakhs was spent during 2002-2003 and 2004-05 respectively. An amount of Rs.15.26 lakhs is proposed in the BE of 2004-05.

2. Production Incentive To Cauvery Delta District Farmers

Under monopoly procurement, TNCSC is procuring paddy from Kuruvai & Samba crops from Cauvery delta district farmers every year. The farmers who are supplying paddy to TNCSC are paid production incentive amount over and above the price fixed by Government of India. The amount of incentive paid by TNCSC to Cauvery Delta district farmers are drawn and paid by Commissioner of Agriculture based on the proposal from TNCSC after getting Government approval.

Seeds

The thrust of the programme is the timely supply of quality seeds, particularly hybrids and new varieties. The productivity of crops largely depend on the genetic and physical purity of the seeds. Considering the role of quality seeds in stepping up production, the Department of Agriculture is producing and distributing Certified seeds, as per the approved Seed Replace Rate (SRR). The seed production activities involve:

- Breeder seed production by TNAU for State Varieties and ICAR Centres for National Varieties.
- Foundation seed production through 39 State Seed Farms, 5 State Oilseed Farms and one Pulses Seed Farm at Vamban.
- Certified Seed Production in farmers' holdings.

Thus, production of foundation seeds and production and distribution of seeds is done by the Department of Agriculture. The Seed Certification Agency is involved to ensure quality.

The Foundation and Certified Seeds produced in the Government farms and farmers' holdings respectively are processed in 16 major, 3 medium and 51 mini seed processing units functioning in the State with an annual processing capacity of 28,500 LMT.

1. Multiplication, Procurement and distribution of Paddy and Millet seeds

Quality seeds contribute 40% in getting higher production and thus play a vital role in increasing the productivity. In view of the policy decision taken by the Government to procure and distribute certified seeds of varieties of crops released / notified within 10 years, it is proposed to procure and distribute paddy and millet seeds through the Department only for the requirement under various crop production schemes.

The main object is to supply quality and viable seeds of paddy to cover 17% of the area and millets to cover 7% of the area (18000 MTs. of paddy and 400 MTs. of millets certified seeds) to the farming community at reasonable price in time.

Certified seeds are multiplied in farmers' holdings under seedfarm condition and distributed through 880 Agricultural Extension Centres located throughout Tamil Nadu. The seed production work is looked after by the Agricultural Development Officers at Agricultural Extension Centres under the supervision of the Seed Certification Department. The Department will restrict the production of paddy and millets certified seeds based on the Government Seed Policy.

The private seed growers, cooperative sectors and corporate sectors will be encouraged to procure and distribute the varieties which were released/notified to meet the additional requirement with reference to the target. The provision made is for the cost of seeds and working expenses.

A sum of Rs.1271.83 lakhs and 1220.19 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.1513.45 lakhs is provided for the year 2004-05.

An sum of Rs.437.90 lakhs and 383.16 lakhs was spent during 2002-03 and 2003-04 respectively under SCP component. An amount of Rs.439.99 lakhs is provided for the year 2004-05 for SCP component.

2. Multiplication and Distribution of Pulses seeds

This scheme contemplates multiplication and distribution of 2600 MTs. of certified seeds of pulses to cover 12.5% of the total area under pulses. Seeds will be produced, processed, certified and distributed to the farmers through the Agricultural Extension Centres. The provision made is towards the cost of seeds, gunnies, transport, fumigation etc., for SCP only. The general allocation for 2002-2003 is transferred to Non-plan.

A sum of Rs.112.11 lakhs was spent during 2002-2003 and Rs.117.14 lakhs was spent during 2003-2004 under Special Component Plan. A sum of Rs.117.14 lakhs is provided in BE 2004-05.

3. Development of Foundation Seed Production Centres for Groundnut

5 State Oilseed Farms are functioning with the objective to multiply foundation seeds of oilseed crops from breeder seeds supplied by TNAU and ICAR Centres. The State Oilseed Farms are located at Musaravakkam (Kancheepuram district), Vellalavidhuthi (Pudukottai district), Agasipalli (Dharmapuri district), Bhavanisagar (Erode district) and Navlock (Vellore district). The expenditure towards working expenses for input cost, wages, transport, etc., for State Oilseed Farms Musaravakkam, Vellalavidhuthi and Agasipalli are met under this Plan Head of account.

A sum of Rs.86.06 lakhs and Rs.85.36 lakhs were spent during 2002-2003 and 2003-04 respectively. A sum of Rs.85.89 lakhs is proposed in BE 2004-2005.

4. Procurement and distribution of Vegetable seeds

The vegetable seeds are procured mainly from the State Seed Farms for distribution to the farmers through Agricultural Extension Centres. The provision made under this scheme is for purchase of vegetable seeds.

A sum of Rs.14.12 lakhs and Rs.13.53 lakhs was spent during 2002-2003 and 2003-04 respectively. A token provision is made for 2004-05.

5. Procurement and distribution of Green Manure seeds

Application of Green Manure to fields builds up the soil health, microorganism and water holding capacity. It also fixes atmospheric nitrogen in the soil through root

nodules. Hence, it is proposed to procure 125 MTs of Green Manure Seeds and distribute it to ryots at a cost of Rs.20.85 lakhs during 2002-2003 at 25% subsidy.

A sum of Rs.25 lakhs is likely to be spent during 2003-2004 and an amount of Rs.25 lakhs is proposed in BE for 2004-2005.

Manures and Fertilisers

Scheme for Composting of Farm Waste through Pleurotus and Vermi Composting.

The scheme to prepare compost from farm waste by using Pleurotus was taken up for implementation during 2003-04 at a cost of Rs.2.80 lakhs. Under this scheme, 2000 minikits each containing the Pleurotus inoculums, Urea and related literature, all worth Rs.140/- have been supplied to the farmers. This programme will be continued during 2004-05 also. This converts eco-friendly waste like coir pith in to useful manure.

To promote Vermi compost production, a scheme is implemented at a cost of Rs. 4.05 lakhs. Under this scheme 5000 farmers have been trained and 100 demonstrations have been conducted to popularise the technology. Dissemination of technology to more farmers and expansion of vermi compost production in more area will be taken up during 2004-05.

Plant Protection

1. Crop and plant protection

The Government of Tamil Nadu in G.O.Ms. No.150, Agriculture (TNADP)/ Department dated 9.3.1993 has ordered that the Director of Agriculture shall not trade in pesticides throughout the State except as and when required to deal with natural calamities including mass pest infestation. The Government directed that the pesticides trading would be taken up by the co-operatives like TANFED and Primary Agricultural Co-operative Societies. The provision for this scheme is utilised for purchase and supply of bio pesticides like neem extract, which are recommended under Integrated Pest Management concept besides the chemicals for seed treatment etc. to implement the Government of India schemes.

A sum of Rs.14.92 lakhs and Rs.114.34 lakhs was spent during 2002-2003 and 2003-04 respectively including Special Component Plan. An amount of Rs.114.98 lakhs is proposed in BE of 2004-2005 including Special Component Plan.

2. Pesticide Testing Laboratories

Enforcing quality control on pesticides through analysis of samples under statutory provisions is the main objective of Quality Control Laboratories. Such quality control measures adopted by the Quality Control Laboratories provide quality products to farmers. The Quality Control Laboratories are guided, monitored and reviewed by the Quality Control Cell. The expenditure under this scheme is towards maintenance of lab equipments and materials and supplies for 9 Pesticide Testing Laboratories. During 2002-03, 16513 numbers were analysed and it is programmed to analyse 13860 numbers of pesticides during 2003-04.

A sum of Rs.7.85 lakhs and Rs.8.24 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.14.02 lakhs is proposed in BE 2004-2005.

3. Scheme for Production of NPV for the control of Prodenia in Cotton

Prodenia is a serious pest, which often causes severe damage to the cotton crops. The spraying of NPV for the control of prodenia is found to be an effective biological control measure. The NPV is being produced in the Parasite Breeding Centres at Gobichettipalayam in Erode district, Melur in Madurai district and

Villupuram in Villupuram district. The provision made under this scheme is towards wages and cost of production of NPV to cover an area of 1500 Ha. annually.

A sum of Rs.0.58 lakh and Rs.0.60 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.0.60 lakh is proposed in BE 2003-2004.

Commercial Crops

1. Sugarcane Development

Sugarcane Crop is often affected by Inter node Borer, which ultimately causes severe reduction in yield. To overcome this problem, biological control by release of parasite, Trichogramma is found to be very effective. The parasites are multiplied in 21 Parasites Breeding Centres functioning near sugar mills area. An extent of 10500 ha. is covered annually. The provision made is towards recurring cost of production of parasites. A sum of Rs.5.76 lakhs and Rs.3.75 lakhs was spent during 2002-2003 and 2003-04. An amount of Rs.3.75 lakhs is proposed in BE 2004-2005.

2. Development of Cotton cultivation

Cotton Certified seeds are produced and distributed to cover 10% of the rain fed area and 15% of irrigated area as per seed distribution policy of the department. Every year 375 MTs. of cottonseeds are produced in the farms organised under the supervision of this department in private holdings. The funds proposed under this scheme are to meet cost of seeds, transport charges etc.

A sum of Rs. 82.19 lakhs and Rs.118.35 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.119.71 lakhs is proposed in BE 2004-05.

3. Integrated Coconut Development

The objective of the scheme is to procure quality tall coconut seed nuts from the selected mother palms, raising of seedlings in the Government coconut nurseries and to distribute them to the coconut growers through Agricultural Extension Centres at a reasonable price so as to bring more area under coconut plantation.

A sum of Rs.67.40 lakhs and Rs.80.01 lakhs was spent during 2002-2003 and 2003-04. An amount of Rs.91.97 lakhs is proposed for 2004-2005.

4. Increasing the production of Oilseeds (IPOS)

This scheme is aimed to increase the production of oilseeds, by supplying the required quantity of seeds as per the SRR and also providing latest technology to increase the productivity. The main activity is multiplication of certified seeds of groundnut, gingelly, sunflower, castor and soyabean by enforcing the seed certification standards. Quality seeds thus produced are distributed to oilseeds growers through the Agricultural Extension Centres. In addition, the application of bio-fertilisers, micro nutrient mixtures are recommended and made available to the oilseed growers.

A sum of Rs.531.89 lakhs and Rs.641.96 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.466.96 lakhs is proposed in BE 2004-2005.

5. Production and Distribution of TXD coconut seedlings at Pattukkottai.

TXD coconut seedlings are produced in Coconut Nursery, Pattukkottai under this scheme. During 2002-2003, it is programmed to produce and distribute 1.00 lakh Nos. of TXD coconut seedlings. The provision under this scheme is towards cost of seed nuts, working expenses.

A sum of Rs.5.11 lakhs and Rs.6.03 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.6.13 lakhs is proposed in BE 2004-2005.

6. Intensive coconut development scheme

The 2 Coconut Nurseries functioning in the districts of Thiruvallur and Cuddalore will produce and supply tall coconut seedlings to the farmers. Provision is made towards staff cost and working expenses of the coconut nurseries.

A sum of Rs.8.51 lakhs and Rs.10.46 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.6.13 lakhs is proposed in BE 2004-2005.

7. Crash programme for the development of coconut seedlings

Tall × Dwarf coconut seed nuts are produced in the Crossing Centres by hybridisation work. The crossed seed nuts are procured after selection and raised into seedlings in the department nurseries. During 2002-2003, it has been programmed to procure 5.60 lakhs nos. of T×D coconut seed nuts under this scheme. The provision under this scheme is towards cost of seed nuts, transport charges, etc.,

A sum of Rs.52.58 lakhs and Rs.74.50 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.95.06 lakhs is proposed in BE 2004-2005.

Extension And Training

1.Documentary film in Agriculture

Mass media is a powerful media for effective dissemination of messages to farmers and is given much importance. Provision is made for purchase of Video films from Government of India, which will be screened at the village level.

A sum of Rs.0.31 lakhs and Rs.0.40 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.0.40 lakhs is proposed for 2004-2005.

2. Agricultural Information Service

Provision is made towards purchase of materials for printing and release of publicity materials like posters, pamphlets, booklets, folders, etc., through the press attached to Agricultural Directorate. These materials will help in dissemination of messages on crop production techniques to the farming community.

A sum of Rs.2.40 lakhs and Rs.4.36 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.2.36 lakhs is proposed for 2004-2005.

3. Training of Farm Women in Agriculture (TANWA) Phase II

The objective of the training is to impart in small and marginal farm women skills of latest agricultural technology with a view to increasing production and improving food security and to enable full utilisation of the potential of the farmwomen. This scheme is implemented as externally aided project funded by DANIDA from 1.4.1986 to 31.3.2003 for a period of 17 years. Under this scheme totally Rs. 42.48 crores have been spent and totally 6.53 lakh farmwomen were trained. From 2001-02 onwards the entire pay and allowance of the staff were fully borne by the State Government. During 2002-03, this scheme was implemented at a cost of Rs.529.32 lakhs. Though the scheme was discontinued by 31.3.2003, to fulfill the major objective to provide technical knowledge to the farmwomen and to sustain the benefits, 300 male officers of Agricultural Department were given technical skill development training.

Other Schemes

1. Scheme for Accelerated Irrigation for small and Marginal Farmers

A special scheme envisaging direct cash support to small and marginal farmers was to be implemented in 2003-04 to enable them to pay their dues to the Tamil Nadu Electricity Board based on the tariff announced by the Tamil Nadu Electricity Regulatory Commission. An amount of Rs.10000 lakhs was proposed for this scheme for the year 2003-04. By this scheme the interest of small and marginal farmers will be protected. Government have recently announced free electricity to the farmers. No allocation is made for this scheme.

2. Scheme for improvement of Farm Pump sets in Irrigated land

The energy efficiency in farm sector pump sets is poor as the farmers are using higher capacity pump sets than the required level or using old pumpsets. They have poor discharge compared to their horse power. The improper installation of switchboards, earth and allied accessories also increases power consumption.

The efficiency of electric pump sets can be increased by :

- Replacing the old pump sets with new energy efficient ISI certified latest technology pumpsets
- Providing proper electric accessories, mains, earths etc
- Providing facility for ground water recharging
- Decreasing the power consumption by reducing the pumping hours by providing micro irrigation facility, which allows drawl of less water from the wells
- Ensuring economy in using ground water by 30%
- Increasing the farm yield by the use of micro irrigation and fertigation cum herbigation so that the farmer will have higher income
- Revised cropping pattern by promoting integrated farming to increase the income of farmers. Reduced energy, water, pesticides, and fertilizer consumption will also increase profitability of farmers.

It is proposed to cover the dark and grey Blocks of the State with this energy efficiency programme for electric farm pumpsets at a cost of Rs.50 crores. A pilot project was taken up in three transformer areas in Theni, Coimbatore and Villupuram districts to study the effect on the consumption of energy under this programme.

B. Centrally Sponsored Schemes With 100% Assistance

1. Integrated farming in coconut holding for productivity improvement

This scheme is being implemented with the assistance of Coconut Development Board, Kochi. Under this scheme the following activities are carried out with the objective of improving the productivity of coconut.

- a. Management of diseases affected palms.
- b. Laying out demonstration plots.
- c. Organic manure Pit.

A sum of Rs.88.27 lakhs and Rs.50.00 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.50 lakhs is proposed in BE 2004-2005.

C. Centrally Sponsored Scheme Shared Equally Between Centre And State

1. Accelerated Maize Development Programme under Technology Mission on Maize

In recent years the demand for maize is increasing due to largescale use of maize in the poultry industry as feed and as processed product for human consumption. The farmers could realize better income maize cultivation and hence a scheme is under implementation with the objective to increase production and productivity of the maize

in the identified potential districts. The cost of the scheme is shared between Government of India and State on 75:25 basis except seed minikit component (100% borne by Government of India).

The component wise physical and financial target and achievement during the 2034-04 is given below:-

Sl.No	Component	Physical	Financial (Rs.in lakhs)
1	Field Demonstration (ha)	1306 (1306)	13.06 (13.06)
2	IPM Demonstration (numbers)	30 (30)	1.80 (1.80)
3	Farmers training (No.)	47 (47)	2.35 (2.35)
4	Incentives for Agri.Implements		0.80 (0.80)
5	Publicity through Electronic Media		1.52 (1.52)
6	POL etc		0.94 (0.94)
7	Seed Minikit Demo - Hybrid (100% GOI)	667 (667)	0.40 (0.40)

Figures given in brackets represent the target.

A sum of Rs.13.62 lakhs and Rs.10.35 lakhs was spent during 2002-2003 and 2003-04. An amount of Rs.10.27 lakhs is proposed in BE 2004-2005.

2. Technology Mission on Cotton Mini Mission II

Efforts are being taken to increase the production and productivity of cotton so as to meet the growing demand. As the scope for expansion of area under cotton is limited, other possibilities are being explored. The intensive cotton development programme has been modified and implemented as ICDP under Mini Mission II of Technology Mission on Cotton and is under implementation in Tamil Nadu in all the districts except Kancheepuram, Thiruvallur, Kanyakumari and Nilgiris. The expenditure under this scheme is shared between Centre and State in the ratio of 75:25.

A sum of Rs.131.27 lakhs and Rs.225.74 lakhs was spent during 2002-2003 and 2003-04 respectively. An amount of Rs.225.74 lakhs is proposed in BE 2004-2005.

3. Production and Distribution of T X D Hybrid Coconut Seedlings at Navlock.

The amount proposed is for the production of T x D Hybrid coconut seedlings. The provision is made towards production cost and working expenses and the staff cost at Navlock coconut nursery at Vellore district. The cost of this scheme is shared between Coconut Development Board and State Government on 50: 50 basis.

A sum of Rs.21.44 lakhs and Rs.22.65 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.24.36 lakhs is proposed in BE 2004-05.

4. National Pulses Development Project

During 1986-87, the NPDP was launched with the objective of increasing the production and productivity of pulses. Two separate Centrally Sponsored Schemes viz. SFPP (Pulses) and Plant Protection Umbrella were also under implementation till 1992-93. These two schemes were merged with NPDP during 1994-95 and the scheme is under implementation in Tamil Nadu in all the districts. The expenditure under this scheme is shared between Centre and State on 75:25 basis. In order to step up the production of pulses so as to narrow down the gap between the demand and supply and also to reduce the imports, the NPDP is implemented in all the districts except Chennai and the Nilgiris.

The component wise physical and financial target and achievement during 2034-04 is given below.

Sl.No	Component	Physical	Financial (Rs.in lakhs)
1	Breeder Seed Production (Qtls)	89.90 (100)	4.05 (4)
2	Foundation Seed Production (Qtls)	1133.88 (1000)	4.56 (5)
3	Seed Village/ Certified Seed production (Qtls)	7820.77 (8000)	39.06 (40)
4	Block demonstration (Ha)	695.5 (364)	7.82 (8)
5	IPM demo (Ha)	536 (534)	7.99 (8)
6	Training (No)	20 (20)	3 (3)
7	Rhizobium culture distribution (Ha)	24.76 (8000)	4.38 (4)
8	Plant Protection equipments distribution (No)	489 (246)	3.99 (4)
9	Gypsum distribution (Ha)	4796.42 (1200)	6 (6)
10	NPV distribution (Ha.)	833.6 (800)	1.98 (2)
11	Staff salary		6.87 (8)

Figures given in brackets represent the target.

A sum of Rs.162.30 lakhs and Rs.126.03 lakhs was spent during 2002-2003 and 2004-05 respectively. An amount of Rs.111.51 lakhs is proposed for 20004-05.

5. Oilseeds Production Programme

The Oilseeds Production Programme is implemented with the objective to increase the productivity of oilseed crop to attain self-sufficiency by supply of essential inputs at subsidised cost and also by encouraging the farmers to adopt latest production technologies. It is a Centrally Sponsored Scheme and the expenditure is shared between the Government of India and State Government on 75:25 basis.

Component wise progress made during 2003-04

Sl.No	Component	2003-04 Achievement	
		Physical	Financial (Rs. in lakhs)
1	Purchase of Breeder seeds (Qtl)	494.68 (400)	6.86 (6)
2	Foundation seed production(Qtl)	9224.19 (5400)	34.90 (27)
3	Production of Certified seeds(Qtl)	17421 (16994)	86.87 (84.97)
4	Distribution of Certified seeds(Qtl)	22279 (17875)	131.67 (143.)
5	Infrastructure facilities		1.70(1.69)
6	Block demonstration(No.)	882 (750)	14.96 (15.00)
7	Distribution of Rhizobium culture(Ha.)	36488 (22014)	11.94 (11.01)
8	IPM demonstration(Ha.)	1667 (1667)	25.00 (25.00)
9	Distribution of Gypsum(Ha.)	13959 (10000)	49.83 (50.00)
10	Distribution of farm implements(No.)	127 (129)	2.95 (3.00)
11	Distribution of PP equipments(No.)	1336 (572)	11.98 (12)
12	Distribution of MN mixture(Ha.)	8613 (6000)	12.51 (12)
13	Farmers Training (No.)	154 (154)	23 (23)
14	Distribution of Sprinklers (No.)	28 (30)	3.79 (4)
15	Pay and allowances		50.74 (45)

(Figures given in brackets are targets for particular component)

A sum of Rs.659.68 lakhs and Rs.706.31 lakhs was spent during 2002-2003 and 2003--04 respectively. An amount of Rs.709.44 lakhs for is proposed in BE 2004-05.

6. Oil palm Development Programme

With the objective of meeting the edible oil demand within the State, the scheme for cultivation of oil palm in 11 districts was launched during 1992-93. The cost proposed is for the procurement of oil palm sprouts, raising of seedlings, provision of Drip Irrigation and training of farmers under the Oil palm development programme.

A sum of Rs.26.87 lakhs and Rs.35.17 lakhs was spent during 2002-2003 and 2004-05. An amount of Rs.35.17 lakhs is proposed in BE 20004-05.

Macro Management Mode

The Government of India has introduced Macro Management Mode scheme wherein the States have been given the flexibility to formulate work plans including in them the schemes and their components according to the local needs and priorities. The expenditure under this scheme is shared by GOI and the State Government on 90:10 basis. Out of the 90% of the GOI share, 80% is extended as grant in aid and the balance 20% is treated as loan. The details of the scheme implemented under the Macro Management Mode are given below.

7. Cereals Development programme

The Cereals Development Programme under the Macro Management Mode is implemented in areas where the rice based cropping system is dominant in the State. Under this scheme, the inputs, which are essential for enhancing productivity of paddy and millets are distributed at subsidised cost.

Component wise progress during 2003-04 under OPP (target given in brackets)

Sl.No	Component	Physical	Financial (Rs.in lakhs)
1	Distn. of certified paddy seed with subsidy of Rs.2 /kg (MT)	4310 (4433)	86.06 (88.65)
2	Distn. of certified coarse cereals seed with subsidy of Rs.2/kg (MT)	220 (300)	4.40 (6)
3	Hybrid rice demo Rs.1000/demo of 0.4 ha.(no.)	4500 (4500)	45(45)
4	Prodn. technology demo @ Rs.2500/ha (Ha.)	1030 (1000)	25.76 (25)
5	Distn. of biofertilisers (25% subsidy @ 18packet per ha.) (Ha.)	73619 (70000)	16.76 (15.75)
6	Distn. of MN mixture for cereals at 25% subsidy (Ha)	49673 (37000)	25.21 (27.75)
7	IPM demo cum training @ Rs.6000/ demo and training (No.)	1500 (1500)	89.51 (90)
8	Publicity / workshop / seminar including preseason workshop		39.89 (40)
9	POL and contingency		20.48 (20.51)
10	Training of farmers in cultivation of paddy and millets (No.)	499 (500)	24.95 (25)

8. Sugarcane Development

With the objective of increasing the productivity of sugarcane through adoption of latest production technology for fresh and ratoon crops with more emphasis on quality distribution of sugarcane setts and its proper treatment to save the crop from various seed borne diseases, the scheme is under implementation in the districts where the productivity is below National / State average. The scheme does not intend to increase the area under sugarcane but aims at enhancing productivity in sugarcane, intercrops and sequence crops so that overall [farmers] income per unit is increased both in mill and non-mill sugarcane areas. The component wise physical and financial targets and achievements for 2003-04 are given below.

Sl. No	Component	Physical	Financial (Rs.in lakhs)
1	Field demo (Ha.)	80 (80)	4.00 (4.00)
2	State level training (No.)	2 (2)	0.25 (0.25)
3	Farmers training (No.)	40 (40)	2.00 (2.00)
4	Sugarcane release of parasite	4000 (4000)	0.40 (0.40)
5	Contingencies		8.48 (8.50)

Scheme for Balanced and Integrated use of Fertilisers

This programme contemplates orientation training of Technical officers on soil and Fertiliser Management by organising 12 training courses at 30 officers per training. Totally 360 officers were trained at a cost of Rs.1.20 lakhs. Besides, equipment and other materials required for various analytical laboratories were provided at a cost of Rs.80 lakhs to ensure accuracy of the analysis.

Part II 2004-05 - New schemes

The following new schemes are proposed to be implemented during 2004-05:

Refurbishing of old Agricultural Extension Centres (Rs.1 crore) - To protect the seed and other seed materials from rain and sun, the repair works have been proposed. An amount of Rs.1 crores is provided for repair of old AECs.

Implementation of Decision Support System for Fertiliser recommendation (DESSIFER) as a part of Precision Farming- (Rs.25 lakhs)- This is computer package which provide site specific and situation specific accurate recommendation of fertiliser and irrigation. All the State Department's Soil Testing Laboratories will be integrated with the master computer in TNAU, Coimbatore and will be networked. If a survey number is fed in, the farmers can get accurate data and advice. As a pilot, it is proposed to implement the scheme in some select districts.

Sinking of borewell with submersible motor in Government Coconut nurseries (Rs.11 lakhs)- The proposal is for providing irrigation facilities to 11 Coconut Nurseries by providing borewells energised by submergible moters.

Popularising of INM among the farmers through FTC (Rs.43.20 lakhs)- To make the farmers aware of the INM practices, it is proposed to train 500 farmers per district per year at a cost of Rs.43.20 lakhs.

Purchase of spares and accessories for existing High performance Liquid Chromatography (Rs.4.90 lakhs)- The proposal is for purchase of spares and accessories for existing HPLC instruemnts in 5 Pesticides Testing Laboratories.

Construction of Preservation Sheds for the coconut nurseries and to take up repairs of the existing buildings (Rs.20 lakhs)- The coconut seedlings raised in the Nurseries have to be preserved in sheds to protect them from direct sunlight and cattle manence. Hence it is proposed to construct 5 preservation sheds at a cost of Rs.19 lakhs and to repair the existing sheds in 2 centres at a cost of Rs.1 lakh.

Providing Tarpaulins to Agricultural Extension Centres (Rs.10 lakhs)-Since the tarpaulins will keep the seed protected from high humidity, it is proposed to provide tarpulins to AECs.

Horticulture

Horticulture Development in India

India is the second largest producer of fruits and vegetables in the world, next only to China, contributing 10 and 13.4 percent of the total world production of fruits and vegetables respectively. India ranks number one in respect of mango and banana production in the world producing 65% and 11% of mango and banana production in the world. As far as vegetables are concerned India ranks first in production of cauliflower, second in onion and third in cabbage in the world. India's tropical, subtropical and temperate climate and varieties of soils are amply suited for cultivation of 40 vegetables and 30 fruit trees. Though horticulture crops cover only 6.1 per cent of the gross cropped area, it contributes 18.8 per cent gross value of agricultural output and 14.5 per cent of foreign exchange earned through agriculture.

Thus, diversification of agriculture to horticulture is very essential from the angle of minimising risk, enhancing profit, generating employment and optimizing as well as conserving natural resources, providing nutritional and economic security and healthy environment.

The area under fruits and vegetables increased from 8.01 million ha in 1991-92 to 9.599 million ha in 1998-99, while production rose from 87.16 million tonnes to 131.572 million tonnes during the same period.

Area and production of important horticulture crops in India (1991-92 and 1998-99)

(Area in '000' ha Production '000' tonnes Yield in Kg/ha)

Crop	1991-92		1998-99		91-92	98-99
	Area	Production	Area	Production	Yield	Yield
Fruits	2870	28630	3729	44042	997	1181
Vegetables	5140	58530	5870	87530	10139	1491
Others	4285	9382	5541	14501	2.19	2.62
Total	12295	96542	15140	146070		

Others include flowers, medicinal and ornamental plant, spices and plantation crops

Exports- The quantum of exports from the country of fresh as well as processed foods and vegetables and their seeds increased marginally by 8.62 % from 581.93 thousand tonnes in 1991-92 to 632.09 thousand tonnes in 1998-99.

The National Tenth Plan has projected the demand as follows:

Production Projections

Crop	Projection in million tonnes in 2007-08
Fruits	74.40
Vegetables	175.20
others	25.330
Total	274.93

Production could be raised substantially by increasing the area under crops and enhancing the productivity of crops. As land is limited and there is competing demand for land for various purposes, it would be very difficult to bring additional land under these crops. However, there is a possibility to increase area by 10% of the existing area through adoption of following:

- Judicious utilisation of land through inter cropping/mixed cropping in the existing orchards, growing crops in vacant space, growing shade-loving crops in grown up orchards and changing crop priorities
- Development of appropriate varieties of crops and agronomic practices to suit reclaimed wastelands and dry land region in the country
- Adoption of cost effective poly green houses technology for raising crops in arid temperate regions
- High density planting by reduction in planting distance or by use of plant growth inhibitors and dwarfing rootstocks in crops like mango, citrus, apple, bannana, pineapple and some temperate fruits
- Use of protected cultivation under controlled condition for growing fruits like strawberry and vegetables like cucumber, cabbage, capsicum, tomato and temperate vegetable in plains

Productivity per unit area can be significantly increased by 20 to 50 percent through bringing maximum possible area in a systematically drawn plan for five years under high yielding/ Genetically Modified varieties and or rejuvenating the existing orchards, along with full package of agronomic practices which include mechanisation, integrated pest and nutrient management, micro irrigation -cum-

fertigation system, post harvest management etc. This effort can, also, facilitate substantial improvement in the quality of produce and reduction in the cost.

Horticulture Development in Tamil Nadu

Horticulture includes cultivation and management of fruits, vegetables, spices and condiments. Tamil Nadu has been blessed with diversified agro-climatic conditions suitable for various kinds of horticultural crops. Tamil Nadu shares 5.7 per cent of National level area under horticultural crops and 7.7 per cent in the national level production. It is aimed to achieve 8 per cent growth rate during the Tenth Five Year Plan in horticultural sector in Tamil Nadu.

Horticultural crops are grown as cash crop with high value and high share of marketable surplus. Their dependence on market is very crucial, particularly in view of their perishability. Refrigeration and containerization have their own costs. Transport of fruits such as mango or flowers involves spoilage and loss of quality in transit and which increases with the distance of market. Any delay in transport spells disaster. The factors of perishability and bulkiness limit the extent of market and market transaction opportunities. This with seasonal dumping accentuates falling of market prices, reduce traders' margin and the farmers' share and farm income. Prices are highly volatile due to seasonal conditions of supply unless they are insulated through processing, packaging and storage. Further, horticultural products are income elastic and their demand seems unstable with income variations and therefore, the supply and demand conditions influence investment in horticultural development. The operational size varies from a few trees in farms to a large plantation area of corporate venture. The period of waiting or production lags are significantly large that discourages investors who seek to earn quick return with certainty. Replanting and replacement involve additional investment periodically. Thus, the investment cycle has three phases: establishment and maintenance, production management, and replanting and replacement. Investment in horticulture is, therefore, shy and small and in droplets. Inter cropping and by products are ways of improving cash flows at the period of zero harvest, partly are mitigating income problems. The random behaviour of income flow from fruit crops either because of production risks or of price fluctuation seem to constrain large scale investment.

For vegetable and flowers, production conditions are not so limiting but marketing is. Spices and condiments, excepting cardamom, pepper, cloves and tamarind have less constraints as their storability could be improved with a small investment and efforts.

The area coverage, production and productivity under horticulture crops during 2002-03 and 2003-04 and target for 2004-05 are given below:

(Area: Lakh Ha., Production: Lakh MT., Productivity: MT/Ha.)

Sl. No.	Crops	2002-2003 (Provisional)			2003-2004 (Estimated)			2004-2005 (Projected)		
		Area	Prdn.	Pdy.	Area	Prdn.	Pdy.	Area	Prdn.	Pdy.
1	Fruits	2.27	45.85	20.20	2.32	48.26	20.80	2.51	52.96	21.10
2	Vegetable	1.71	48.13	28.15	1.86	52.82	28.40	2.15	61.49	28.60
3	Spices	1.46	6.25	4.28	1.62	6.95	4.29	1.98	8.51	4.30
4	Plantation Crops	2.35	7.57	3.32	2.39	9.25	3.87	2.50	9.75	3.90
5	Flowers	0.18	1.44	8.00	0.20	1.65	8.25	0.21	1.79	8.50
6	Medicinal Plants	0.08	0.80	10.00	0.11	1.10	10.00	0.15	1.50	10.00
	Total (All crops)	8.05	110.04		8.50	120.03		9.50	136.00	

Strategy for horticulture development

- Thrust on high tech horticulture and precision farming with micro irrigation and fertigation
 - Stabilizing the crop area of water loving crops and expanding the area under dry land crops with focus on effective water management and bringing wastelands under horticulture
 - Focus on need based research and effective coordination with the TNAU and other research institutions
 - Strengthening the production system for pedigree planting material (private/ Government)
 - Enactment of State Nursery Regulation Act to regulate and ensure quality standards
 - Enhancing the productivity of the select horticulture crops with a mission mode approach
 - Promotion of Organic farming for export market
 - Promotion of AEZ for specified crops
 - Building up public- private partnership
 - Promotion of contract /corporate farming
 - Effective transfer of technology by tour-cum-training to farmers
 - Training for Extension Officers
 - Linkage with Agro Processing Industries on New Anna Marumalarchi Thittam (NAMT) model.
 - Post Harvest Management and reduction of Post Harvest losses.
 - Strengthening the domestic market system with focus on urban markets as well as rural shandies
 - Empowerment of farmers with special focus on farmwomen
 - E-Governance and Human Resources Development through effective training for extension officers.
 - Promotion of Agri Export Zones (AEZ) for specified crops.
 - Building up of Public and Private Partnership.

The main elements in the strategy for promotion of horticulture in the three well performing States viz Maharashtra, Andhra Pradesh and Karnataka were technology transfer by farmers' training on scientific cultivation, post harvest technology, preservation and processing of horticulture produce, study tours, demonstration farms, use of bio-technology, supply of quality planting/ pedigree materials, drip irrigation, setting up of post harvest infrastructure, high tech green-houses for floriculture, cold chain (pre-cooling units, refrigerated trucks, cold storage facility at Airport for flowers for export). Besides, Andhra Pradesh has been encouraging contract farming practices (e.g., palm-oil sector) by offering incentives.

The following policies covering horticulture development in the State are already in place:

- Tamil Nadu Commercial Floriculture Policy [Agr. (H1) Deptt. G.O.Ms 392 dated 10.10.1996]
- Tamil Nadu Contract / Corporate Sector Farming Policy for Fruits & Vegetables [G.O.Ms. No.92 Ind. (MIE I) Deptt. dated 26.02.2001]
- Tamil Nadu Bio-Technology Policy [G.O.Ms. No. 318, Ind. (MIE. I) dated 12.09.2000]

Horticulture Mission

The Government of Tamil Nadu has recognized the emergence of Horticulture as a growth engine of Agriculture sector in recent years and set up a

Mission for Horticulture development in Tamil Nadu, to give an impetus to cultivation, processing for value addition and marketing of vegetables, fruits, flowers and medicinal plants in the State.

Objectives of the Mission

- 1) Improving production through balanced Nutrient management
- 2) Evolving suitable mechanism for regulating quality planting material and giving impetus to need based research
- 3) Providing adequate infrastructure for post harvest management and marketing
- 4) Encouraging active involvement of farmers' associations in adoption of modern technologies

A *Governing Body* has been constituted to monitor the effective implementation of the mission under the chairmanship of the Minister for Agriculture with the Vice- Chancellor of TNAU, Secretaries to Government and Senior Officers of various departments and Nominees of Central Government agencies like National Horticulture Board, as members. The Chief Secretary to Government is the Vice-Chairperson of the Governing Body.

Mission Target

It has been planned to achieve 8 per cent growth during the 10th Plan Period. It is also aimed to double the horticulture production by 2011-2012 in consonance with the National Horticulture Mission. Mission gives thrust for potential horticulture crops like mango, bannana, cashew, tapioca, cole vegetables, flowers and medicinal plants as components of the overall mission. The common strategies include: Adoption of INM and IPM, training of farmers in latest technology, laying of demonstration plots, efficient irrigation mangement through installation of micro irrigation system, area expansion under new high yielding and export varieties.

Mini Missions

The Tamil Nadu Horticulture Development Mission consists of following 3 Mini-Missions which have different sub-components.

Mini Mission - I -Technology generation and Research (Tamil Nadu Agriculture University)

Mini Mission - II -Transfer of Technology and Development (Deptt. of Horticulture and Plantation Crops)

- Crop Development Missions - Fruits Development Mission - Mango & Banana
- Vegetable Development Mission
- Cashew Development Mission
- Floriculture Development Mission
- Medicinal Plants Development Mission

Mini Mission - III- Post Harvest Management and Market Linkages (Deptt. of Agr. Mkg. and Agri Business)

The Union Finance Minister has indicated in his speech for Budget 2004-05 that a **National Horticulture Mission** would be launched with goal of doubling horticulture production from the current level of 150 million tones to 300 million tones by 2011-12. Towards this objective, the States would be encouraged to emulate the Anand model and establish a State Level Cooperative Society for promoting horticulture.

Micro irrigation

Drip and Sprinkler- needs considerable scaling up.

Micro-irrigation is suitable for all row crops and especially for wide spaced high value crops. The required quantity of water is provided to each plant daily at the root zone through a pipe network. Hence there is little loss of water by evaporation from the soil surface. Micro-irrigation is specially well adapted for undulating terrain, shallow soils, porous soils and water scarce areas. The main advantages of micro-irrigation as compared to gravity irrigation are:

- Increased water use efficiency
- Higher yield
- Decreased tillage requirements
- Higher quality products
- Higher fertilizer use efficiency
- Less weed growth

However, as the initial investment cost is high, adoption of micro-irrigation has been slow. Other problems are clogging of drippers, cracking of pipes, damage due to rodents and rats, high cost of spares and components and insufficient extension effort.

Studies show that water saving in this method compared to surface irrigation is about 40 to 80% and the increased yield is up to 100%. As water is becoming increasingly scarce, adoption of micro-irrigation system offers potential for bringing nearly double the area under irrigation with the same quantity of water. The cost of installing drip irrigation varies from Rs. 20,000 – Rs. 25,000/ ha. for wide spaced crops like coconut/ mango etc. to Rs. 50,000 – Rs. 60,000/ ha. for closely spaced crops like sugarcane/ cotton/ vegetables etc. The cost of the system depends upon the crop, spacing, quantity of water required, distance from water source etc. The pay back period is about one year for most of the crops and the B:C ratio varies from 2 to 5. [Status, Scope, Constraint and Potential of Micro-Irrigation in Tamil Nadu, by Dr. R.K. Sivanappan in *Kisan World* of April 2004]

Cost benefit, pay back period of micro-irrigation for various crops

Crops	Spacing (m.)	Cost of system (Rs./ ha.)	Water used lpd/ plant	Yield tonnes/ ha.	Pay back period	B:C ratio
Banana	0.91*1.5*1.8 paired row	47,500	15-20	75	1 year	3.00
Grape	3.03*1.8	44,000	15-20	45	< 1 year	3.28
Pomegranate	4.3*4.3	30,000	50-60	25	< 1 year	5.16
Ber	4.5*4.5	30,000	60	25	1 year	4.56
Tomato	0.45*0.45*1.65 paired row	30,000 canewall	40,000 lpd/ ha	45	1 season (6 months)	1.09
Papaya	1.81*1.81	40,000	15	Late x- 750 kg. Fruit - 60 t.	1 year	4.09
Cotton	0.9*1.5*1.8 paired row	47,500	8-10	1.5	1 ½ years	1.83
Sugarcane	0.83*1.66 paired row	47,500	30,000 lpd/ ha	200	1 year	3.45

[Source: Case studies in Maharashtra State by Dr. Sivanappan from the booklet *Drip Irrigation* by N. Asokaraja & K. Palanisami]

Among the advanced methods of irrigation, drip system has the added potential of precise nutrient delivery to the plant through fertigation. Farmers have to be educated through demonstrations, training and extension education relating to irrigation to change their traditional methods of irrigation. Seminars and workshops can be organized at the block, taluk and district levels to popularise the system. Drip irrigation may be extended to the following category of lands:

- Waste lands after planting tree crops including fruit trees
- Hilly areas
- Semi-arid zones
- Coastal sandy belts
- Water scarcity areas
- Command areas of community wells

The development of micro-irrigation has been very spectacular in Maharashtra after 1987. This is due to the encouragement given by the Government and the promotional efforts of the manufacturers.

The *Task Force on Micro-irrigation* (TFM) in which Dr. M.S. Swaminathan was also one of the Members has in its Report (2003) pointed out that the coverage under micro-irrigation in the country has been minuscule in the face of the fact that almost 69 M.ha. could be covered through this improved system. Though the hectareage under drip irrigation in the country rose from a meagre 1500 hectares in 1980s to nearly 5 lakhs hectares in 2002, yet the technology adoption is confined only to 12 States. Maharashtra is the single most progressive State in terms of the area under drip with a hectareage of 2 lakhs contributing to almost 46 percent of the drip area in the country. Karnataka, Tamil Nadu and Andhra Pradesh follow this with percentage of about 21, 14 and 12, respectively and Gujarat is the distant 5th one with a meager percentage of 2.5.

[According to TNAU- *Proposal for enhancing Productivity and Profitability in TN Agriculture- 2003*, the area coverage under micro-irrigation in India is only 3,12,453 hectares (1.6% of the total irrigated area). Maharashtra is the leading State covering 1,42,347 hectares under micro-irrigation followed by Karnataka with 64,680 hectares and Tamil Nadu with 43,292 hectares. According to the article *Status, Scope, Constraint and Potential of Micro-Irrigation in Tamil Nadu*, by Dr. R.K. Sivanappan in *Kisan World* of April 2004, the area under drip irrigation increased from 1,000 ha. in 1985 to 60,000 ha. in 1993, 1.70 lakh ha. in 1997, 3.10 lakh ha. in 2001, about 4 lakh ha. in 2002 covering about 30 different crops. The projected area is estimated to be about 1 million ha. in another 5 years and about 10 million ha. in 2020/2025].

The Report sets out the strategy as increase in coverage through the congruence of investment, institutional support, technological interventions, fiscal incentives as well as concession on taxes. The total expenditure could be shared by Government of India, State Government and the farmers. The Central Government's share could be 40% of the cost. The State Government's share could be 10% which could be raised by availing Rural Infrastructure Development Fund (RIDF) of NABARD. The balance 50% share may be borne by the beneficiaries for which they may seek institutional financing. The assistance should be administered through a transparent system, preferably by way of credit linked back-ended mode. Micro irrigation has to be adopted for horticulture and row crops whereas sprinkler irrigation could be adopted for pulses and oilseeds. Online type of micro irrigation could be adopted in general for horticultural crops and in-line dripper system should be with those farmers, who have gained experience in micro irrigation technology. Precision irrigation invariably enhances the frequency of application of water and has been found to give better productivity with saving of water. Therefore, pulse irrigation

should be promoted in water scarce areas. This will also help in reducing the temperature related stress to crops. Large scale demonstrations of micro irrigation technology has to be taken up at strategic locations with the involvement of the farmers.

Drip irrigation is an effective tool for conserving water resources and studies have revealed significant water saving ranging between 40 & 70% by drip irrigation compared to surface irrigation with yield increases as high as 100% in some crops in specific locations. Micro-irrigation is very popular in 30 different crops especially wide spaced horticulture crops.

Fertigation- Fertilisers applied under traditional methods of irrigation are not efficiently utilized by the crops. Once investment on drip irrigation is made, it is very easy to achieve the full benefits through the next step called fertigation which means addition of fertilizers to irrigation water and its application via drip or similar micro-irrigation system. Fertigation provides Nitrogen, Phosphorous & Potassium as well as the essential trace elements (Mg, Fe, Zn, Cu, Mo, Mn) directly to the active root zone thus minimizing the loss of expensive nutrients and helping ultimately to improve productivity and profitability.

The objective should be to expand the area under drip irrigation and fertigation by popularization of these techniques and imparting training to farmers as well as providing subsidy for drip/ drip fertigation system.

Advance planning- The seed and plants are expected to be available by June every year. Hence the Government order for seeds and plant procurement should be issued by December of previous year so that advance planning can be made to produce sufficient quantity of planting materials and seeds in time.

Organised production system for horticultural crops (with industrial tie-up and farmers' SHG Maharashtra model) may be promoted to ensure quantity, quality, uniformity and timely delivery as has been done in Maharashtra.

Measures for development (crop-wise) are set out below.

Mango

- Promotion of high yielding / export varieties
- Replacement of senile trees with new varieties
- Pruning and top working
- High density plantation
- Demo farms in farmers' fields with drip irrigation
- Nursery villages for quality planting materials
- Concentration in Mango growing districts / AEZ
- Establishment of Food Park in Dharmapuri (TIIC, CAM & MFPI)

Banana

- High yielding varieties and tissue culture plants
- Drip irrigation and fertigation
- High density plantations
- Laying demonstration plots in farmers' fields
- Adoption of INM & IPM
- Improving post harvest handling with focus on exports
- Concentration in banana growing districts / AEZ

Cashew

- Promotion of high yielding varieties

- Rejuvenation of senile gardens by replanting
- Maintaining plant density and gap filling
- High density plantations
- Demonstration plots with drip irrigation
- Training farmers in improved technology
- Concentration in cashew growing districts/ AEZ

Tapioca

- Locating virus free pockets and providing virus free sets for planting
- Promotion of high yielding varieties
- Laying of demonstration plots
- Promoting product range and Industrial linkage – Sago, ethanol, glucose, etc.
- Training the farmers

Genetically Modified Varieties - While in the conventional methods of crop improvement both desirable and detrimental genes get transferred from the parents, the modern bio-technology enables to insert a single or two/three genes into the crop to impart in it desirable characteristics. The new millennium of gene revolution helps modify some of the traits through genetic engineering that include high productivity, resistance to pest/ diseases, weeds and drought conditions, stress/salt tolerant, increasing shelf life, improving nutritional quality etc. This technique also facilitates production of uniform size, shape, colour and texture of products, besides production during off-season which can help utilize processing units throughout the year. Micro propagation is the most popular and widely commercialised technique in the world for production and supply of millions of identical plants including pathogene-free planting material. Propagation of plants through tissue culture, including sophisticated techniques as of meristem culture and molecular indexing for disease, are of immense use in making available healthy planting materials.

Tissue Culture- There is an increasing need for quality and disease free planting materials for horticulture crops. Conventional plant propagation is very slow and cannot cater to the immediate needs of the industry. Mass multiplication of horticultural crops can be done by tissue culture which would also be cost effective apart from ensuring genetically pure planting material. [TNAU has proposed establishment of a tissue culture laboratory in the existing building of the Horticultural College & Research Institute at TNAU at a cost of Rs. 73.84 lakhs (staff Rs. 24.69 lakhs for 3 years, non-recurring items Rs. 24.50 lakhs & recurring items like chemicals, other consumables Rs. 24.65 lakhs for 3 years)].

Floriculture

Floriculture is a capital intensive business. Further, the gestation period is long. Floriculture products have ample export possibilities in both developed and developing countries. Absence of infrastructural support and lack of organized marketing systems for floriculture produce are the major obstacles for the development of floriculture as a business.

Various countries have expanded vastly the area under floriculture. Columbia was having about 200 ha. in flower production in 1992 which grew to 4500 ha. in 1998. Kenya was increasing one hectare per day under poly-house on an average. The area in countries like Ethiopia, Kenya, Uganda, Zimbabwe, Zambia, Malaysia etc. is growing in geometric proportions in horticulture.

It is estimated that the world trade of **cut-flowers** is about US \$ 7.0 billion (INR 3500 crores). Europe, Japan and USA dominate the trade. India's share is less than 1%. [Countries such as Israel and Netherlands are concentrating on high value

horticultural and floricultural crops which have a high demand in international markets. Israel with all its constraints of land and water resources produces around 350 roses per square metre of land and markets them in Holland. Each rose (cut flower) earns 1 US \$ in the export market. From one hectare of land, they are able to earn \$ 3.5 million- from *Kisan World*, March 2004]

Cut-flower industry in India is 10 years old. Large commercial floriculture units have come up in areas near Bangalore, Hosur best in Tamil Nadu, Pune, Hyderabad and Delhi. Because of favourable agro-climatic condition, cheap labour, arable land and skilled manpower, India has very high potential for export of cut-flowers. Rose is the most preferred flower in international market. The share of different flowers in European market is as follows:

<i>Flower</i>	<i>Share in %</i>
Roses	51
Carnation	19
Chrysanthemum	10
Gladioli and Orchids	15
Other species	5

Out of the 71 floriculture export units operating in India, including 43 in south and 19 in west/north, some of the units have either closed down or changed hands for different reasons.

- High cost of capital investment
- Lack of infrastructure and logistic support
- Non-availability of cold-chain
- Non-availability of uninterrupted power-supply
- Lack of surety on air-cargo space in hour of need
- Low unit production of quality flowers
- Lack of technical knowledge in rural people
- Lack of effective control of plant diseases and weed growth

However, in recent years the industry has tied over initial teething problems and is ready to take off.

Though the **commercial cultivation of cut-flowers in green houses** came into existence in India in early 90s, the sector got restricted to corporate houses and big companies. The size of green houses is 1 ha. or multiples thereof. Most of the flower growers have mini green houses of 500 sq. m. Some families have even set up multiple mini houses.

Floriculture is a labour intensive activity; wages forming roughly 1/3rd of the production cost. It is estimated that the activity has a potential of generating direct employment of approximately 20 workers per ha. and indirect employment of additionally up to 200%.

Statement of National and Tamil Nadu State performance

Sl.No	Nation/ State	Area ('000' ha)	Prodn ('000 tonnes)	Productivity (tonnes/ha)
1	National level (2000-01)	98.44	556.42	5.65
2	Tamil Nadu (2001-02)	19.08	147.38	7.72
3	Highest productivity level	19.08	147.38 (TN)	7.72
	2 nd Place	15.94	111.62 (AP)	7.00
4	Bench Mark	-	-	7.75
5	Mission Target	-	-	9.00

Source: Tamil Nadu Agricultural University, Coimbatore

Tamil Nadu is the second largest producer of flowers in India. Flowers are used extensively on occasion of marriages, festivals, religious functions and ceremonies. Majority of the flowers are used without their stems for making adornments, garlands and offering for religious purposes. Another important use of flowers is for extraction of oils for perfumery industry. The total area covered under flowers in the State is 16,745 ha. and the production of flowers is 1,42,333 MTs. Jasmine grandi, jasmine aurculatum, tuberose, cossandras, champaca, rose etc. are some of the major flowers grown in the State.

The plateau of Hosur, Thalli and Denenikottai areas in Krishnagiri (earlier undivided Dharmapuri) district is located at 920 metres above MSL with red loamy soil conducive for floriculture. The average mean and maximum temperature in this region is between 14 to 28 degrees centigrade which is ideal for many flowers including filler material. There is a potential for bringing 500 ha under poly-house cultivation while at present only 50 ha. is under poly-house cultivation besides vast area in open field.

The strategy for promoting floriculture will be as follows:

- Promotion of protected cultivation in poly green houses and shade net houses
- Promotion of export oriented cut flowers / flowers
- Promotion of traditional flowers like jasmine, tube rose, crossandara, marigold etc.
- Training farmer in high-tech floriculture
- Laying demo plots
- Concentration in AEZ / flower growing districts

The strategy proposed by AFC is that for small and marginal farmers to take up cut-flower cultivation, they may be requested to form themselves into farmers clubs, each club or unit consisting of 20 members or so. Women SHGs also may be encouraged either to take up the project on their own or to assist the men folk. A cluster of 10 units (min.) of 1000 sq.m. each may be located in one or two villages. The nodal agency may facilitate the lease arrangement between the lessor and the farmers' club. Initially 5 such clusters may be established and the project location can be Thalli and Denkanikotta Blocks in Krishnagiri district. Each cluster can be attached to an individual large-scale unit/ grower or to the proposed infrastructure park coming up near Berigai in Dharmapuri district so as to have back-up support such as planting material, liquid fertilizer, chemicals for pest control, agronomy guidance etc. and also initially for post-harvest handling namely grading, packing, transport, marketing etc. Each unit will be a multi-span naturally ventilated poly-green house complex with independent water-tank, drip irrigation system, fertigation system, overhead misters etc. Each cluster, besides having 10 units of polygreen houses will also house a small cold room of 10 sq.m. and 2 or 3 water-sources (bore-well) and storage tanks.

The National Horticulture Board (NHB), APEDA and NABARD have been extending support for establishment of production facilities for intensive cultivation and export. It is expressed that there are some difficulties for people in availing themselves of this assistance. It is mentioned that NHB provides 20% of the project cost as capital subsidy subject to a maximum limit of Rs. 25 lakhs per unit but the entitlement is only for those projects which avail of a minimum term loan of 40% of the project cost. This stipulation hinders the sanction and disbursement of subsidy. It has been suggested that the upper limit may be increased to Rs. 30 lakhs per unit or norms be fixed for entitlement of subsidy on per sq. m. basis irrespective of the size of the project and project cost.

NABARD has schemes of refinance and co-finance. Since Banks are reluctant to avail of refinance, funding is possible only under co-finance. The rate of

interest of NABARD under co-finance which is the same as that of the Banks, i.e., 11%, with monthly rests, is high.

APEDA provides freight subsidy at 25% of the freight cost or IATA rate whichever is less. The actual average freight cost is around Rs. 130 per kilo while IATA rate is about Rs. 40 per kilo. It has been suggested that APEDA may give subsidy as per actual freight incurred and not as per IATA rate.

Erstwhile Dharmapuri (now Krishnagiri) district has been declared as AEZ for floriculture. Necessary infrastructure like roads, refrigerated transportation need to be provided. It has been represented that since all the units engaged in cut flower production are doing similar activity, the differentiation between a 100% unit and a DTA unit may be removed and that all necessary inputs, viz., fertilizers, chemicals, capital items etc. may be allowed to be imported/bought duty/ tax free for self-use.

Processing industry- There are 5 medium units and 14 small units in the State with an overall capacity of 7800 kgs. of *flower concrete* on a single shift basis. The manufacturing units are located broadly in three clusters- Nilakottai, Coimbatore and Vellore belts. The capital investment in a small unit of 2 T/day plant is Rs. 60 lakhs and in a medium/ large size unit of 8-10 T/ day plant is Rs. 250- 300 lakhs. Though the installed capacity on a single shift basis is 7800 kg. of flower concrete per annum, the units have been operating only at an average load of 4000 kg. per annum (approximately 50% capacity) with an export turnover of Rs. 10 crores. There are two major reasons for extraction units not being able to work to their full capacity, viz., (i) non-availability of adequate export orders, and (ii) non-availability of flowers in the price-band offered by the extraction units. Besides India, Egypt & Morocco are two other countries reported to be supplying flower concrete in bulk to Europe and other markets.

AFC has suggested a long term tie-up (or contract farming arrangement) of flower extraction unit with NGOs/ Farmer Groups for continuous supply of the flowers. The designated nodal agency may play the role of facilitator. The Association of extraction units may conduct a survey of the international flower market. Market development, brand image creation, product promotion would also help flower extraction industry.

Agri Export Zones

There is tremendous scope for the export of horticultural crops afresh as well as processed foods from Tamil Nadu. In accordance with the Government of India policy to develop Agri Export Zones in Tamil Nadu, 3 Agri Export Zones have been sanctioned and 7 Agri Export Zones have been identified having regard to the traditional cropped area and the proximity of Airport / Seaport.

Sanctioned

- 1) Flowers - Hosur (Dharmapuri District)
- 2) Flowers - The Nilgiris District
- 3) Mangoes - Theni, Madurai, Dindigul, Virudunagar, Tirunelveli & Kanyakumari Districts

Announced (2003-2004)

- 1) Banana - Tiruchirappalli District
- 2) Cashew - Cuddalore District

Under consideration

- 1) Mango - Dharmapuri District
- 2) Medicinal plants (Senna) - Tuticorin and Tirunelveli Districts
- 3) Turmeric - Erode District
- 4) Grapes - Theni District
- 5) Onion - Palladam (Coimbatore District); Oddanchatram (Dindigul District)

Food Parks

It has been proposed to setup a **food park** at Nilakkottai Industrial Estate with private sector participation. Another food park has been proposed near Krishnagiri to promote Mango Processing facilities utilizing the existing units as an industrial cluster. A food park has already been established at Virudhunagar in private sector to promote agro processing industries.

New Anna Marumalarchi Thittam (NAMT)

With a view to promoting industrial investment, employment and output in rural areas in the small-scale sector a special scheme known as *New Anna Marumalarchi Thittam* is being implemented. It aims to establish agro-based small-scale industries in all the 385 blocks in the State with capital investment of about Rs.1 crore per block. Processing of horticultural produces, flower-based extracts, coir and food processing are given importance under this scheme. Concessions like capital subsidy at 15% on investment, power tariff concession, subsidy for generator, additional 5% capital subsidy if 50% women work forces are employed, priority in power supply etc. are provided.

Innovative Programmes

Hi-Tech Horticulture-Focus is given to establishing hi-tech farms in the farmers' fields. Those plots are laid out in co-ordination with Tamil Nadu Agricultural University. Hi-tech methods are demonstrated in these farms to increase the productivity of the crops. Steps would be taken to popularize techniques like micro irrigation and fertigation, cultivation of green houses and shade nets, tissue culture plants, hybrid seeds, high density planting and use of Hi-tech farm machinery.

Nursery Villages & Seed Villages- With a view to ensure the production of quality seeds and pedigree planting materials in the private sector, the farmers in selected villages will be trained in various aspects of quality seed production and grafting techniques for the production of horticulture plants. The model villages will serve as knowledge centres for the farmers of the adjoining areas. The programme is implemented under the technical guidance of Tamil Nadu Agricultural University.

Establishment of Model Horticulture Villages- Based on the encouraging results obtained from the recent trials of this department it has been proposed to establish model villages in various districts and on-farm training will be given to the farmers in latest technologies in the cultivation of hi-value vegetables, tissue culture banana, cashew, flowers and medicinal plants. It has been proposed to establish 100 model villages in various districts in which on farm training will be given to the farmers in latest techniques.

Horticulture Self Help Groups- With a view to empowering small and medium farmers and farm women, Horticulture Self Help Groups are being organised and group oriented extension is provided to promote Horticulture. In addition to the various assistances provided under the Horticulture schemes, the groups are also eligible to get additional assistance under rural development schemes like SGSY. It has been proposed to form 1000 Horticulture Self Help Groups in various districts for effective dissemination of latest technologies in horticulture through SHG approach. Effective training will be given to the members of SHG by TNAU and the Horticulture Department.

Model farms would be established in farmers field, which would serve as an effective tool for impressive extension service. "Seeing is believing" is the underlying principle in developing such model farms.

Quality Upgradation of Tea in The Nilgiris - In order to mitigate the sufferings of the tea growers in Nilgiri districts, Government took expeditious action to assist the farmers for production of quality tea, thereby enabling them to realize better price for their tea leaves. A programme implemented with the assistance of the Tea Board from the year 2002-03 onward has broad based up-gradation of quality of tea plants and Village Awareness Campaign Programme as its components. For this purpose, 90 extension workers were recruited. After training they are being intensively engaged in the dissemination of improved technologies to the farmers. Because of these efforts, the price of tea leaves has increased. So far, an amount of Rs.63 lakhs has been spent in The Nilgiris and the programme will be continued during 2004-05.

Organic Farming-In order to switch over from the use of chemical inputs that are hazardous to human health, awareness has been created among the farming community to use organic inputs viz., neem based products, vermi-compost and bio-fertilizers like azospyrillum, phosphobacteria, etc. Based on this concept, focus would be given to organic farming in the coming years. Panchagavya and Mutka guard will also be encouraged.

Farmers' Training in Other State Institutions

Considering the need for giving exposure and training on latest technologies, the farmers are taken on tour to Government and Private Institutions in other States. It is proposed to give training to 10,000 farmers every year in reputed training institutions within and outside the State.

Promotion of Alternate Crops in The Nilgiris

Promoting alternate crops is considered as an important measure to overcome the crisis facing the tea growers. Steps are being taken to popularize multi-tier cropping, viz. cultivation of silver oak, pepper, cardamom, mandarin orange, etc., along with tea plantation. Considering the prevailing agro-climatic condition in The Nilgiris, new kinds of crops like Macadamia and Peacan nuts have been identified for introduction. It is proposed to raise these crops in the State Horticultural Farms at Nanjanad and Colegrain in Nilgiris district on trial basis. Subsequently, efforts would be made to introduce these crops to the farmers in select pockets. A sum of Rs.50 lakhs has been sanctioned by the Government for promoting alternate cropping in Nilgiris district and the scheme will be continued during 2004-05 also.

Tamil Nadu Precision Farming Project

In the Budget speech for 2003-04, Government announced the Tamil Nadu Precision Farming Project to be implemented in Dharmapuri District and newly formed Krishnagiri district covering an area of 400 Ha. of farmers' land with Micro Irrigation and Fertigation. This scheme will be implemented with a total cost of Rs.720.60 lakhs over a period of 3 years.

It is programmed to cover an area of 100 Ha. in the first year, 200 Ha. in the second year and 100 Ha. in the third year at financial allocation of Rs.208.59 lakhs, 316.16 lakhs and Rs.195.85 lakhs respectively.

The Tamil Nadu Agricultural University will undertake this project as a Turnkey project and implement it with the Departments of Horticulture, Agricultural Engineering, Agriculture, Agricultural Marketing and Agri. Business and the District Administration.

Under this project, 100% subsidy will be given on the cost of cultivation of the first crop to the farmers selected during first year. 10% of the cost of cultivation will be collected from the farmers selected during second year. 20% of the cost of cultivation will be collected from the farmers selected during third year.

Source of Funds

- Dovetailing of funds for on-going schemes of Departments of Horticulture, Agriculture, Agriculture Engineering, Agriculture Marketing and Agri Business & TAWDEV Agency
- In addition, accessing funds from NABARD, NHB, APEDA & MFPI and external agencies like World Bank, IFAD, ADB, etc.
- Funds from the special schemes of Government of India like the National Horticulture Development Mission, Rashtriya Sam Vikas Yojana (RSVY) etc. for the overall development of horticulture in Tamil Nadu.

Horticulture and Plantation crops Department are implementing various schemes viz., State Plan Scheme and Centrally Sponsored Schemes involving various components. This Department is also maintaining 54 State Horticulture Farms and pedigree planting materials are being produced for distribution both through various schemes as well for sales. These schemes are briefly described below.

Organic Farming

In order to switch over from the usage of chemical inputs that are hazardous to human health, awareness has been created among the farming community to use organic inputs viz., neem based products, vermi-compost and bio-fertilizers like azospirillum, phosphobacteria, etc. Based on this concept, focus would be given to organic farming during 2004-05 as already indicated. Panchagavya and Mutka guard will also be encouraged.

Farmers' Participatory Demonstration of Green Village Programme

This programme with the objectives of (a) promotion of toxin free food production, (b) ensuring the sustainability of the production system particularly soil, (c) ensuring supply of organic produce to the consumers and (d) developing model organic villages will be implemented by the Tamil Nadu Agricultural University over a period of three years covering 100 villages in six districts. Farmers, farmer groups and self help groups will be involved. The TNAU will closely work with the Departments of Horticulture and Plantation Crops and Agricultural Marketing and Agri Business. The proposed outlay is Rs. 63.44 lakhs.

Establishment of Commercial Tissue Culture Laboratory for Horticultural Crops

This programme is proposed (i) to propagate horticultural planting materials in large scale for commercial distribution to farmers and (ii) to produce disease free horticulture planting materials. This programme will be implemented by TNAU at Coimbatore over a period of three years at a total cost of 73.84 lakhs. The TNAU will work in close association with the Department of Horticulture and Plantation Crops.

Farmers' Participatory Demo of Medicinal Plants Production Programme

The proposed programme will help the farmers to undertake cultivation of medicinal plants in an organized way by ensuring quality standards for export and domestic utilization. Initiatives will also be taken to resolve the marketing problems. This programme will be implemented by TNAU over a period of three years at a total cost of 168.60 lakhs in close association with the Department of Horticulture and Plantation Crops and Department of Agricultural Marketing and Agri Business. A total area of 1500 acres will be covered in 60 villages spread over six districts.

Regulation of Plant Propagation and Nursery Development

This project will promote production of genetically pure and healthy horticulture, planting material to be made available during the planting season

through Nursery Village concept by involving farmers' groups. This project will be implemented over a period of three years by TNAU in collaboration with the Department of Horticulture and Plantation Crops at a total cost of 70.74 lakhs.

Conservation of rare tree species-Eco friendly (Green) Movement

Conservation of rare germplasm is an important item in the 'Green Agenda'. There are trees, some more than a thousand years old in temples which are worshipped as 'Sthala Vrikhas'. This was an attempt of our ancestors to conserve rare germplasm and also show the importance of trees and forest. This also testifies to the ecological awareness of our ancient civilization.

For example, the tree in Kodumudi has different types of fruits in each branch. It is proposed to conserve multiply such rare trees which are becoming extinct due to their age by use of hi-tech tissue culture propagation. This will be done by the Department of Horticulture in association with the Tissue Culture Laboratory of Tamil Nadu Agricultural University.

Part II Schemes (New Schemes 2004-05)

The following new schemes will be implemented during the year 2004-05:

(1) *Tamil Nadu Horticulture Development Agency (TANHODA)*-An independent nodal agency viz., The Tamil Nadu Horticulture Development Agency (TANHODA) will be established with the following objectives:

- To promote Hi-Tech Horticulture and Precision Farming
- To promote Public Private Partnership (PPP) for horticulture development
- To disseminate knowledge on modern technologies in horticulture to the farming community as well as extension personnel
- To manage production and distribution of pedigree planting materials through State Horticulture Farms
- To implement horticulture development schemes including the schemes under the Tamil Nadu Horticulture Development Mission and the National Horticulture Mission by accessing funds from the agencies concerned

This agency will serve as a special purpose vehicle (SPV) for the implementation of various horticultural development programmes.

(2) *Improving Infrastructure Facilities in the State Horticulture Farms*-A sum of Rs. 15.00 lakhs was sanctioned during the year 2003-04 for establishing a new State Horticulture Farm at Kannampalayam of Coimbatore district. Further a sum of Rs.100.00 lakhs was sanctioned to improve the infrastructure facilities in 25 State Horticultural Farms during the year 2003-04. Similarly during the year 2004-05, it is proposed to improve the infrastructure facilities in 28 State Horticultural Farms at a cost of Rs. 120.00 lakhs. This fund will be utilised to improve the existing irrigation facilities and to create additional infrastructure in the State Horticultural Farms to improve the production of pedigree and hybrid planting materials.

State Plan Schemes

1. Integrated Horticulture Development Scheme

a. Area Expansion Programme

The objective of the scheme is to increase the area, production and productivity of fruits, vegetable and flowers in Tamil Nadu by supply of quality planting materials and seeds at 50% subsidy to the farmers, enhancing the area under Hybrid and HYV vegetables, new and export varieties and varieties preferred for processing. An area of 26,800 hectares was covered during 2002-2003 and

Rs.294.48 lakhs was spent. During the year 2003-04, an area of 17279 ha was covered and an amount of Rs.249.61 lakhs was spent. An amount of Rs.266.27 lakhs is provided for 2004-05 to cover an area 16772 ha.

b. State Horticulture Farms and Government Orchards

Quality and pedigree planting materials are produced in 54 State Horticulture Farms. The total farm area is 2598 Ha. These farms also serve as "Model Demonstration Units" to the farmers, besides providing employment opportunities to the landless labourers. The aim of the scheme is to produce quality and pedigree plants, increase in the share of kinds and varieties in demand both for domestic and export and kinds suitable for waste and arid lands would be produced in large quantities. During 2002-03 and 2003-04, a total of 100 lakh Nos. of Horticultural plants and 99.900 MT of vegetable seeds were produced and the expenditure was Rs.467.73 lakhs. During 2004-05, an amount of Rs.570.35 lakhs is proposed and 100 lakhs of Horticultural plants and 100 MTs of vegetable seeds will be produced for distribution to the farmers under various schemes.

c. Horticulture Training Centre at Madhavaram and Kudumianmalai

In-service Training to field functionaries, viz. Assistant Agricultural Officer / Field Demonstration Officer are given every year at Horticultural Training Centre, Kudumianmalai on improved production technologies of horticultural crops for upgrading their skill and updating their knowledge. A two-year Diploma course is conducted at Horticultural Training Centre, Madhavaram with an annual intake of 40 students. During 2002-03 an amount of Rs.0.19 lakh was spent towards imparting training to 603 extension officers and for 36 students admitted in the Diploma course. This scheme is proposed for continuance during 2003-04 also with an outlay of Rs.0.39 lakh.

2. Integrated Tribal Development Programme

The aim of the scheme is to improve the Socio-economic status of the tribals and to promote better utilisation of resource in these areas and training the Tribals on improved techniques. This scheme is implemented in Shevarayan Hills, Aranothumalai Hills, Pachamalai Hills and Kalrayan Hills of Salem district, Kolli Hills of Namakkal district, Pachamalai Hills of Trichy district, Sitheri Hills of Dharmapuri district, Javadu Hills of Vellore and Kalrayan Hills of Villupuram district. Growing perennial fruit crops is proposed and quality planting materials are distributed to each tribal grower at 25% cost during 2002-03 and 75% subsidy to cover an area of one acre/farmer and proper follow up action is arranged.

An amount Rs.2.05 lakhs and Rs.43.13 lakhs were spent during 2002-03 and 2003-04 respectively. An amount of Rs.42.55 lakhs is proposed in BE 2004-2005. An area of 448 ha was covered as against the target of 448 ha. The same target will be maintained for 2004-05.

3. Western Ghat Development Programme

The main objective of the scheme is to prevent soil erosion in the areas of Western Ghats and to improve the eco-system. This scheme is being implemented in the districts of Coimbatore, Erode, Dindigul, Theni, Virudhunagar, Madurai, Kanyakumari and Tirunelveli. Under this scheme, quality planting materials, vegetable seeds, implements and other inputs are distributed to the farmers at 50% subsidy for taking up cultivation of horticultural crops.

An amount Rs.126.12 lakhs and Rs.141.30 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.152.79 lakhs is proposed in BE 2004-

2005. As against the target 1736 ha, an area of 1700 ha was covered during 2003-04 and 1259 ha is targetted for 2004-05.

4. Hill Area Development Programme

This scheme is implemented in Nilgiris district in order to prevent soil erosion in the sloppy hill areas and to preserve the eco-system of the hills by crops diversification viz. from annual crops to perennial horticultural crops like tea, coffee, fruit, spices and other economic crops. Farmers are encouraged to take up vegetable cultivation in the lands having less than 10% slopes. Under this scheme, planting materials are produced and supplied to the farmers at subsidised cost.

An amount Rs. 28.03 lakhs and Rs.283.75 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.350.96 lakhs is proposed in BE 2004-2005. As against the target 1290 ha, an area of 1287 ha was covered during 2003-04 and 1309 ha is targetted for 2004-05.

Centrally Sponsored Schemes

1. Integrated Programme for Development of Cashew

This scheme is implemented to increase the production of cashew in the State by adopting a three pronged approach viz., area expansion, rejuvenation of old senile garden and adoption of integrated pest control measures. Demonstrations are also being laid out for the promotion of improved cultivation techniques for the benefit of the growers.

This scheme was implemented at cost of Rs.229.73 lakhs and Rs.271.25 lakhs during 2002-03 and 2003-04 respectively. An amount of Rs.272.06 lakhs is proposed for 2004-05.

2. Integrated Programme for Development of Tropical, Temperate and Arid zone fruits

The main object of the scheme is to step up the production and productivity of fruit crops for which assistance will be given for quality planting materials of high yielding varieties and inputs to the growers and the farmers trained on the latest technologies.

An amount Rs.161.53 lakhs and Rs.311.78 lakhs were spent during 2002-03 and 2003-04 respectively. An amount of Rs.311.78 lakhs is proposed in BE 2004-2005.

The target for 2003-04 and the proposed target for 2004-05 is set out below.

No.	Details	Target for 2003-2004	Achievement 2003-2004	Target for 2004- 2005
I. Physical (Area in Ha.)				
1.	Area coverage under Spices crops	8080	8080	8900
2.	IPM of Pest and diseases (ha)	1000	1000	1100
3.	Training (no)	1500	1500	1650
II. Financial (Rs. in lakhs)		311.77	311.77	342.95

3. Integrated Programme for Development of Spices

This scheme is to increase the area and production of various spice crops like pepper, turmeric and chillies in Tamil Nadu by providing assistance for quality seeds and planting materials to the growers.

An amount Rs.263.08 lakhs and Rs.188.76 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.190.03 lakhs is proposed in BE 2004-2005. The target for 2003-04 and the proposed target for 2004-05 is furnished below.

S. No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical				
1.	Area coverage under Spices crops (Ha)	4500	4500	5000
2.	Demonstration plots in Spices crops	5800	5800	6400
II. Financial (Rs. in lakhs)		188.75	188.76	190.03

4. Scheme for Development of Commercial Floriculture

The scheme aims at promoting cultivation of flowers of commercial importance on large scale. Demonstration plots are laid out in the farmers' holdings and inputs worth of Rs.60, 000/- per plot are distributed to the growers for establishing demonstration plot in an extent of 0.10 ha. A Model Floriculture Centre has been established at Udhaigai for demonstration and production of tissue culture plants for distribution among farmers.

An amount Rs.57.16 lakhs and Rs.172 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.172 lakhs is proposed in BE 2004-2005.

The target for 2003-04 and the proposed target for 2004-05 is set out below

S. No.	Details	Target for 2003-2004	Achievement 2003-2004	Proposed Target for 2004-2005
I. Physical				
1.	Area Expansion (Area in Ha.)	850	850	950
2.	Training to Farmers (Nos.)	1000	1000	1100
II. Financial (Rs. in lakhs)		172	172	172

5. Scheme for Development of Vegetables including Root and Tuber crops

The main object of the scheme is to increase the production and productivity of vegetables including Root and Tuber crops in the State. Demonstration Plots are laid and training to farmers given under this scheme. An amount Rs.46.23 lakhs and Rs.260.50 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.260.50 lakhs is proposed in BE 2004-2005.

The target for 2003-04 and the proposed target for 2004-05 is furnished below.

S. No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical				
1.	Improving Productivity (Ha)	7000	7000	7700
2.	Training to Farmers(no.)	2000	2000	2200
3.	Demonstration Plots(No)	1000	1000	1100
II. Financial (Rs. in lakhs)		46.23	260.50	260.50

6. Development of Medicinal and Aromatic Plants

The scheme is implemented with the objective of introducing medicinal plants and to increase their area and production in Tamil Nadu. Demonstration-cum-seed

production centres are laid out in the farmers fields for which assistance is given for inputs worth Rs.1500/- per plot of 0.05 ha. An amount Rs.26.23 lakhs and Rs.48 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.48 lakhs is proposed in BE 2004-2005.

The target for 2002-03 and the proposed target for 2003-04 is furnished below.

S. No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical (Nos.)				
1	Area expansion (Ha)	200	200	200
2	Demosntration Plot (No.)	2000	2000	2200
3	Minikit distribution	200	200	220
II. Financial (Rs. in lakhs)		26.23	48	48

7. Integrated Programme for Development of Cocoa

This scheme is implemented to increase the production and productivity of cocoa in the State. Demonstration Plots are laid out by using vegetative propagated high yielding varieties in the farmers' holdings in order to educate them on the latest technology. An amount Rs.6.64 lakhs and Rs.18.01 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.18.01 lakhs is proposed in BE 2004-2005.

The target and achievement during 2002-03 and target proposed for 2004-05 is furnished below.

S. No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical				
1.	Area expansion (Ha.)	200	200	220
II. Financial (Rs. in lakhs)		5.50	18.01	18.01

8. Development of Mushroom cultivation

The main object of the scheme is to improve the quality and the production of mushroom in Tamil Nadu. Under this scheme training is given to farmers in order to educate them about mushroom cultivation. An amount Rs.5.20 lakhs and Rs.10 lakhs was spent during 2002-03 and 2003-04 respectively. An amount of Rs.10 lakhs is proposed in BE 2004-2005.

The target and achievement during 2003-04 and target proposed for 2004-05 is furnished below.

Sl.No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical				
1.	Training to farmers(No.)	2000	2000	2200
II. Financial (Rs. in lakhs)		6.00	10	10

9. Use of Plastics in Horticulture

Polygreen Houses - This scheme is implemented to popularise the use of plastics in the cultivation of Horticulture Crops. For establishing one unit of low cost polygreen house, 40% subsidy to a maximum of Rs.40, 000/- unit is given. The other component of this scheme is distribution of polythene sheets for drying of spices to

get quality produce and establishment of low tunnels for production of plants. An amount Rs.22.45 lakhs and Rs.34.5 lakhs were spent during 2002-03 and 2003-04 respectively. An amount of Rs.34.50 lakhs is proposed in BE 2004-2005.

The target and achievement during 2003-04 and target proposed for 2004-05 is furnished below.

No.	Details	Target for 2003-04	Achievement 2003-04	Proposed Target for 2004-05
I. Physical				
1.	Green house demo (Sq.mt)	22500	22500	45000
2.	Shade net House (in lakhs)	4	4	4.4
II. Financial (Rs. in lakhs)		22.88	34.50	34.50

III Agricultural Engineering

Tractor and Bulldozer Hiring Scheme

Agricultural Engineering Department provides necessary support to farmers in reclamation of virgin land and to carryout cultivation operations like ploughing, harrowing, puddling and harvesting. In order to bring virgin lands to arable conditions, the department has a fleet of 122 Bulldozers to work in the districts all over the State. In order to take up ploughing operations, the department has 122 tractors and 4 combine harvesters.

IV Crop Insurance (Co-operation Department)

The comprehensive Crop Insurance Scheme implemented in this State from 1.4.85 was discontinued with effect from Rabi 1999-2000 season. The Government of India introduced a new scheme called "National Agricultural Insurance Scheme (NAIS)" for Crop Insurance from Rabi 1999-2000. However, in Tamil Nadu the scheme was implemented only from Khariff 2000. Under the scheme, Food Crops like paddy, Ragi, Choram, Oil Seed crops like Groundnut, Gingely and commercial crops like Cotton and Potato are covered. The sum insured will be upto 100% value of the threshold yield on normal coverage and upto 150% on additional coverage. Moreover, apart from the loanee farmers, non-loanee farmers are also covered under this scheme.

The Small and Marginal farmers insuring their crop are given 50% of premium subsidy under this scheme. The burden of premium subsidy to Small Farmer/Marginal farmer is shared by Government of India and State Government on 1:1 basis.

1. Assistance to Small and Marginal Farmers enrolled under Crop Insurance Scheme

	(Rs. in lakhs)	
	Revenue	
Budget Estimate 2003-2004	-	25.00
Revised Estimate 2003-2004	-	25.00
Budget Estimate 2004-2005	-	25.00

The National Agriculture Insurance Scheme is being implemented in the State from Kharif 2000. Under the scheme approved by Government of India 50% premium by way of subsidy is allowed in respect of small farmers and marginal farmers which is to be shared equally by Government of India and State Government. Based on the proposals received from Government of India, the State Government share of premium subsidy is claimed. For the year 2003-2004, the proposals for sanction of premium subsidy for small and marginal farmers are as follows:

Season	Amount
Paddy II	Rs.12,02,624
Paddy III	Rs.1,79,885
Paddy III Other crops	Rs.3,68,010
Total	Rs.17,51,519

Further, it is expected that General Insurance Corporation of India will send proposals under this Scheme for Paddy-I (Kar, Kuruvai, Sornavari) and Paddy -II Crop season. The Budget Estimate for 2004-2005 is Rs.25.00 lakhs.

2. Contribution to the National Agricultural Insurance Scheme (State's Share)

	(Rs. in lakhs)
Budget Estimate 2003-2004	- 1000.00
Revised Estimate 2003-2004	- 1516.35
Budget Estimate 2004-2005	- 1000.00

Under the National Agricultural Insurance Scheme which is under implementation from Rabi 1999-2000 in the State, the State Government will have to meet 50% of the claims approved which exceeds 100% of premium collected for food crops. The said claims will be settled only on receipt of respective share of claims from the State Government and the Government of India.

In G.O.Ms.No.193, Cooperation Food & Consumer Protection Department, dated 23.5.2003, the Government has sanctioned a sum of Rs.1,08,62,844 being 50% of the State Government's Share for the claims approved by General Insurance Corporation of India for Paddy I 2002 Crop Season. Hence provision of Rs.1516.35 lakhs was suggested in RE 2003-2004. A sum of Rs.1200 Lakhs is provided in B.E. 2004-2005.

Plan Outlay - Crop Husbandry

A sum of Rs. 17928.12 Lakh is proposed for the Sector. The component wise outlay for the year 2004-05 is as follows:

(Rs. in Lakh)

Sl.No.	Component	Total Outlay
1	Direction and Administration	61.00
2	Food grains Crops	89.46
3	Seeds	1629.59
4	Manures and Fertilisers	7.43
5	Plant Protection	119.98
6	Commercial crops	975.72
7	Extension and Training	57.12
8	Crop Insurance	1225.00
9	Agricultural Economics and Statistics	14.37
10	Development of Pulses	55.76
11	Agricultural Engineering	10078.65
12	Development of Oilseeds	177.36
13	Small and Marginal Farmers	17570.00
14	Horticulture & Vegetable Crops	985.33
15	Special Component Plan	848.73
16	Tribal Area Sub Plan	42.55
17	Other Expenditure	375.12
18	Hill Area Development	350.96
19	Western Ghat Development	152.79
A	Total -State Schemes	34816.93
B	Total-Centrally Sponsored Schemes (100%-centre)	84.65
C	Total-Autonomous Bodies	0.00
D	Total-Shared Schemes between Centre and State (Full Cost Shown)	3872.67

Annexure
Alternative Cropping Pattern (Agro-climatic zone wise)

I. North East Zone – Kanchipuram, Tiruvallur, Cuddalore, Villupuram, Vellore & Tiruvannamalai	
<i>Command Areas (Sathanur)</i>	Heavy clay & sandy soils
Existing	Rice (Aug-Jan) – Pulses / Sesame (Jan-Apr)
Normal	Rice (Aug-Jan) – Pulses / Sesame (Jan-Apr)
Moderate drought	Maize (Aug-Dec) – Pulses (Jan-Mar)
Severe drought	1. Pearl millet / Sorghum / Fodder (Oct-Jan) 2. Cluster bean / Vegetable beans (Oct-Jan) in heavy soils
<i>Tank-fed areas</i>	Heavy clay, laterite soils
Existing	Rice (Aug-Jan) – Pulses (Jan-Apr)
Normal	Rice / Vegetables (Aug-Jan) – Sesame / Pulses (Feb-May)
Moderate drought	Pearl millet + Cluster bean (Aug-Jan) – Pulses (Feb-Apr) Pulses (Jun-Sep) – Wheat (Nov-Feb)
Severe drought	Wheat / Fodder (Nov-Feb)
<i>Well-irrigated areas</i>	Laterite, Red and Black soils
Existing	1. Sugarcane (plant) (Dec-Jan) – Sugarcane (ratoon) (Jan-Nov) - Rice (Dec-May)–Groundnut (Jun-Sep /Oct)–3 year rotation. 2. Rice (Aug-Jan) – Groundnut (Feb-Apr) – Sesame (Apr-Jun) 3. Banana (Jul-Aug) – Banana ratoon (Sep-Aug) – Vegetable (Sep-Feb) – Maize (Feb-May) – 3 rotation.
Normal	1. Vegetables (Jun-Oct)– Maize (Oct-Jan)- Pulses (Feb-May) 2. Maize (Jun-Sep) – Cabbage / Knolkhol (Oct-Feb) – Pulses (Feb-May) 3. Maize (Jun-Sep) – Marigold (Oct-Feb) – Pulses (Feb-May) 4. Chrysanthemum (May –Mar) – Chrysanthemum
Moderate drought	Vegetables (May-Jul) –Maize / Sunflower (Aug-Dec) – Groundnut / Sesame (Jan-Apr)
Severe drought	Pearlmillet / Sorghum / Vinca rosia / Senna (Jul-Oct) – Wheat (Nov-Feb) – Cluster beans / Drought tolerant Vegetables / Watermelon (Feb-May)
<i>Rain-fed areas</i>	Laterite, Red and Black Soils
Existing	1. Pearl millet (Jun-Sep) – Groundnut (Oct-Feb) 2. Sesame (Jun-Sep) – Groundnut (Oct-Feb) 3. Groundnut (Jun-Sep) – Sesame (Oct-Feb)
Normal	1. Maize (Jun-Sep) – Groundnut (Oct-Feb) 2. Aswagantha (Jun-Jan) – Pulses (Feb-May)
Moderate drought	Maize (Heavy soils / Sunflower + Pulses / Sesame (Oct-Jan)
Severe drought	Pearl millet/ Ragi / Horse gram / Sunflower /Minor millets / Pulses/ Aloe (Oct-Jan)
Perennial crops- 12% of cultivated area Cashew, Jack fruit, Casuarina, Jatropha, tree fodder (Glyricidia) Livestock-Sheep and Poultry Sericulture	
II. North West Zone - Dharmapuri, Salem, Namakkal	
<i>Command Areas (Krishnagiri Reservoir and system tanks)</i>	Red and Heavy Clay

Existing	Rice (Jun-Sep) – Rice (Dec-Mar)
Normal	1. Bhendi / Cluster bean / Watermelon (Jun-Sep) – Rice (Dec- Mar) 2. Cotton (Aug-Jan) – Green gram / Cowpea (Feb-Apr)
Moderate drought	Green manure / Pulses (June Sowing) – Rice (Aug-Jan)
Severe drought	Cowpea / Minor millets / forages (Oct-Jan)
<i>Well-irrigated areas</i>	Red and Black Soils
Existing	1. Tapioca (Jan-Dec) 2. Groundnut (Jun-Sep) – Wheat / Cole vegetables (Oct-Feb) – Pulses / Sesame (Feb-May) Cotton (Aug-Feb) – Pulses / Sesame (Feb-May)
Normal	1. Tapioca (Jan-Dec) 2. Groundnut (Jun-Sep) – Wheat / Cole vegetables (Oct-Feb) – Pulses / Sesame (Feb-May) Cotton (Aug-Feb) – Pulses / Sesame (Feb-May) 3. Cotton (Aug-Dec) – Pulses (Feb-Jun) 4. Coleus (Jun-Nov) – Maize (Dec-May) 5. Vegetables / Gherkins (Jun-Nov)
Moderate drought	1. Forage / Pulses (Mar-May) – Groundnut (Dec-Mar) 2. Ragi /Maize/ Minor millets (Jun-Sep) – Wheat / Cole Vegetables (Nov-Jan) – Ilybrid Tomato (Feb-May) 3. Grapes – 3 years 4. Jasmine / Arali / Stevia/ Jatropha/ Agathi
Severe drought	Sorghum / Pearl millet + Pulses / Wheat (Aug-Feb)
<i>Rain-fed areas</i>	Red and Black soils
Existing	1. Tapioca (Jun-Dec) 2. Groundnut + Pulses / Castor (May-Oct)
Normal	1. Tapioca (Jun-Dec) 2. Ragi / (Groundnut / Sunflower + Pulses / Castor (May-Oct) 3. Rainfed Tomato (Jun-Sep) – Horse gram (Oct-Dec) 4. Wheat
Moderate drought	1. Groundnut spreading / Sunflower + Castor + Redgram (Jun-Sep) – Horsegram (Oct-Dec) 2. Sorghum / Maize/ Pearl millet + Pulses (May-Oct) 3. Castor + Pulses (Jul-Dec)
Severe drought	1. Ragi / Minor millets + Castor /Fodder (May-Oct) 2. Castor + Pulses (Jul-Dec)
20% tree crops- Mango, Amla, Sapota, tree fodder (Glyricidia), Simarouba Sericulture Dairy & poultry Sheep	
III. Western Zone- Erode , Coimbatore , Karur (Parts), Namakkal (Parts), Didigul (Parts), Theni (Parts)	
<i>Command Areas (LBP, PAP, ARP)</i>	Red and Black soils
Existing	1. Rice (Aug-Nov) – Groundnut (Dec-Mar) 2. Rice (Jun-Sep) – Rice (Oct-Jan) 3. Sugarcane (plant) (Dec-Nov) – Sugarcane (ratoon) (Dec-Nov) - Rice (Jan – Apr) 4. Tuemic (May-Jan) – Rice (Feb-Apr) 5. Banana –Banana
Normal	1. Rice (Aug-Nov) – Groundnut (Dec-Mar) 2. Turmeric (May-Jan) – Rice (Feb-Apr)

	3. Sugarcane (plant) (Dec-Nov) – Sugarcane (ratoon) (Dec-Nov) - Rice (Dec-Apr) 4. Groundnut (Jun-Sep) – Rice (Oct-Jan) – Maize (Feb-May) 5. Jasmine / Marigold / Papaya
Moderate drought	Maize (Jun-Sep) – Vegetables / Sunflower / Sesame (Oct-Feb) – Pulses (Mar-May)
Severe drought	Pearl millet / Fodder Sorghum / Pulses / Sesame (Aug-Feb)
<i>Well-irrigated areas</i>	Red and Black soils
Existing	1. Sugarcane (plant) (Mar-Jan)– Sugarcane(Ratoon)(Feb-Dec) – Millets / Cotton (Jan-Apr) – (2 Year rotation) 2. Cotton (Aug-Dec) –Millets / Vegetables (Jan-Apr) – Groundnut (may-Jul) 3. Turmeric (May-Dec) – Maize (Jan-Apr) 4. Annual Moringa (Jun sowing – Ratoon – 2 year rotation)
Normal	1. Sugarcane (plant) (Mar-Jan) – Sugarcane(Ratoon) (Feb-Dec) – Millets / Cotton (Jan-Apr) 2. Cotton (Aug-Dec) – Coleus/ Vegetables (Jan-Jul) 3. Annual Moringa (Jun sowing – Ratoon – 2 year rotation) 4. Turmeric (Jan-Apr) / Coleus
Moderate drought	1. Maize (Aug-Dec) – Vegetables / Beans / Pulses (Jan-Apr) 2. Pulses (Aug-Nov) – Wheat (Nov-Feb) 3. Annual Moringa 4. Wheat
Severe drought	Small millets / Sesame – Minor millets / Forages (Aug-Dec)
<i>Rain-fed areas</i>	Red and Black soils
Existing	1. Millets (Jul-Aug) / Maize – Pulses (Oct-Nov) 2. Cotton (Jul – Nov) – Fallow 3. Groundnut – Fallow
Normal	1. Millets (Jul-Aug) / Maize – Pulses (Oct-Nov) 2. Cotton (Jul – Nov) – Wheat (Nov-Feb)
Moderate drought	1. Sorghum / Maize + Pulses (Aug-Jan) 2. Castor + Pulses (Jul-Jan)
Severe drought	1. Sorghum / Pearl millet / Horsegram/ Bengalgram / Forage / Minor millets (Oct-Jan) 2. Castor + Pulses (Jul-Jan)
15% tree crops- Coconut + Vanilla/ Pepper/ Cocoa Sericulture Dairy, poultry, sheep & rabbit Essential oil crops like Lemongrass/ Citronella	
IV. Cauvery Delta Zone- Thiruchrapalli, Perambalur, Pudukottai (Parts), Thanjavur, Nagapattinam, Tiruvarur, Cuddalore (Parts)	
<i>Command Areas Cauvery</i>	Mixed Alluvium and Heavy Clay
Existing- <i>Old Delta</i>	1. Rice (Jun-Sep) –Rice (Oct-Jan) – Pulses / Sesame (Feb-May) 2. Rice (Aug-Jan) - Pulses / Sesame / Cotton (Jan-Apr) Sugarcane (plant)- sugarcane (ratoon)
Existing- <i>New Delta</i>	Rice (Aug-Jan) –Groundnut (Jan-Apr) – Sesame/ Maize (Apr-Jun)
Normal – <i>Old Delta</i>	Maize/ Vegetables (Jun-Sep)– Rice (Oct-Jan)– Rice fallow pulses/ Cotton / Sesame / Sunflower (Feb-May) Sugarcane
Normal- <i>New Delta</i>	Maize/ Vegetables/ Groundnut (Jun-Sep)– Rice (Oct-Jan)– Sesame / Groundnut (Feb-May)
Moderate drought- <i>Old</i>	Pulses / Green manure (June- Sep) – Rice (Aug-Feb) – Groundnut

<i>Delta</i>	(Feb-May)
Moderate drought- <i>New Delta</i>	Sesame/ Green manure (June- Sep) – Rice (Aug- Feb)- Groundnut (Feb-May)
Severe drought – <i>Old Delta</i>	Millets (grain/ fodder) (Jun-Sep) – Maize / Forage (Oct-Feb) – Pulses (Feb-May)
Severe drought – <i>New Delta</i>	Sesame/ Green manure- Maize/ Vegetables (Oct.-Feb) – Pulses (Feb-May)
<i>Well-irrigated areas (filter point well)</i>	Heavy clay and Laterite soils
Existing	1. Rice (Aug-Dec) – Groundnut (Dec-Mar) 2. Banana (Jan-Dec) – Banana ratoon (Jan-Dec) – Rice (Dec-Apr) 3. Vegetables (Jun-Sep) – Rice (Oct-Feb)
Normal	1. Banana with drip fert (Jun-May) –Banana ratoon (May-June) – Vegetables (Jun-Dec) – Rice (Dec-Apr) 2. Vegetables (Jun-Sep) – Maize / Pulses (Oct-Feb) – Pulses (Feb-May) 3. Gloriossa – 2 year rotation / Coleus
Moderate drought	Maize (Aug-Dec) – Sesame / Soybean (Dec-Mar)
Severe drought	1. Vegetables (Jul-Dec) – Watermelon / Cluster bean / Cucumber (Jan-Apr) 2. Vinca rosea / senna (Jun-Sep)
<i>Rain-fed areas</i>	Laterite soil
Existing	Groundnut + red gram (Oct-Feb)
Normal	Groundnut + red gram (Oct-Feb) Green Chilli / Cluster beans / Bhendi (Oct-Feb)
Moderate drought	Sorghum / millets + pulses / sesame/ cucurbits (Oct-Feb)
Severe drought	Fodder sorghum / minor millets / forages (Oct-Feb)
20% tree crops- Mango, Cashew, Lime, Coconut + Vanila/ Cocoa/ Pepper, Amla, Bamboo, Casuarina Oil palm in New Delta area in well drained soil with assured irrigation Dairy, Fresh water fisheries, Sheep	
V. Southern Zone- Madurai, Ramanathapuram, Virudhunagar, Sivagangai Tirunelveli, Toothukudi	
<i>Command Areas (Periyar-Vaigai and Thamiraparani)</i>	Black and Red soils
Existing	1. Rice (Jun-Sep) – Rice (Oct-Jan) – Pulses(Feb-Apr) 2. Rice (Jun-Sep) – Rice (Oct-Jan) – Green manure (Feb-May) 3. Banana – 2 years
Normal	1. Rice (Jun-Sep) – Rice (Oct-Jan) – Pulses(Feb-Apr) 2. Rice (Jun-Sep) – Cotton / Chillies / Pulses (Oct-Jan) 3. Banana (Jun) –Banana ratoon- Pulses (Feb) – 2 year rotation
Moderate drought	Vegetables (Jun-Sep) – Rice (Oct-Jan) – Fallow
Severe drought	Maize (Jun-Sep) – Senna / Vinca rosea (Oct-Jan)
<i>Tank-fed areas</i>	Black soils
Existing	1. Rice (Sep-Jan) –Cotton (Feb-Aug) 2. Rice (Jun-Sep) –Chillies (Oct-Feb)
Normal	1. Rice (Oct-Jan) – Cotton (Feb-Aug) 2. Maize (Jun-Sep) – Chillies (Oct-Feb)
Moderate drought	Maize / Vegetables / Chillies (Jun-Oct) – Pulses (Nov-Feb)
Severe drought	Sorghum / Minor millets / Sesame / Forage / Watermelon / Gourds /

	Senna (Sep-Feb)
<i>Well-irrigated areas</i>	Red and Laterite soils
Existing	1. Chillies / Groundnut (Jul-Jan) – Cotton (Feb-Jun) 2. Pearl millet (Jun-Aug) – Chillies (Oct-Apr) 3. Rice (Oct-Feb)- Pulses (Mar-Jul)
Normal	Chillies / Groundnut (Jul-Jan)- Cotton (Feb-Jun)
Moderate drought	Maize / Chillies / Sunflower / Senna / Vinca rosia (Oct-Feb) – Pulses (Mar-Jul)
Severe drought	Perl millets / Sorghum / Forage / Minor millets / Vegetables (Oct-Feb)
<i>Rain-fed areas</i>	Black, Red and Laterite soils
Existing	1. Cotton / Blackgram /Chillies (Sep-Feb) 2. Sorghum /Senna / Vinca rosea (Sep-Jan)
Normal	1. Cotton / Blackgram /Chillies (Sep-Feb) 2. Sorghum /Senna / Vinca rosea (Sep-Jan) 3. Maize / Sunflower / Coriander (Sep-Jan)
Moderate drought	Pearl millet + Pulses / Minor millets/ Vegetables (Sep-Jan)/ Chillies/ Coriander/ Sesame/ Sunflower
Severe drought	Minor millets / Pearl millet +Cowpea (Sep-Jan)
20% tree crops- Mango, Amla, Sapota, Guava, Cashew, Custard Apple, Tamarind, tree fodder (Glyricidia), Simarouba, Palmyra, Jatropa, Flower crops Dairy, & sheep	
VI. High Rainfall Zone - Kanniyakumari	
<i>Command Areas:</i> Pechiparai, Perunchani	Laterite & sandy soils
Existing	1. Rice (Apr-Aug) – Rice (Sep-Mar) – Fallow 2. Rice (Jun-Oct) –Rice (Oct-Feb) – Pulses (Feb-May) 3. Banana
Normal	1. Rice (Apr-Aug) – Rice (Sep-Mar) – Fallow 2. Rice (Jun-Oct) –Rice (Oct-Feb) – Pulses (Feb-May) 3. Banana
Moderate drought	Maize / Vegetables Oct-Feb) – Pulses (Feb-May)
Severe drought	Sorghum / Sesame / Minor millets / Forage (Oct-Feb)
<i>Tank-fed areas</i>	Lateritic Alluvium
Existing	Rice (Jun-Oct) – Rice (Oct-Feb) – Pulses (Feb-May)
Normal	Maize (Jun-Oct) – Rice (Oct-Feb) – Pulses (Feb-May)
Moderate drought	Maize / Vegetables (Oct-Feb) – Pulses (Feb-May)
Severe drought	Minor millets / Pulses / Vegetables / Forages (Oct-Feb)
<i>Well-irrigated areas</i>	Laterite soil
Existing	1. Tapioca + Pulses (Sep-Jul) 2. Rice (Oct-Feb) – Pulses (Feb-May)
Normal	1. Tapioca + Pulses (Sep-Jul) 2. Red Banana (Jun-May)
Moderate drought	Maize /Tapioca / Medicinal plants (Mucuna – Poonaikali) (Oct-Feb) – Pulses (Feb-May)
Severe drought	Pulses / Medicinal Plants (Mucuna – Poonaikali)/ Forages / Minor millet (Oct-Feb)
<i>Rain-fed areas</i>	Laterite
Existing	Tapioca + Pulses (Jun-Dec)

Normal	Vegetables (yam) / Medicinal plants (Mucuna-Poonaikali) (Jun-Sep) – Pulses (Oct-Jan), Bitter guard, brinjal
Moderate drought	Millet + Pulses (Oct-Jan)
Severe drought	Minor millets / Forages / Pulses (Oct-Jan)
30% tree - Mango, Coconut + Vanilla/ Pepper/ Cocoa/ Yam, Rubber, Jack, Nutmeg, Cinnamon, Clove, Arecanut Dairy, Goat Bee-keeping	
VII. Hilly & High Altitude Zone- Nilgiris, Kodaikanal	
<i>Nilgiris</i>	Reduce 10% area under tea during next five years Replace by rosemary and thyme, potato, cabbage, radish and carrot (grow these crops in terrace) Cut flowers
Kodaikanal	
Lower Pulney hills	Coffee, Mandarin, Cocoa, Vanilla, Chowchow, Pineapple, French beans, Avocado, Cardamom, Pepper Cut flowers
Upper Pulney hills	Potato, pear, peaches, plums, apple, garlic, cabbage, cauliflower, ginger Cut flowers