Tamil Nadu
Agricultural Development

Final Report

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ACRONYMS

AAY	Antyodaya Anna Yojana	**MSP**	Minimum Support Price
AP	Andhra Pradesh	**NDDB**	National Dairy Development Board
APL	Above poverty line	**NPC**	Nominal Protection Coefficient
BPL	Below poverty line	**NSS**	National Sample Survey
DOA	Department of Agriculture	**O&M**	Operation and Maintenance
DPAP	Drought Prone Area's Programme	**PCMS**	Primary Co-operative Marketing Societies
GCA	Gross Cropped Area	**PDS**	Public Distribution System
GDP	Gross Domestic Product	**SGDP**	State Gross Domestic Product
GFCF	Gross Fixed Capital Formation	**TPDS**	Targeted Public Distribution System
GoI	Government of India	**T&V**	Training and Visitation
GoTN	Government of Tamil Nadu	**TNAU**	Tamil Nadu Agricultural University
FCI	Food Corporation of India	**TNERC**	Tamil Nadu Electricity Regulatory Commission
FMIS	Farmer Management of Irrigation Systems	**WRO**	Water Resources Organization
IMT	Irrigation Management Transfer	**WUA**	Water Users' Association

Unit Measurements

ft	feet	Kwh	kilowatt hour
Ha	hectare	mt	metric ton
hp	horse power		
kg	kilogram		

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TAMIL NADU
AGRICULTURE DEVELOPMENT

EXECUTIVE SUMMARY

Achievements and Challenges in Tamil Nadu Agriculture

(i) **Agriculture in Tamil Nadu has enjoyed three decades of growth based largely on rapid technological change**. Food security has also increased due to rapid increases in food grain output, sales from the Public Distribution System (supplied by Food Corporation of India stocks), targeted feeding and employment programs, and well-functioning rice markets that have enabled price-stabilizing inflows of rice from neighboring states in years of local production shortfalls. Partly because of agricultural growth, rural poverty rates declined from 38.5 percent to 24.3 percent between 1993/94 and 1999/2000 (Deaton and Drèze estimates). The state's agriculture has a strong base for continued growth in terms of a strong agricultural research system, an extensive road network, and a relatively well-educated rural labor force.

(ii) **While agricultural sector growth rates in Tamil Nadu were among the highest in India during the 1980s and early 1990s, deceleration in growth since the mid-1990s is of increasing concern to policymakers**. During the 1980s agricultural GSDP grew at 3.4 percent, exceeding the all-India agricultural growth of 2.9 percent. Adequate rainfall contributed to even higher growth in the early 1990s: between 1989/90 and 1994/95 agriculture grew by 7.2 percent in Tamil Nadu, compared with 3.1 percent in all of India. But between 1994/95 and 1999/2000 agriculture in Tamil Nadu suffered from severe consecutive droughts and grew only 1.3 percent a year, compared with 2.9 percent for all of India. As a result, the state's agricultural growth rate during the 1990s was only 2.9 percent a year, compared with 3.2 percent for all of India.

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

(iv) **Traditional sources of growth in agriculture face major constraints such as growing water scarcity, increasing land degradation, declining farm sizes, and rising costs of labor**. Tamil Nadu is one of the driest states in India, averaging only 925 millimeters of rainfall a year. The state's dry season lasts five months (January through May) even in good years, and severe droughts occur in 3 of 10 years, severely limiting cultivation of crops between June and September. Per capita availability of water resources in Tamil Nadu is only 900 cubic meters a year, compared with 2,200 cubic meters for all of India. Irrigation through a combination of canals, wells, and tanks[1] increases the reliability and availability of water for farming and is

[1] A tank is a small-scale surface water reservoir constructed on a gentle slope, designed so that water flows out of the tank through the force of gravity.

essential for cultivating crops in much of the state. But the seasonality and scarcity of supply limit cultivation to only one crop per plot for most of the state.[2] The agricultural sector faces increasing competition for water from industry and domestic users and intensifying interstate competition for surface water resources. In many parts of the state, the rate of extraction of groundwater has exceeded recharge rates, contributing to falling water tables. Water quality is also a growing concern. Effluents discharged from industries and heavy use of pesticides and fertilizers have had a major impact on surface water quality, soils, and groundwater.

(v) **Agricultural land resources have also come under increasing pressure because of rapid population growth and urbanization**. Between 1971/72 and 1997/98 the available cultivable land per rural resident declined from 0.22 hectares per capita to 0.15 hectares per capita. The growing pressures on land, skewed pricing policies, and rural poverty have all contributed to land and soil degradation. As a result, poor soil fertility, salinity, water logging, overgrazing, and deforestation are growing problems and pose serious constraints to the performance of the agricultural sector in some parts of the state.

(vi) **Seasonal labor shortages and rising real agricultural wages during the past two decades, in part caused by rapid rural-urban migration, have contributed to higher incomes for agricultural laborers, but make future agricultural growth more difficult by reducing the competitiveness of Tamil Nadu's agriculture vis-à-vis other agricultural producers**. Higher labor costs, due in part to rapid growth in demand for nonagricultural labor, have increased the cost of cultivation, especially for labor-intensive crops. In 1999–2000 rural wages for male agricultural labor in the kharif season in Tamil Nadu averaged Rs.62.2 a day, compared with only Rs.45.3 a day in Andhra Pradesh and Rs.42.8 in Karnataka. These higher labor costs encourage mechanized land preparation and harvesting, but small farm sizes constrain the rate of mechanization.

(vii) **Given the constraints, diversification into higher value, less water-intensive products, such as fruits, vegetables, spices, and livestock products, may be one of the most promising sources of agricultural growth**. Tamil Nadu's agro-climatic conditions are well suited for diversified agriculture. Rapidly increasing incomes and changing patterns of food demand also provide strong impetus for diversification. Increased agricultural diversification and private investments in processing for many of the higher value agricultural commodities are likely to generate new rural nonfarm employment opportunities and contribute to higher rural incomes.

(viii) **Against this background this study assesses agricultural policies in Tamil Nadu and the implications of these policies for future agricultural growth, food security, and rural poverty reduction, and recommends reform options**. This report focuses on selected critical issues rather than a comprehensive review of the agricultural sector in the state. It analyzes the structure of the agricultural economy, water management, agricultural subsidies, agricultural marketing and regulations, and implications of policy reforms for food security and consumption of the poor.

The Structure of Agriculture in Tamil Nadu

(ix) **Rice dominates both food consumption and agricultural production**, accounting for about a third of total gross cropped area and nearly 60 percent of irrigated area in Tamil Nadu (over 90 percent of paddy is irrigated). Pulses (18 percent of total cropped area), millet (11 percent), and groundnuts (10 percent) require less water than rice or sugar cane, and millet and pulses are grown almost exclusively on nonirrigated land. About 5 percent of total cropped area is

[2] In 1998/99 average cropping intensity was only 1.20 in Tamil Nadu, compared with 1.34 for all of India.

devoted to sugar cane, all of it irrigated (accounting for almost 10 percent of irrigated land). Cotton occupies about 3 percent of cropped area, and about a third of the cotton crop is irrigated.

(x) **The livestock and fisheries subsectors are also important in Tamil Nadu**. The state ranks second among Indian states in egg production and ninth in milk production.[3] In 2001/02 Tamil Nadu accounted for approximately 6 percent of national milk production and 11.9 percent of egg production. The state is also relatively well endowed with fisheries, accounting for 13.2 percent of total marine fish production and 4 percent of in-land fish production in India. In all, crop agriculture, livestock, and animal husbandry account for 92.2 percent of total value added in agriculture and allied activities, with fishing accounting for 4.5 percent and forestry for 3.3 percent.

(xi) **The average size of individually held farms is only 0.91 hectares, with over half the farms smaller than 0.5 hectares**. Nearly three-quarters of farms are smaller than 1 hectare, accounting for only 30.2 percent total cultivable land. In comparison, the average farm size in India is 1.41 hectares, with 62 percent of farmers holding less than 1 hectare.

Water for Agriculture

(xii) **Agriculture is the single largest consumer of water in the state, using 75 percent of the state's water**. Despite limited water resources, Tamil Nadu has a high percentage of net sown area that is irrigated (54 percent). In 1999/2000 the state had a net irrigated area of 3 million hectares. Today the state relies equally on surface and groundwater sources for irrigation, though its reliance on groundwater has been steadily increasing. Approximately 30 percent of the net irrigated area is watered by canals and 21 percent by tanks, while 49 percent is fed by wells. The remaining area is irrigated by other sources such as streams and springs. Rainfed agriculture, employing approximately 25 percent of farmers, accounts for 46 percent of the net sown area of 5.5 million hectares.

Institutional Issues

(xiii) **Institutional weaknesses have undermined proper management and development of water resources in the state**. As is common in many Indian states, inadequate priority to and funding for operations and maintenance led to rapid deterioration of surface irrigation. There was also minimal involvement of farmers in the operations and maintenance of irrigation systems. But recent efforts have been made to address many of the issues plaguing the water sector.

(xiv) The Government of Tamil Nadu is now undertaking **comprehensive water planning on a river basin basis** and has decentralized water resource management along river basins. In 1995 the Public Works Department was divided into the **Water Resources Organization** (WRO) and the Buildings Organization. The WRO is to be formalized in 2004 as a separate agency with a specialized cadre of staff, with Chief Engineers reorganized around river basins. The Palar Basin Development and Management Board and the Thambaraparani Basin Development and Management Board were established in January of 2000. Preparation of macro-level basin development plans and formulation of decision support systems for development and management of the water resources of the state have been under way since 1997. The state has drafted a **Water Policy**, initiated steps for irrigation management transfer, and passed a **Groundwater Regulation and Management Act**, one of the first states in India to do so. The State Legislative Assembly passed the **Tamil Nadu Farmers Management of Irrigation**

[3] Ranks are computed based on average production in Indian states between 1999 and 2001.

Systems Bill in May 2000. Substantial progress has been made in the environmental aspects of water resources development.

(xv) **Tamil Nadu has implemented a number of centrally sponsored and donor funded watershed development schemes to improve the production potential of rainfed agriculture**. The government recently launched the Comprehensive Wasteland Programme, which will cover 2 million hectares through a watershed development project. Watershed projects in India have enjoyed relatively little success in curbing land degradation, improving the productivity of rainfed agriculture, and reducing rural poverty, and remain to be carefully evaluated in Tamil Nadu.

Economic Incentives for Water Use: Taxes and Implicit Subsidies

(xvi) **Under the current system of economic incentives (prices, subsidies, taxes) the cost of water for farmers and other water users does not reflect the scarcity value (opportunity cost) of water**. Throughout India, farmers using surface water for irrigation from canals or tanks are implicitly subsidized because water charges fall short of operations and maintenance expenditures. Between 1990 and 2002 farmers using groundwater for irrigation in Tamil Nadu also benefited from free agricultural power supply. Subsidizing irrigation water means that the environmental costs of water use are not being internalized, reducing incentives for water conservation, encouraging the cultivation of water-intensive crops, and contributing to environmental degradation. The irrigation and agricultural power subsidies have contributed to the state's large fiscal deficit. These subsidies also have a high opportunity cost in terms of other social and economic expenditures foregone, and few poor directly benefit from them.

(xvii) **In 2002, the Government of Tamil Nadu announced increases in irrigation water charges and reintroduced a tariff for agricultural power consumers**. These reforms—charging for water on a per area basis (as is the case for surface irrigation) or on a flat rate basis (for agricultural power consumers)—were a step in the right direction. But even these reforms did not result in economically efficient pricing, because the marginal cost for water was almost zero and thus demand for irrigation water was not affected.

(xviii) **Prior to 2003, water charges were levied by the Government of Tamil Nadu at a base rate (which varied according to crop, season, and soil quality) plus an additional charge equivalent to six times the base rate**. This additional charge was transferred to the local panchayats. Beginning in July 2003, an additional water charge of Rs.150 per hectare was imposed, de-linked from any additional cess. Thus, farmers were to pay the original charge plus the Rs.150 per hectare. In addition, the FMIS Act empowered water user associations to charge users between Rs.250 and Rs.500 per hectare. This fee could be retained by the associations for operation and maintenance of the systems turned over to them.

(xix) **The agricultural power tariff introduced in 2003 included a flat rate for unmetered connections of Rs.250 per horsepower a year and Rs.0.20 per kilowatt-hour for metered connections**. Along with the reintroduction of the agricultural power tariff, the government announced an income support scheme for smallholders and marginal farmers. Under the income support scheme, the Government of Tamil Nadu was to provide smallholders and marginal farmers a transfer of up to Rs.1,250 a year. This was a significant step toward creating a more direct and transparent system of subsidies to farmers and other target groups and ensuring the separation of commercial operation of the power utility from the need for subsidy. However, the reintroduction of agriculture power tariff became a highly contentious issue in Tamil Nadu during the recent national election, forcing the government which suffered severe electoral loss for the national parliament seats to reverse the policy.

(xx) **Nonetheless, the analysis in this report suggests that introduction of a flat rate charge of Rs.250 a year for a five horsepower pumpset would have only a small effect on net returns to land and management, reducing them by only 4.9 to 6.5 percent**. Costs of crop cultivation using well irrigation would rise by only Rs.625 per hectare (annual charge pro-rated for one season) to Rs.1,250 per hectare (for sugar cane grown over eleven months).

(xxi) **Raising electricity charges to the estimated marginal economic price of electricity to agriculture of Rs.3.1 per kilowatt-hour, though, would increase irrigation costs to about Rs.4,600 per hectare for paddy and sugar cane, reducing returns to land and management by 35.9 percent for paddy and by 23.8 percent for sugar cane**. Likewise, total returns to land, labor, and capital (value added) would fall sharply for paddy and sugar cane irrigated by wells if farmers bore the cost of electricity for pumping, strengthening the case for a compensating income support scheme in this scenario.

Other Public Expenditures on Agriculture and Food

(xxii) **Although public expenditures on agriculture in Tamil Nadu are high, the quality of expenditures is a cause for concern**. Expenditures on agriculture, allied activities, and irrigation as a share of agricultural GSDP are higher in Tamil Nadu than in most major agricultural states in India (World Bank 2003). Between 1998 and 2000 public expenditures on agriculture equaled 11 percent of total agricultural GSDP in Tamil Nadu, compared with 7.8 percent in all of India.[4] Public agricultural capital expenditures in the state are relatively low compared with the all-India average, while the opposite is true of revenue (i.e. current) expenditures as a share of agricultural GSDP. This is a situation for concern since capital investments are important for future growth. Furthermore, a large share of revenue expenditures are incurred on staff salaries, and food and irrigation subsidies, leaving operating expenses under funded. Gross fixed capital formation in agriculture increased by 15 percent during the 1990s, due primarily to private capital formation, which accounted for 88 percent of gross fixed capital formation in agriculture.

(xxiii) **The agricultural extension system in Tamil Nadu is still organized around a modified Training and Visit approach and continues to focus on major food-grains**. There is little coordination among line departments (agricultural, animal husbandry, fisheries) in their extension approach. The extension system is slowly changing, however, and the promotion of public-private partnerships in extension is encouraging. The Government of Tamil Nadu also plans to link agricultural, horticultural, and agricultural engineering extension systems and units to improve the extension capacity for horticultural development.

(xxiv) **Reforms of the public procurement system and improvements in targeting are reducing state expenditures on food subsidies**. The Government of Tamil Nadu estimates that the food subsidy will fall from Rs.15 billion in 2001/02 to Rs.7 billion in 2003/04. Cessation of local procurement (except on behalf of the Food Corporation of India) reduced government expenditures on procurement by an estimated Rs.6.8 billion by eliminating the costs of paying extra procurement incentives and of milling the paddy into rice. Additional savings came from reducing the subsidy per kilogram of rice sold and the number of cards (and ultimately the sales of rice). The total estimated reduction in subsidy (from both reforms on procurement and

[4] Agricultural public expenditures as a share of expenditures on Economic Services and Agricultural GSDP are averages of data from 1998/99–2000/01.

distribution) was about Rs.9.92 billion, with about two-thirds due to the cessation of Government of Tamil Nadu procurement on its own behalf.

Development of Agricultural Markets

(xxv) **In the past decade Tamil Nadu has increased private sector participation in marketing and eliminated government restrictions**. Unlike most Indian states, where wholesale marketing is restricted to regulated markets, Tamil Nadu permits traders to transact sales outside of regulated markets. Private markets account for about 90 percent of the statewide trade in major crops. Regulated markets, in which licensed traders bid for farmer produce through a tender system, account for only 10 percent.

(xxvi) **In May 2003, following the February 2002 central Government order removing licensing restrictions on rice and 13 other crops, the state Government withdrew its licensing system for these crops**. Restrictions on purchase, movement, stocking, and sales of these commodities have been removed, though some provision remains for Government intervention in the case of high market prices for goods distributed through the public distribution system.

(xxvii) **Greater private sector participation in markets has enhanced food security in Tamil Nadu. Increases in state production of major staples (especially rice), sales of subsidized rice through the public distribution system, school feeding programs, and targeted relief programs have increased access to food**. During the drought of 2002/03 the wholesale prices of rice only rose 2.8 percent in real terms above the previous year's prices despite a 34 percent fall in paddy production in the state. This was because private sector inflows from neighboring Andhra Pradesh and Karnataka and the availability of rice through the public distribution system helped to maintain access to food for poor consumers.

(xxviii) Private investments in processing and marketing horticultural and export crops have enjoyed some success (for example, tumeric exports from Erode). Contract farming involving business agreements for the purchase of outputs and often the provision of inputs and extension advice is increasing, particularly for sugarcane, cotton, and horticultural crops.

Policy Reform Options in Tamil Nadu's Agriculture

(xxix) **Reducing rural poverty, accelerating growth in agricultural production, and overcoming the constraints faced by the agricultural sector in Tamil Nadu require appropriate policies and investments in four priority areas**: improving the efficiency of water use, increasing the effectiveness of public expenditures and agricultural extension, spurring the development of agricultural markets, and maximizing the real income growth of the rural poor.

Improving the Efficiency of Water Use

(xxx) **Long-term growth in agriculture and rural incomes depends in large part on using water efficiently**. Water management options include scaling up the pilot river basin framework for managing water resources holistically, allowing interagency coordination and public-private partnerships; introducing specific, legally enforceable water entitlements to various users in a river basin and or aquifer framework; adjusting electricity, water, and crop prices to change the

financial incentives for irrigation and crop choice; and improving management practices and irrigation technologies (such as drip and sprinkler irrigation) and investing in canals and water storage (coupled with improved operation and maintenance).

(xxxi) **Public administration in the water sector could be improved by separating responsibilities for water resource management and irrigation service delivery**. Tamil Nadu is the only state in India without a separate department of irrigation, now a part of the Department of Public Works. Two new agencies are needed: a regulatory agency to allocate the share of water resources to agriculture, industry, and other uses, and an irrigation department focusing on irrigation delivery systems. A separate irrigation department would allow for the creation of a specialized cadre of irrigation specialists, instead of the current setup that relies on staff from the Department of Public Works (which also includes administration of public buildings).

(xxxii) **Irrigation management transfer is at an early stage in Tamil Nadu and water user associations are not yet fully functional**. The transfer of irrigation management to farmers in line with the FMIS Act should be expedited to make water distribution more efficient and equitable.

(xxxiii) **Providing the right economic incentives (prices, subsidies, taxes) that recognize the opportunity cost of water is essential for improving water use efficiency**. Raising electricity charges to the estimated marginal economic price of electricity to agriculture of Rs.3.1 per kilowatt-hour may not be politically feasible, but moving gradually toward marginal cost pricing (perhaps combined with compensation to farmers in the form of income transfers or a more reliable electricity supply) would help rationalize water use in Tamil Nadu. Paying greater attention to market infrastructure, strengthening research and extension to meet the needs of diversified agriculture, developing tools for farmers to better manage risks, and improving irrigation pumpset efficiency are likely to make higher power charges more palatable to farmers. If farmers' costs and incomes varied according to the amount of electricity (and water) used with well irrigation, they would have an incentive to shift some land from water-intensive crops (rice and sugar cane) toward less water-intensive crops (including cotton, maize, and vegetables).

(xxxiv) **Increases in electricity charges would have little effect on overall rice production and market prices but a major effect on sugar cane production**. Since only about 10 percent of rice area cultivated is irrigated with well water (about 200 thousand hectares), changes in electricity pricing would have only marginal effects on production. And since rice is also supplied by net public distribution (averaging 1.2 million tons a year from 1997/98 to 2001/02, 18 percent of net production) and private market trade from neighboring states (estimated at 1.0–1.3 million tons in the drought year 2002/03), the effect of lower rice production from well irrigated areas on market prices of rice would likely be small. Impacts on sugar cane production would be much greater, however, as essentially all sugar cane is irrigated in part with well water.

(xxxv) **The current provisions for irrigation water charges allow full cost recovery of required operations and maintenance expenditures**. The extent to which farmers are actually being charged the proposed water rates remains unclear.

(xxxvi) **Greater attention is also needed for modernizing irrigation infrastructure and scaling up the adoption of water saving irrigation technologies**. While the use of sprinkler and drip technology has been promoted in the state, the high capital cost of these technologies constrains widespread adoption by smallholders and marginal farmers. More affordable technology or a suitable system of targeted subsidies should be developed to increase the use of sprinkler and drip systems.

(xxxvii) Past experience reveals that extensive community participation with sound technical inputs are necessary for successful watershed programs. **A basin perspective should be adopted to ensure that these initiatives do not have negative impacts on downstream human and ecological uses.**

Increasing the effectiveness of public expenditures and agricultural extension

(xxxviii) **Responding to the needs of diversified agriculture requires a highly effective research and agricultural extension system**. An assessment of the state's comparative advantage in producing higher value crops for the domestic and export markets would also help in setting future research and development priorities. Re-orienting agricultural research to make it more farmer-responsive would likewise improve the output of a system that has enjoyed much success in rice technology development in the past. Similarly, the current extension system in the state remains organized around a modified Training and Visit approach and continues to be highly focused on major food-grains, though the promotion of public-private partnerships in extension is a very encouraging recent development and offers potential for both cost-savings and greater efficiency. Thus, it is recommended that the GoTN develop a new agricultural extension strategy to meet the changing needs of farmers. This could include adopting an integrated and decentralized extension system that could help build farmer organizations that could link with private firms to increase economic growth in rural areas.

(xxxix) **Rationalizing public expenditures and shifting expenditures from subsidies to investments in key public goods such rural roads, markets and agricultural research and extension will facilitate productivity improvements and diversification of agriculture to higher value products.** Tightening competition for limited fiscal resources heightens the urgency of appropriate public expenditure reallocation. Institutional reforms within government departments to ensure improved quality of delivery of rural-related public goods and services is also important.

Promoting the development of well functioning agricultural markets

(xl) **Well functioning agricultural markets are also important for successful agricultural diversification**. If recent policy reforms removing restrictions on purchase, movement, stocking and sales of paddy and 13 other crops are consistently implemented at the local level, they can be expected to improve marketing efficiency, reducing the margin between producer and consumer/export prices. Reductions in marketing costs are also necessary in order for production increases to lead to higher agricultural incomes, particularly for perishable high-value products (e.g. fruits, vegetables, animal products). Contract farming and other private sector initiatives should be encouraged, though the impact of these business arrangements on farmer incomes should be evaluated, as well .

(xli) **There remain, however, important roles for the public sector in promoting agro-food system and agro-enterprise development** In addition to policies that establish "rules of the game" and address market failures, public investments in rural roads to strengthen rural connectivity can contribute to reduced costs of marketing. Although Tamil Nadu has an extensive road network, further attention to maintenance and upgrading of rural roads in some regions may be warranted. Given the rapidly changing nature of markets in Tamil Nadu, an in-depth study of market structure and investment needs would be useful.

(xlii) **Increasing agricultural diversification will not compromise Tamil Nadu's food security objectives given an effective PDS , well-functioning markets and targeted nutrition programs**. Greater food security has largely been achieved through increases in state production of major staples (especially rice), sales of subsidized rice through the PDS, school feeding programs, and targeted relief programs during droughts. During the recent drought of 2002/03 the wholesale prices of rice only rose 2.8 percent (in real terms) above the previous year's price, despite a 34 percent fall in paddy production in the state, helping to maintain access to food for poor consumers. This was largely due to private sector inflows from neighboring states of Andhra Pradesh and Karnataka and the availability of rice through the PDS.

Maximizing Real Income Growth for the Poor

(xliii) **Increasing employment and earnings in the dry season is especially important for the rural poor**. Increased availability of water and greater efficiency of water use in the dry season (for example, through the widespread adoption of drip irrigation) could enable cultivation of crops year-round, providing employment in agricultural production and processing. Dissemination of new production technology and establishing markets for dry season crops remains an important unresolved issue, however. Contract farming may help overcome these problems, if competition between firms helps farmers maintain their share of the value of the final product sales. The experience of Latin America and the Caribbean suggests that education, transport infrastructure, and engines of non-farm growth that promote female employment are key aspects of a success strategy to promote non-farm growth and rural poverty reduction.

(xliv) **Whether agricultural diversification reduces poverty in Tamil Nadu will depend on the extent to which small farmers adopt new technologies and have access to markets, the magnitude of employment and real wage rate gains, and the size of linkage effects with rural non-agriculture**. The implications of an agricultural diversification strategy involving higher risk crops and capital-intensive technologies (drip irrigation) must be assessed. This assessment should review crop and drought insurance instruments, and the potential for innovations in these instruments to enable rural farmers, particularly poor farmers, to better manage risks.

TAMIL NADU
AGRICULTURAL DEVEL0PMENT

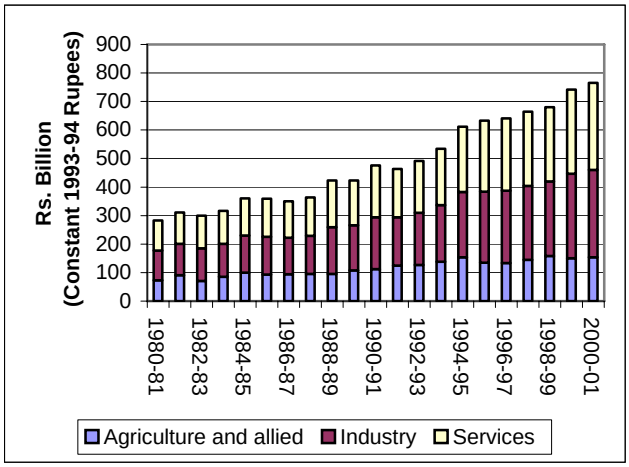
1. Introduction

1.1 **The agricultural sector in Tamil Nadu has a long history of notable achievements and significant progress**. Construction of the Grand Anicut (dam) on the Cauvery river in the second century AD permitted a large expansion of irrigated area and rice cultivation, and a flourishing of the Chola kingdom. Centuries later, rapid expansion of green revolution technology (improved seeds, increased fertilizer use, and irrigation) enabled the state to increase average rice yields by 74.4 percent between the trienniums ending 1972/73 and 2001/02, enabling production to increase by 36.2 percent in spite of a 21.9 percent decrease in area cultivated with rice.

1.2 **While agricultural sector growth rates in Tamil Nadu were among the highest in India during the 1980s and early 1990s, deceleration in growth since the mid-1990s is of increasing concern to policymakers**. During the 1980s agricultural GSDP grew at 3.4 percent, exceeding the all-India agricultural growth of 2.9 percent. Adequate rainfall contributed to even higher growth in the early 1990s: between 1989/90 and 1994/95 agriculture grew by 7.2 percent in Tamil Nadu, compared with 3.1 percent in all of India. But between 1994/95 and 1999/2000 agriculture in Tamil Nadu suffered from severe consecutive droughts and grew only 1.3 percent a year, compared with 2.9 percent for all of India. As a result, the state's agricultural growth rate during the 1990s was only 2.9 percent a year, compared with 3.2 percent for all of India.

1.3 **In contrast to the uneven growth in agriculture, the non-agricultural economy of Tamil Nadu has expanded rapidly, leading to a sharp decline in the share of agriculture in total output (**Figure 1.1**)**. The agricultural and allied services (livestock, forestry and fisheries) sector's contribution to GSDP has declined from 24.3 percent in 1980/81 to 15.7 percent in 2001/02, one of the lowest shares in the country. By comparison, between 1980/81 and 2001/02 the services sectors share of GSDP increased from 40.7 percent to 51.5 percent, while the share of industry decreased slightly, from 35 percent to 32.8 percent.

Figure 1.1: Sectoral Contributions to GDP, 1980-2000



Source: World Bank States Database

1.4 **Despite its declining importance in the overall economy, however, agriculture remains a major source of employment and earnings for the rural poor**. About 56 percent of the state's population of 62 million (2001 Census) resides in rural areas and close to half (14.4 million workers) of an estimated 29 million workers are employed in agriculture (Table 1.1). For the poorest rural quintile (approximately 1.5 million households with about 7.5 million people), more than three-quarters of income continues to be derived from agriculture, with agriculture wage labor alone accounting for half of household income. Agricultural labor accounts for 49.5 percent of the labor force in the state, less than the all-India average of 59.2 percent. Unlike most of India (with the exception of Andhra Pradesh), agricultural laborers outnumber cultivators by a 1.69:1 ratio (compared with a 0.88:1 ration across India), further highlighting the importance of returns to labor for poverty reduction.

Table 1.1: Population, Labor Force and Agriculture in Tamil Nadu and Other States

	Andhra Pr.	Maharashtra	Punjab	Karnataka	Tamil Nadu	All India
Population (2000 census)						
Total (mns)	75.7	96.8	24.3	52.7	62.1	1027.0
Rural (mns)	55.2	55.7	16.0	34.8	34.9	741.7
Urban (mns)	20.5	41.0	8.2	17.9	27.2	285.4
% rural	72.9%	57.6%	66.1%	66.0%	56.1%	72.2%
Labor force in agriculture						
as percentage of total	62.3%	55.4%	39.4%	55.9%	49.5%	59.2%
Cultivators (% of total)	22.7%	28.6%	23.0%	29.5%	18.4%	31.6%
Agric laborers (%of total)	39.6%	26.8%	16.4%	26.4%	31.2%	27.6%
Agric laborers/cultivators	1.75	0.94	0.71	0.90	1.69	0.88
GSDP/capita (2001)	11,154	17,394	17,436	13,335	14,393	11,752
Share of agric&allied	28.0%	12.6%	38.7%	28.5%	17.3%	24.2%
Agric&allied/capita	3,121	2,199	6,740	3,805	2,486	2,847
Agricultural GSDP/worker	6,779	5,059	17,909	8,530	5,552	7,603
Agricultural wage (1999-00)						
(Kharif, Rs/man-day)	45.32	43.74	77.66	42.76	62.19	51.81

Source: Population Census 2001 ; CMIE 2003 ; Reports of the Commission for Agric Costs and Prices 2001-02 (published 2002), pp.304f.

1.5 **Agricultural growth has played a major role in rural poverty reduction in the past in Tamil Nadu, and could make substantial contributions in the future**. Analysis based on household surveys indicates that the spread of green revolution technology in the 1970s and 1980s contributed to sizeable increases in returns to land, raising farmer's incomes. Increasing demand for goods and services by farm households further stimulated expansion of the rural non-farm economy contributing to poverty reduction. Although rural poverty rates declined by 6.7-14.2 percent (depending on the definition of the poverty line), between 1993/94 and 1999/00, there remain between 7 and 11 million rural poor in Tamil Nadu (1999/00 data), 21-32 percent of the rural population. Increases in agricultural production, processing and trade could enable further declines in rural poverty.

Fostering Agricultural Growth in Tamil Nadu

1.6 **Yields of major crops in Tamil Nadu are among the highest in India, but productivity growth has slowed in recent years**. By the late 1990s, yields of major crops grown in Tamil Nadu including paddy, sugar cane, cotton and groundnut were among the highest across major Indian states. In 1998-99, Tamil Nadu had the highest rice, sugar cane and groundnut yields in India and cotton yields in the state were second only to Gujarat. Increases in yields enabled land productivity to grow by 6.1 percent per year between 1987/88 and 1993/94 from Rs 16,423/ha to Rs 23,459/ha (in constant 93/94 Rs), but by only 2.4 percent per year between 1993/94 and 1999/00 (to Rs 27,099/ha in constant 93/94 Rs). Likewise, average labor productivity in agriculture increased by an average of 4.6 percent per year between 1987/88 and 1993/94 from Rs 6,881 per worker to Rs 9,024 per worker (in constant 93/94 Rs), but by only 2.4 percent per year between 1993/94 and 1999/00 to Rs 10,434 per worker (in constant 93/94 Rs).

1.7 **Traditional sources of agricultural growth face major constraints including growing water scarcity, increasing land degradation and declining farm sizes, and rising costs of agricultural labor**. Tamil Nadu is one of the driest states in India, with an average of only 925 millimeters of rainfall per year. The state has a dry season that extends over five months of the year (January through May) even in good years, and severe droughts occur in three out of every ten years severely limiting cultivation of crops between the months of June and September. The per capita availability of water resources of Tamil Nadu is only 900 cubic meters compared to an all-India average of 2200 cubic meters per annum. Irrigation through a combination of canals, tanks,[5] and wells, increases the reliability and availability of water for farming, and is essential for successful cultivation of crops in much of the state. Nonetheless, seasonality of supply and scarcity of water limit cultivation to only one crop per plot for most of the state.[6] In addition to growing water scarcity, the agricultural sector faces increasing competition for water from industries and domestic users and intensifying interstate competition for surface water resources. In many parts of the state, the rate of extraction of groundwater has exceeded recharge rates contributing to falling water tables. Water quality issues are also of increasing concern. Effluents discharged from industries as well as heavy use of pesticides and fertilizers have had a major impact on surface water quality, soils and groundwater.

1.8 **Agricultural land resources have also come under increasing pressure because of rapid population growth and increasing urbanization**. 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 growing pressures on land coupled with skewed pricing policies and rural poverty have contributed to land and soil degradation. As a result, poor soil fertility, salinity, water logging, over grazing, and deforestation are growing problems and pose serious constraints to the performance of the agricultural sector in some parts of the state.

1.9 **Solid growth in agricultural output and employment, rapid growth in the non-agricultural sector, and rural-urban migration have all contributed to rising real agricultural wages over the past two decades.** These higher returns to labor have contributed

[5] A tank is a manmade small-scale surface water reservoir on a gentle slope, designed so that water may flow out of the tank through the force of gravity.

[6] Average cropping intensity in Tamil Nadu is only 1.20, compared to 1.34 (1998-99) for all-India.

to the state's success in raising rural incomes and reducing rural poverty, though unemployment in the dry season remains a major factor underlying low incomes of poor rural households.

1.10 **However, high real agricultural wages and seasonal labor shortages have also increased the costs of cultivation, and tended to reduce the competitiveness of Tamil Nadu agriculture vis-à-vis other states and in international markets.** Rural daily wage rates for male agricultural labor in the kharif season in Tamil Nadu in 1999-2000 averaged 62.2 Rs/day, compared with only 45.3 and 42.8 Rs/day in Andhra Pradesh and Karnataka, respectively (Table 1.1). These higher labor costs have spurred mechanization of some operations, including field preparation and rice harvesting, but small farm sizes constrain the rate of mechanization.

1.11 **Faced with these constraints, the Government has adopted a strategy of agricultural diversification to accelerate agricultural growth**. Tamil Nadu's agro-climatic conditions are well suited to diversified agriculture. Furthermore, rapidly increasing incomes and changing food demand patterns provide strong impetus for diversification. The Government's 10^{th} plan articulates a strategy to reinvigorate agricultural growth through improved productivity, higher cropping intensities, diversification and increasing commercialization. Efficient land and water management underlie the proposed strategy for growth in agriculture. The Government's recently announced approach to diversifying agriculture includes area expansion through the development of waste and fallow lands and crop substitution by further developing the horticultural sector. Emphasis is also placed on improving the productivity of water through the promotion of drip and sprinkler irrigation technology and improved irrigation practices.

1.12 **In spite of some promising recent steps, current price incentives do not promote efficient water and land resource use, and the research and extension system remains better suited for technology for traditional crops**. Existing input subsidies for power, water and fertilizer distort incentives for diversification and sustainable use of natural resources. Further, the agricultural research and extension is not yet in a position to respond to the new demands of diversified agriculture. With its relatively educated rural labor force and growing manufacturing sector, Tamil Nadu is well poised to capture the benefits of rural non-farm growth stimulated by both upstream and down stream linkages with diversified agriculture.

Plan of the Report

1.13 **Against this background the objectives of this study are to assess agricultural policies in Tamil Nadu and the implications of these policies for future agricultural growth, food security and rural poverty reduction, and to recommend reform options**. This report focuses on selected critical issues related to agricultural growth in Tamil Nadu, rather than a comprehensive review of the agricultural sector in the state. The analysis focuses on the structure of the agricultural economy, water management, agricultural subsidies, agricultural marketing and regulations, and implications of policy reforms for food security and consumption of the poor.

1.14 Chapter 2 provides an overview of the structure of the agriculture sector and the rural economy, focusing on the major crops and cropping patterns, livestock and fisheries. Chapter 3 examines the importance of water for agriculture. Chapter 4 discusses public policies and agricultural research and extension issues. Chapter 5 focuses on agricultural markets and marketing policies. Chapter 6 discusses issues related to food security and rural poverty. The conclusion and policy options are presented in Chapter 7.

1.15 This paper is based on the missions' discussions with various stakeholders, including the Government of Tamil Nadu, farmers, agricultural laborers, private sector representatives and academics. This work also draws on a background paper, "Promoting Agricultural Development

in Tamil Nadu: Perspectives, Dimensions and Potentials," prepared by a team of researchers at Tamil Nadu Agricultural University led by Professor C. Ramasamy. The study complements other concurrent analytic work (particular, the papers on poverty and investment climate) on Tamil Nadu.

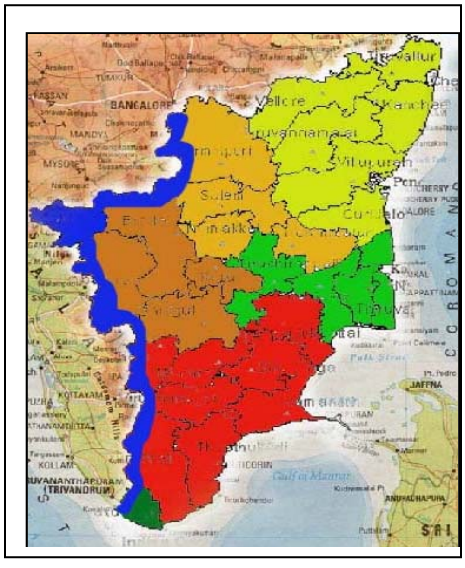
2. Overview

2.1 Tamil Nadu's agriculture, though dominated for centuries by rice cultivation in river basins, varies considerably across the state's major agro-climatic zones. Although water availability limits cultivation on most land to a single crop, technological change in agriculture has enabled increased yields and production over a wide range of crops. Livestock sector growth, particularly poultry and dairy products, has also accelerated in the 1990s.

Agro-climatic Zones of Tamil Nadu

2.2 **Tamil Nadu is divided into seven agro-climatic zones** based on rainfall distribution, irrigation patterns, soil types, and other ecological characteristics (Figure 2.1, Table 2.1).[7] The Cauvery Delta which forms its own agro-ecological zone, enjoys relatively high rainfall relative to most of Tamil Nadu (1101 millimeters per year), and irrigation water through canals for six to seven months in good rainfall years in the catchment area of the Cauvery river. The Northeast, which includes Chennai, includes the Palar river basin and surrounding hillsides. Sufficient concentrated rainfall and slow drainage enable irrigation from natural and man-made tanks. Average annual rainfall is slightly less in the North zone (849 millimeters); the western zone which receives very little rainfall from the southwest monsoon is the driest region, with only 714 millimeters of average annual rainfall. Total rainfall in the Southern zone is similar to that of the north zone, but there are few large river basins, apart from the Tambraparni which flows south in Tirunelveli district. The two remaining zones receive more rainfall than the rest of the state. The High Rainfall zone, located in the southern tip of Tamil Nadu (Kanniyakumari district), receives heavy rainfall from the southwest monsoon, (annual average rainfall of 1457 millimeters). In the Hilly zone that includes the mountains in Western Tamil Nadu, (Nilgiris district and the western edge of several other districts), numerous types of tree crops are cultivated.

Figure 2.1: Agro-climatic Zones of Tamil Nadu



[7] Rainfall data in Table 2.2 and other data on area, yield and production of crops by agro-climatic zones are based on data for the districts indicated. These figures are only approximate indicators of the characteristics of the zones, however, since actual boundaries of agro-climatic zones do not coincide exactly with district boundaries.

2.3 **Rice is the major crop in the Cauvery delta zone and the Northeast zone,** (52.4 and 42.3 percent of gross area cultivated, respectively), but plays a smaller role in the farming systems of the drier Western and Northwestern zones (9.6 and 15.9 percent of gross area cultivated, respectively) (Table 2.2). In these latter areas, other cereals, (millets, sorghum and maize) account for 18.8 and 24.6 percent of gross area cultivated, respectively. Cropping patterns are more diversified in the Western, South, and High Rainfall zones, where the share of crops other than cereals, pulses, sugar cane, cotton and groundnuts, is 38.1, 27.9 and 46.2 percent, respectively. Tree crops dominate the cropping patterns in the Hilly zone.

Table 2.1: Agro-climatic Zones of Tamil Nadu

Zone	Districts	Geographical area		Rainfall
		Million Ha	Percent	mm
Northeastern (Yellow)	Kancheepuram, Thiruvallur, Vellore, Thiruvannamalai, Villupuram, Cuddalore	31.2	24	1109
Northwestern (Orange)	Dharmapuri, Salem, Namakkal, Perambalur	18.3	14.1	849
Western (Brown)	Erode, Coimbatore, Karur, Dindigul	15.6	12	714
Cauvery Delta (Green)	Thiruchirapalli, Thanjavur, Thiruvarur, Nagapattinam	19.2	14.8	1101
Southern (Red)	Theni, Madurai, Pudukottai, Ramanathapuram, Sivagangai, Virudhunagar, Thirunelveli, Thoothukudi	41.5	31.9	814
High rainfall (Dark Green)	Kanniyakumari	1.7	1.3	1457
Hill (Blue)	The Nilgiris, Western ghats	2.5	2	1857
Total Tamil Nadu		130	100	925

Note: Data in Table 2.1 correspond to the boundaries of zones defined by the Department of Agriculture as shown in Figure 1.1. Other tables showing data by agro-climatic zone use slightly different definitions from Tamil Nadu Agricultural University (2003); (see Appendix Table 1).

Table 2.2: Gross Area Cultivated and Cropping Patterns by Agro-ecological Zone (2001-02)

	GCA ('000 has)	Paddy	Other Cereals	Pulses	Sugar Cane	Ground-nuts	Cotton	Other Crops	All Crops
1. Northeast	1,600	42.3%	7.5%	13.6%	8.8%	18.6%	1.1%	8.2%	100.0%
2. Northwest	766	15.9%	24.6%	20.9%	5.7%	20.9%	3.8%	8.1%	100.0%
3. Western	638	9.6%	18.8%	13.3%	7.7%	9.5%	3.1%	38.1%	100.0%
4. Cauvery Delta	1,281	52.4%	8.5%	19.0%	3.4%	5.1%	2.7%	8.8%	100.0%
5. Southern	1,404	35.5%	9.9%	14.2%	3.1%	4.9%	4.5%	27.9%	100.0%
6. High Rainfall	98	28.7%	0.0%	25.0%	0.0%	0.1%	0.0%	46.2%	100.0%
7. Hilly	77	2.8%	0.0%	0.0%	0.0%	0.0%	0.0%	97.1%	100.0%
All Tamil Nadu	6,226	33.1%	11.3%	18.0%	5.2%	10.6%	2.6%	19.1%	100.0%

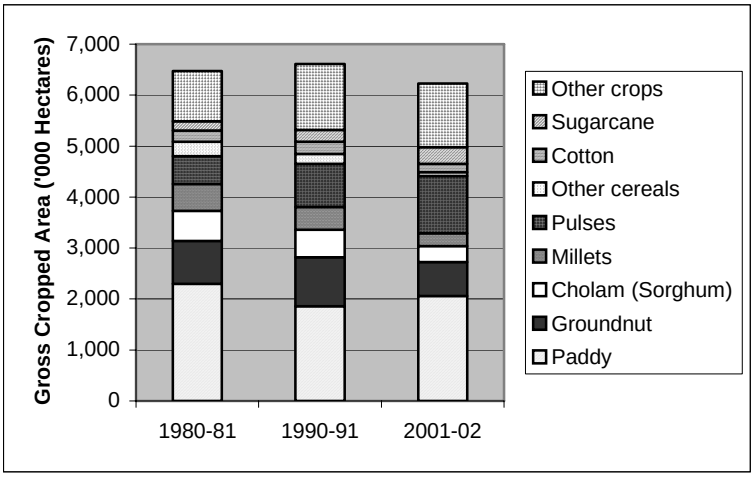
2.4 **Multiple cropping in Tamil Nadu is severely limited by the relatively low levels of rainfall, concentrated in only a few months of the year**. Only one crop per year can be grown in the upland areas in most parts of the state. Even in river valleys, water availability through

surface irrigation in canals is sufficient for two crops in only a few areas, and depends heavily on the extent and timing of the southwest monsoons. Likewise, water availability through irrigation from tanks or wells is limited in the dry season. Thus, although 55 percent of net area cultivated in Tamil Nadu is irrigated, the cropping intensity is only 1.2. In the drier south region (zone 6), the cropping intensity is only 1.06 (Ramasamy et. al., 2003) .

Major Crops

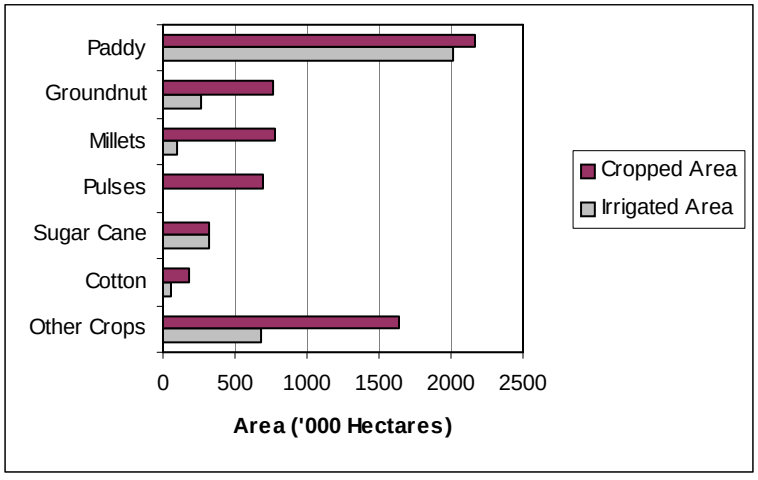
2.5 **Rice dominates both agricultural production and food consumption, accounting for about one-third of total gross cropped area and nearly 60 percent of irrigated area in Tamil Nadu** (Figure 2.2, Table 2.3). About 5 percent of total cropped area is devoted to sugar cane, all of it irrigated (accounting for almost 10 percent of irrigated land). Pulses (18 percent of total cropped area), millets (11 percent) and groundnuts (10 percent) require less water that rice or sugar cane, and, millets and pulses are grown almost exclusively on non-irrigated land. Cotton occupies only about 3 percent of cropped area; about one third of the cotton crop is irrigated (Figure 2.3). Water shortages, ample supplies of Food Corporation of India rice stocks, and potential for cultivation of higher value crops underlie the Tamil Nadu government's policy of promoting crop diversification.

Figure 2.2: Distribution of Gross Cropped Area by Crop



Source: Ramasamy et. al, 2003

Figure 2.3: Irrigated Area by Crop (1999-2000)



Source: Ramasamy et. al, 2003

2.6 **In most of Tamil Nadu, a single rice crop is grown, planted some time between August and October in anticipation of the onset of the northeast monsoons and harvested four to five months later**.[8] In the Cauvery delta region, which accounted for 33 percent of rice area cultivated in 2001/02, two rice crops are grown on land where sufficient water is available. On about 120 thousand hectares of cultivated land, the *kuruvai* (June/July – October/November) rice crop is followed by *thaladi* (October/November – February/March) in the four major districts[9]. On another 200-240 thousand hectares of land, there is generally insufficient water for two crops (because of drought or lack of canal water), and a single *samba* crop (August-January) is grown. Total gross cultivated area of rice in these districts is thus 440-480 thousand hectares. [10]

2.7 **Rice production increased rapidly in Tamil Nadu from the 1950s to the 1970s, as green revolution technology (high-yielding varieties, fertilizer, and irrigation) spread**. Area planted to paddy in Tamil Nadu expanded by 52.6 percent from 1.73 million hectares in 1950/51 to an average of 2.64 million hectares in 1970s, in part due to increased well irrigation. Yields also increased, from an average of 1.31 tons of paddy (in rice equivalent) in the 1950s to 1.94 tons in the 1970s. As a result, average production in the 1970s was 87 percent higher than that of the 1950s (Rajagopalan, 2000).

2.8 **Area planted to paddy peaked in 1979/80 (2.906 million hectares), but has declined steadily since that time, from 2.82 million hectares for the triennium ending (TE) in 1979/80 to 2.13 million hectares for the triennium ending in 2001/02 (a 24.4 percent decline in total)**. Yield increased by 67.6 percent over the same period (from 2.02 to 3.39 tons/ha), more than outweighing the decline in area. The most rapid period of yield growth occurred in the late 1980s: from the triennium ending in 1985/86 to 1990/01, yields increased by 44.1 percent from 2.14 to 3.08 tons/hectare. Overall for the entire period (1979/80 to 2001/02), production of rice increased 26.7 percent, reaching a peak of 8.14 million tons in 1998/99.

2.9 **Sugar cane, with a duration of 11 months, is grown on land irrigated by canals and wells.**[11] About 10 percent of irrigated area is planted with sugar cane and the crop requires, on average 1800 millimeters of water per unit area cultivated. Given that a single crop remains in the field year-round, however, its total water use per crop per year is less than two crops of paddy, but still greater than any other crop. Over all, sugar cane, which accounted for 5.16 percent of gross cropped area in 2000-2001 used an estimated 14.0 percent of irrigation water resources. Sugar cane yields in Tamil Nadu (109 tons/ha) are the highest in India (all-India yield is 68 tonnes/ha). Four-fifths of sugar cane is sold directly to sugar mills; the remainder is used to make jaggery (i.e. gur or unrefined sugar). Government support prices have maintained output price incentives for sugar production over time. While real market prices for paddy have declined

[8] The timing of the cropping seasons shown here and elsewhere in this report are approximate, and vary somewhat across regions and according to the timing of the monsoon rains.

[9] Figures on crop area by season are for the four districts of the Cauvery delta as defined by the Department of Agriculture: Thiruchirapalli, Thanjavur, Thiruvarur, and Nagapattinam. Two other districts, Karur and Perambular, districts are included in the Cauvery Delta agro-climatic zone in the tables in this report.

[10] See Hazell and Ramasamy (eds.), (1991) for a detailed description of cropping patterns in North Arcot (Vellore and Thiruvannamalai districts).

[11] A second *ratoon* crop, grown from the roots and base of the stalks from the first harvest, is cultivated on approximately 70-80 percent of the area planted to sugar cane.

by an average of 4.8 percent per year from 1990 to 2000, real prices of sugar cane have increased slightly over the same period (0.5 percent per year) (Table 2.4).

Table 2.3: Area and Share of Gross Cropped Area (GCA) by Crop

	1980-81		1990-91		2001-02	
	000 ha	% GCA	000 ha	% GCA	000 ha	% GCA
Paddy	2,299	35.54	1,856	28.07	2,060	33.08
Cholam (Sorghum)	591	9.14	541	8.18	317	5.09
Cumbu (Pearl Millet)	328	5.07	274	4.15	125	2.01
Ragi (Finger Millet)	197	3.04	170	2.57	125	2.01
Maize	19	0.29	27	0.42	13	0.21
Other cereals	266	4.11	169	2.56	66	1.05
Total cereals	3,703	57.23	3,038	45.95	2,766	44.43
Total pulses	544	8.41	847	12.81	1,122	18.03
Total food grain	4,247	65.64	3,885	58.76	3,888	62.45
Sugarcane	183	2.83	233	3.52	321	5.16
Vegetables	-	-	147	2.22	216	3.46
Cotton	221	3.41	239	3.62	164	2.64
Groundnut	842	13.01	963	14.56	663	10.65
Coconut	112	1.73	180	2.72	336	5.39
Fodder crop	106	1.63	210	3.17	200	3.22
Green manure	23	0.36	4	0.05	8	0.13
Gross cropped area	6,470	100	6,612	100	6,226	100
Area cropped more than once	1,109	-	1,033	-	1,054	-
Net cropped area	5,360	-	5,578	-	5,172	-
Cropping intensity	1.2	-	1.19	-	1.2	-

Source: Ramasamy et. al, 2003

Table 2.4: Growth rates of real Market Prices of Major Commodities

Year	Paddy	Cholam	Groundnut	Cotton	Sugar Cane
1980-1990	-3.00%	-2.90%	-1.50%	-1.60%	-2.20%
1990-2000	-4.80%	1.00%	-2.60%	0.70%	0.50%
1980-2000	-2.70%	-1.40%	-1.60%	0.30%	0.00%

Source: Paddy data from Raveendaran (1994) and Department of Agriculture.
All other crops from TNAU Agriculture Report

2.10 **Cotton cultivation declined during the 1990s by 2.38 percent per year due to increased incidence of pests and diseases, the high cost of pesticides, and unstable output prices**. Cotton is cultivated throughout the state except in the high rainfall zones, with the largest concentration in the drier southern zone (Table 2.5). Although cotton requires less water than rice (about 600 millimeters per season), it is a longer duration crop (six months) than rice (generally 4 months). Thus, cotton cultivation in most of Tamil Nadu requires some irrigation.

Nonetheless, it does not grow well in water-logged soils, making cotton cultivation difficult in canal systems with heavy soils and lack of water control. As a result, cotton cultivation is concentrated in the western zone, where irrigation in drier months is supplied by well water. Biological control methods that include intercropping of cotton with other plants have enabled a reduction in pesticide use in recent years. Commercial cultivation of genetically modified Bt cotton commenced in Tamil Nadu during 2002. (Text Box 2.1). Only about 50,000 tons of the 600,000 tons of cotton lint used annually by the state's textile factories (mainly around Coimbatore) are produced in the state; the bulk of the cotton lint derives from Maharashtra, other Indian states, and imports.

Table 2.5: Tamil Nadu: Share of Area Cultivated by Agro-ecological Zone for Major Crops (2001-02)

	GCA	Paddy	Other Cereals	Pulses	Sugar Cane	Groundnuts	Cotton	Other Crops
1. Northeast	27.3%	32.8%	17.7%	23.4%	43.8%	45.7%	10.4%	9.4%
2. Northwest	13.1%	5.9%	27.9%	17.2%	13.7%	24.5%	17.9%	7.2%
3. Western	10.9%	3.0%	17.7%	9.1%	15.4%	9.2%	12.2%	21.2%
4. Cauvery Delta	21.8%	32.6%	16.1%	26.2%	13.7%	10.1%	20.9%	12.1%
5. Southern	23.9%	24.2%	20.6%	21.4%	13.5%	10.5%	38.6%	38.4%
6. High Rainfall	1.7%	1.4%	0.0%	2.6%	0.0%	0.0%	0.0%	3.0%
7. Hilly	1.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
All Tamil Nadu	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Ramasamy et al. , 2003

Table 2.6: Distribution of Gross Irrigated Area by Major Crops (1999-2000)

	Cropped Area	Cropped Area	Irrigated Area	Irrigated Area	Irrigated/ Total Area	Water Requirement	Share of Irrigated Water Use
	'000 has	percent	'000 has	percent	percent	mms	percent
Paddy	2164	33.20%	2016	58.70%	93.20%	1350	67.10%
Millets	776	11.90%	93	2.70%	12.00%	500	1.10%
Pulses	693	10.60%---	---	---		400	
Cotton	178	2.70%	62	1.80%	34.80%	650	1.00%
Sugar Cane	316	4.80%	316	9.20%	100.00%	1800	14.00%
Groundnut	759	11.60%	265	7.70%	34.90%	500	3.30%
Other Crops	1633	25.00%	684	19.90%	29.40%	800	13.50%
Total	6519	100.00%	3436	100.00%	52.70%		100.00%
Current Fallow	1085						
Other Fallows	1139						

Note: Irrigated area under other crops includes pulses. Water requirements for other crops estimated at 800 mms, given water requirements of chilies and turmeric (850) and tomatos (550). Share of water use estimated using water requirement times irrigated area. This estimate assumes that each irrigated crop receives the same share of its water requirements from irrigation.
Source: GoTN, 2002b.

2.11 **Production of cholam (sorghum/jowar), cumbu (pearl millet/bajra), and ragi (mundua/finger millet) increased slightly in the 1980s, but declined in the 1990s,** registering overall growth rates of -2.33, -2.05 and -1.02 per cent respectively over the entire period. These crops (included along with maize in the broad category of "millets" in Tamil Nadu), are grown almost exclusively on non-irrigated land, as cumbu and ragi are particularly drought tolerant. Often planted on non-irrigated land in December/January after the northeast monsoon has ended, the crop survives on residual moisture and is harvested in the dry season (around April). Shifts in food habits due to increased income and urbanization have reduced demand for these crops, and real prices of cholam declined by 1.4 percent per year over the 1980s and 1990s, despite the slow growth in production (Table 2.4).

Text Box 2.1: Bt Cotton in Tamil Nadu

Genetically modified Bt cotton has been grown commercially in Tamil Nadu since 2002 and is currently the only biotech crop that has been approved for commercial cultivation in the state. Bt cotton contains the gene for Cry1AC which provides a high degree of resistance to the bollworm, a common pest whose larvae feed on cotton bolls. The technology introduced into India through a collaboration between Monsanto and the Maharashtra Hybrid Seed Company (Mahyco) received commercial approval in 2002 with farmers in Tamil Nadu harvesting their first crop of Bt cotton in January/February, 2003.

According to data from Mahyco Monsanto Biotech (India) Ltd. (MMB) 295 farmers have planted Bt Cotton over an area of 374 hectares in Tamil Nadu. Of the 925 packets of seed sold during the 2002 Kharif crop, 745 were of the MECH 162 variety, with the remaining 180 being of the MECH 184 variety.

Early experience from the state indicates that pesticide use against bollworms dropped by 65-70 percent on most farms and farmers realized an average yield increase of 30 percent (MMB). As a result of the drought in Tamil Nadu last year the pest pressure was low resulting in the Bt cotton crop faring fairly well in the state in comparison to other southern states which grew Bt cotton. Normally farmers spray 8-10 times for controlling bollworms in their cotton crop. As many as 15 sprays may be needed in some districts of Tamil Nadu. Farmers cultivating Bollgard in 2002-03 managed their crop with a maximum of 4 sprays. In most cases farmers only used 2-3 sprays in the Bollgard Cotton crop, compared to 6-8 sprays used in other commercial cotton crops.

As pest related damage on cotton plots in India is fairly high (averaging 50-60 percent), the yield effects of Bt cotton in field trials in India have been larger than those observed in countries such as China and the United States where pest pressure is lower and farmers exhibit a higher rate of pesticide adoption. It is still too early to assess the real success of Bt cotton in Tamil Nadu. Increasing bollworm resistance to Bt resulting from poor farm management practices is growing cause for concern.

2.12 **Maize production has increased very rapidly (by 8.25 percent per year) over the last two decades from just 20 thousand tons in 1980-81 to 118 thousand tons in 2001-02**, due to an increase in demand from the poultry and other livestock feed industries. Production is concentrated in western and southern zones, the two zones with the lowest annual rainfall. There has been little change in average yields, which have hovered at about 1.6 tons/hectare.

2.13 **Groundnut production increased by 5.07 percent per year in the 1980s, but stagnated during the 1990s (declining by 0.50 percent year), due to a decline in area cultivated** (Table 2.7). Slack demand for groundnuts, reflected in an average decline in real market prices of 2.6 percent year in the 1990s, has reduced producer incentives, as well (Table 2.4). Nonetheless, yields have increased by an average of 3.32 percent over the 1980s and 1990s. Groundnuts require far less water than rice and do not perform well in water-logged soils, so they

are typically grown from December through April, after the heavy monsoon rains. Nonetheless, for 35 percent of area cultivated, supplemental irrigation is used in the dry season. Groundnut cultivation is concentrated in the Northeast and North zones which account for 70 percent of groundnut area cultivated, (45.7 and 24.5 percent, respectively).

2.14 **The share of gross cultivated area devoted to horticultural and other crops has increased from 15.1 percent in 1980-81 to 19.5 percent in 1990-91, but has remained at only 19.1 percent in 2001-02**. In 2002-03 approximately 815,000 hectares (12.5 percent of total cropped area) was under horticultural crops. Plantation crops accounted for 29 percent of the horticultural crop area with fruits, vegetables and spices accounting for a further 28 percent, 22 percent and 19 percent, respectively. The recently announced Comprehensive Wasteland Programme aims at promoting perennial horticulture crops on 2 million hectares of cultivable wastelands in the state. The state has also been promoting the cultivation of medicinal and aromatic plants with these crops accounting for approximately 5000 hectares (less than 1 percent of total cropped area). There is a growing interest in bio-fuel crops (Jatropha and Paradise Tree) although these crops are yet to be grown commercially in the state.

Table 2.7: Growth Rates in Area, Yields and Production: 1980s and 1990s

	% GCA	Area			Yield			Production		
	2001-02	1980's	1990's	Overall	1980's	1990's	Overall	1980s	1990s	Overall
Rice	33.08	-2.53	1.03	-0.24	7.54	0.87	2.87	4.82	1.90	2.62
Cholam	5.09	-0.99	-4.92	-3.99	5.85	-0.73	1.74	4.8	-5.61	-2.33
Cumbu	2.01	-2.52	-6.13	-4.41	4.2	3.09	2.48	1.57	-3.23	-2.05
Ragi	2.01	-2.18	-4.58	-3.23	3.99	0.20	2.29	1.72	-4.39	-1.02
Maize	0.21	5.88	10.35	8.00	1.00	-0.11	0.23	6.94	10.23	8.25
Red gram	1.02	5.43	-5.87	0.06	2.02	1.13	0.18	7.56	-4.81	0.24
Green gram	2.07	3.89	-1.4	2.85	4.38	-0.06	2.08	8.44	-1.45	4.99
Black gram	4.27	7.98	-2.59	1.95	3.72	-1.26	1.66	11.99	-3.81	3.64
Horse gram	1.61	-4.8	-6.06	-4.17	2.9	1.72	2.99	-2.05	-4.45	-1.31
Sugarcane	5.16	2.83	3.7	3.4	0.52	0.78	0.59	3.36	4.51	4.01
Turmeric	0.38	3.2	11.35	2.57	3.38	1.35	0.63	6.69	12.85	3.22
Coriander	0.48	-0.89	-4.62	-3.65	-0.32	0.67	-3.28	-1.2	-3.99	-6.81
Groundnut	10.65	2.33	-3.83	0.32	2.68	3.47	3.32	5.07	-0.50	3.65
Gingelly	1.35	5.00	-4.72	0.62	-2.2	4.77	2.22	2.69	-0.18	2.85
Cotton	2.64	3.00	-2.57	0.4	4.5	0.2	0.93	7.64	-2.38	1.34
Tapioca	1.73	3.78	1.26	3.61	2.12	0.77	1.85	5.98	2.04	5.52
Banana		0.22	3.65	3.15	6.94	3.2	4.48	7.17	6.96	7.77
Tomato	0.43	6.68	8.14	7.29	--	0.06	0.06	--	7.12	7.12
Onion	0.46	1.12	3.22	2.34	0.57	0.41	-1.07	1.7	3.64	1.25
Other Crops	25.35									
Total	100									

Source: Ramasamy et al, 2003

Output Price Incentives: Nominal Rates of Protection for Major Commodities

2.15 **For most of the last two decades, producers of rice and cotton in Tamil Nadu have been implicitly taxed through price and trade policies that kept domestic prices below**

border prices.[12] The nominal protection coefficient (NPC) for paddy, calculated as the domestic price (in this case the procurement price for common variety paddy), divided by the border price, averaged only 0.64 in the 1990s; i.e. the procurement price was on average 36 percent below the border price (Table 2.8). Similarly, cotton (kapas) prices were 26 percent below border prices (average across India). Sugar prices, however, were 21 percent higher than border prices in the 1980s and only 8 percent below border prices in the 1990s.

2.16 **There has been no implicit taxation of rice in Tamil Nadu through price and trade policies in recent years, however**. NPC's for paddy in 2001-02 are, in fact, slightly positive. Cotton (all-India average) remains taxed relative to international prices, as does groundnut.[13] Prices of refined sugar are likewise near (import parity) border prices. Thus, estimated trade distortions for the two most water-intensive major crops in Tamil Nadu (paddy and sugar cane) have declined, and were minimal in 2001 and 2002.

Table 2.8: Nominal Protection Coefficients for Major Crops in Tamil Nadu, 1980-2002

	Rice[a]	Rice[b]	Cotton	Cotton	Sugar	Sugar	Groundnut
	(paddy)	(paddy)	(kapas)	(kapas)	(refined)	(refined)	(pods)
Importable / Exportable	Import	Import	Export	Import	Export	Import	Import
1981-1990	0.83	1.20	0.97	0.87	1.58	1.21	1.31
1991-2000	0.64	0.76	0.80	0.74	1.21	0.92	0.83
2001-2002	1.03	1.06	0.65	0.59	1.47	1.04	0.79

Note: [a] Using procurement price of paddy (common variety). [b] Using wholesale price of paddy (common variety). All NPCs except for cotton are measured at TN rural markets, assuming that rural market exports to Chennai. NPCs for cotton are national averages. Rice: 15% broken, FOB Bangkok. Groundnuts: C&F Rotterdam (kernels) converted to pods using 0.7 kgs kernel/ kg pods. Cotton: World prices of lint cotton, converted to value of seed cotton (kapas; Sugar: FOB Europe, refined sugar.

Source: Gulati and Marayanan (2003); authors' calculations

Agricultural Inputs: Fertilizer Use and Mechanization

Average fertilizer consumption in Tamil Nadu has increased over the years with consumption per hectare increasing from 107.86 Kg in 1986/87 to 121.03 Kg in 1999/00, an average annual growth rate of 1.90 percent per annum. Average per hectare consumption was 66.7 Kg for Nitrogen, 28.33 Kg for Potash and 26.01 Kg for phosphorous. Approximately 67 percent of households growing crops report use of fertilizers (Table 2.9). The proportion of farmers reporting use of fertilizers is slightly lower than Punjab and AP, but higher states such as Maharashtra and Karnataka.

[12] Note that the nominal protection coefficients do not include any adjustment in exchange rates. Accounting for the overvaluation of the rupee in the 1980s and early 1990s would raise the estimated border price in rupee terms and lower the nominal protection coefficients in this period. Thus, the degree of taxation on Tamil Nadu agriculture in the 1980s and early 1990s is understated in Table 2.8.

[13] The estimated 21 percent implicit taxation of groundnuts relative to world prices may reflect domestic constraints in processing and marketing, as well as differences in quality of groundnuts for alternative end uses (direct consumption and crushing for groundnut cake and oil).

Table 2.9: Characteristics of Agriculture in Various States (1998)

	Andhra Pradesh	Karnataka	Maharashtra	Punjab	Tamil Nadu
Principal Cropped Area (ha)	1.33	2.09	1.72	2.60	0.86
Households Using Tractors/Power Tillers	43.53%	16.11%	13.75%	92.38%	49.96%
Households Using Fertilizers	70.59%	53.40%	56.25%	72.10%	67.16%
Households Using Pesticides	82.14%	63.04%	49.74%	86.86%	86.40%
Households Using Improved Seeds	69.70%	69.17%	70.31%	80.05%	66.93%
Households Using Weedicides	24.32%	27.97%	15.08%	78.58%	52.70%
Households that Own Electric Pumps	30.21%	19.36%	28.77%	51.03%	32.69%
Households that Own Diesel Pumps	5.82%	2.30%	3.85%	38.10%	14.71%

Source: Authors' calculations using the 54th round of the NSS (1998). Households reported area cultivated under five principal crops and the use of various inputs for each principal crops.

2.17 **Rates of pesticide consumption appear to be declining over time** with growing awareness of the deleterious health effects of exposure to chemicals, the use of organic pesticides and the adoption of pest resistant varieties of crops. Despite this farmers in Tamil Nadu appear to be more likely to use pesticides and weedicides as compared to farmers in Neighboring states such as AP, Karantaka and Maharashtra. Approximately 53 percent of farmers in Tamil Nadu report using weedicides and about 86 percent report using pesticide, insecticides, fungicides etc. The proportion of households reporting using pesticides is comparable to Punjab. Approximately 67 percent of farmers report using improved varieties of seeds. The proportion of farmers using improved varieties of seeds in Tamil Nadu is less than most southern Indian states and Punjab where close to 80 percent of farmers use improved seed varieties.

2.18 **The degree of mechanization in agriculture in Tamil Nadu is still relatively low** although it is higher than most southern states. According to data from the 54th round of the NSS (1998), only 50 percent of agricultural households in the state used tractors or power tillers (Table 2.9). While the degree of mechanization is relatively low compared to Punjab where more than 90 percent of agricultural households reported using tractors/power tillers it is higher than most southern state including Andhra Pradesh, Maharashtra and Karnataka. The majority of households (89 percent) using tractors or power tillers in Tamil Nadu rented these services.

Land

2.1 **Current land distribution and use in much of Tamil Nadu reflect centuries old patterns of settlement and cultivation in the valleys and plains**.[14] In pre-colonial society,

[14] Baker (1984) distinguishes a third major region, Kongunad, in western Tamil Nadu (approximating the modern districts of Coimbatore and Erode), as a mix of plains and valley geography and society. P.93f

river valley villages, where agriculture centered on irrigated rice, were divided into two exclusive groups: the land owning Brahman and Vellala (nobles), and the outcaste laborers (usually Pallan or Paraiyan) (Baker, 1984:87). The economy of the drier plains with generally poor soils outside the valleys was based on livestock, hunting, cultivation of millet, and non-agricultural activities.[15]

2.2 **The average farm size (individual holdings) in 1995-96 was only 0.91 hectares, with 52.5 percent of farms less than 0.5 hectares** (Table 2.10). 74.3 percent of farms were less than 1.0 hectare, accounting for only 30.2 percent of the land.

Table 2.10: Land Distribution in Tamil Nadu, 1995-96

Size of holding (hectares)	Number Of farms	Percentage of farms	Area (hectares)	Area (percent)	Area (Ha) (average)
Less than 0.5	4,205,413	52.49	982,356	13.45	0.23
0.5-1.0	1,745,691	21.79	1,227,988	16.81	0.70
1.0 - 2.0	1,233,836	15.40	1,721,288	23.57	1.40
2.0 - 4.0	600,833	7.50	1,622,810	22.22	2.70
4.0 - 10.0	199,791	2.49	1,134,853	15.54	5.68
Greater than 10.0	26,268	0.33	613,911	8.41	23.37
Total (all sizes)	8,011,832	100.00	7,303,206	100.00	0.91

Source: GoTN, 2002a

Land Resource Policy and Administration

2.19 **There is no explicit statement of State Land Use policy in Tamil Nadu; the policies are implicit in the legislative and administrative measures related to the regulation of land use**. The Revenue Department administrates all the government lands including those vested with the various departments of the state government. Following the Tamil Nadu Patta Pass Book Act, 1983, private owners of agricultural land are issued Patta pass books. These serve as evidence of ownership that facilitates loans from financial institutions, co-operative banks and commercial bank.

2.20 **Land reforms in India were designed to (1) to enhance the productivity of land (2) to ensure distributive justice (3) to create a system of peasant proprietorship and (4) to transfer the incomes of the few to many so that the demand for consumer goods would be created**. By 1972, laws had been passed in all the States to abolish intermediaries. In Tamil Nadu, Karnataka, Kerala, Andhra Pradesh and Orissa, measures in the form of an order for staying ejection have been adopted to give temporary protection to the tenants. As a result of these measures, 92 per cent of the holdings in India are wholly owned and self-operated. By the year 1972, ceiling legislation had been passed in all the States. Land ceilings in Tamil Nadu (4.86 hectares for irrigated land with two crops; 12.14 hectares for irrigated land with one crop and 24.28 hectares for dry land) have relatively little effect on land distribution, however, due to registration of land in the names of various family members, and reportedly even in the names of

[15] "The importance of agriculture in the valleys made control of land the crucial feature of social organiztion. By contrast the crucial feature in the plains was control of men… The importance of military service and, to a lesser extent, the production of goods and services, laid great stress on the control of men and their ability to work or fight." Baker, p. 90.

workers (with their knowledge). Nonetheless, the number of farms greater than 10 hectares is rather small (0.33 percent), accounting for only 8.41 percent of area (Table 2.10).

Livestock

2.21 **The performance of the livestock sector has been strong.** The livestock sector (including animal husbandry, poultry and dairy) is an important contributor to Tamil Nadu's agricultural growth. This sectors is also important for rural livelihoods offering a source of income and employment. For many rural households livestock are the main instrument for savings and insurance. Livestock also provide a source of power for tilling land and organic fertilizer (manure). According to the last census, TN had about 5.3 percent of India's livestock population. Thirty-eight percent of the livestock population comprises of cattle, 11 percent of buffaloes, 25 percent goat, 20 percent sheep and 2 percent pigs (Livestock Census, 1997).[16] TN ranks second among Indian states in egg production and nineth in terms of milk production.[17] Approximately 6 percent of national milk production came from TN in 2001/02 and the state accounted for 11.9 percent of India's egg production.

2.22 **There is significant growth potential for the livestock and poultry sectors arising from growing consumer demand.** With increasing urbanization and growing per capita incomes, the demand for animal products (meat, eggs and dairy) in Tamil Nadu have been increasing. Production of the main animal products has also been increasing to meet consumer demand. Milk production in the state has increased from 3.29 million tones in 1986-87 to 4.90 million tones in 2000-2001. Milk production increased at an average annual rate of 4 percent. Egg production has also increased by approximately 4 percent per annum in the 1990s. Growth of meat production has been much slower averaging 1 percent per annum between 1996/97-99/00. Cross bread cows contribute to approximately 37 percent of the milk produced in the state, while indigenous breads and buffaloes contribute roughly 26 percent and 37 percent, respectively. Milk yields (yield per animal) from crossbred cows of 5.72 Kg/day are slightly lower than the all-India average of 6.36 Kg/day, but significantly lower than yields in Punjab (8.7 Kg/day). The same trend can be observed for yields from buffaloes which is 3.68 Kg/day. Yield from indigenous cows (2.4 Kg/day) are comparatively high compared to most India states.

2.23 **Most of the poultry production in the state derives from large commercial units**. 70 percent of poultry products are produced by commercial farmers with the remaining 30 percent being produced by small holders (personal communication with Secretary, Animal Husbandry). While this increases efficiency in production, food safety concerns and concerns for animal welfare will increase. Environmental effects, particularly eutrophication from high levels of phosphorous and nitrogen runoffs, could become problematic without proper regulation. Small-holders may be crowded out of the sector since by its structure the industry lends itself to economies of scale. The growth in the poultry industry has contributed to rapidly increasing demand for maize as poultry feed.

2.24 **Unlike poultry production, the dairy industry is still dominated by small-holders.** Much of the milk produced in the state is marketed through milk producers cooperatives. In 2001-2002 the state had 8,238 Dairy Cooperative Societies with a membership of approximately 2.04 million members. The number of dairy cooperatives and farmer members in Tamil Nadu has almost quadrupled since the early 1980s (NDDB, Annual Report, 2000/01). The commercial sector produces 30 percent of milk, with small holders (who have an average of 1-3 cows)

[16] Livestock population refers to cattle, buffalo, goats, sheep and pigs.

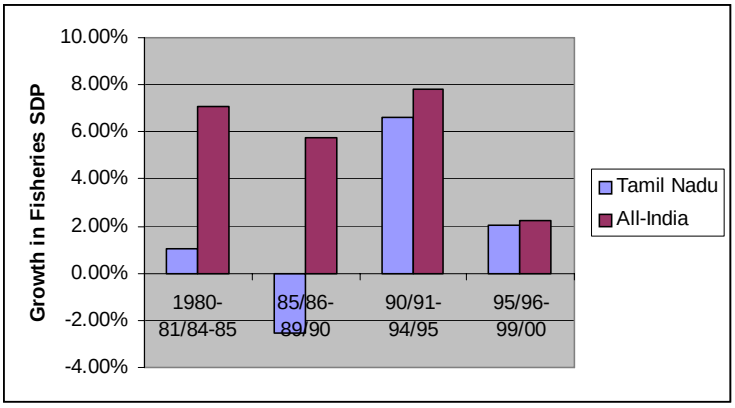
[17] Ranks are computed based on average production in Indian states between 1999 and 2001.

producing 70 percent of milk in the state (personal communication with Secretary, Animal Husbandry). Recent drought in the state has reduced fodder production which has implications for the quality of milk yields from cows and buffaloes. Adequate cold storage and further improvements in veterinary services are needed for this sector to realize its full potential.

Fisheries

2.25 **Tamil Nadu's fisheries sector has significant potential, but its performance has been mixed.** The state has a coastal length of 1,076 km, equivalent to 15% of India's coast line and is also well-endowed in terms of in-land fisheries. The inland fisheries sector has about 370,000 ha of water spread area, comprising of 52,000 ha of reservoirs, 97,700 ha of major irrigation and long seasonal tanks, 158,100 ha of short seasonal tanks and ponds and 63,000 ha under estuaries, backwaters and swamps.

Figure 2.4: Growth in Fisheries SGDP



Source: India States Database

2.26 **The contribution of the fisheries sector to total agricultural and allied sector GDP has decreased over the past two decades from roughly 7% in the early 1980s to 4.5% in 2001/02** (Figure 2.4:). Growth in the fisheries sub sector has fluctuated and growth rates consistently fall below all-India averages. Production is around 0.5 million tones with four-fifths of fish production from wild fisheries (marine fisheries). The state's fish production accounts for 13.2 percent of total marine fish production and 4 percent of total in-land fish production in India (GoTN, 2001c).

2.27 **Marine fisheries are an important export earner for the state and accounted for 5.5% of total export earnings in 2001**. The coast of Tamil Nadu has also become attractive for investment in shrimp culture. However growth in shrimp production has slowed down since a ban was imposed on shrimp culture in the Coastal Regulation Zone (area within 50 metres of the coast line) due to growing problems with salinity (GoTN, 2001c).

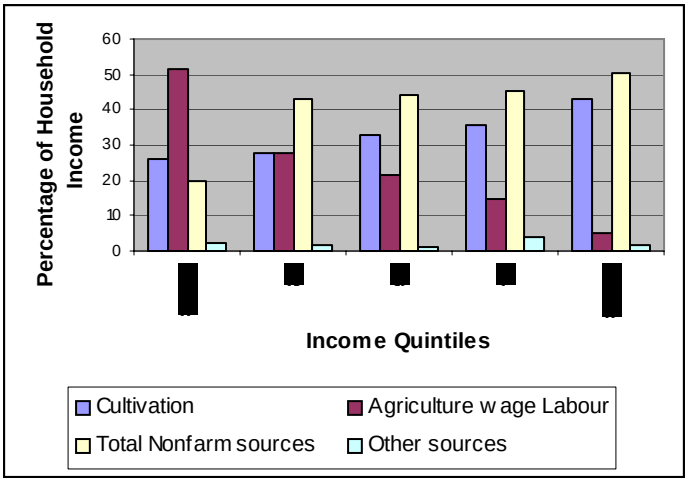
The Rural Non-farm Sector

2.28 **The non-farm sector is an important source of income and employment for rural households in Tamil Nadu**. Data from 1993/94 indicate that on average income from non-farm sources accounted for 46.4 percent of rural households incomes. The average real per capita

income in 1993/94 was Rs 4,867. In Tamil Nadu the share of non-farm income increases monotonically with households wealth. For the lowest expenditure quintile, non-farm incomes accounted for 19.8 percent of household incomes, on average. In contrast, income from non-farm sources contributed slightly more than half of household income for the wealthiest quintile.

2.29 **The Government of Tamil Nadu has encouraged development of the non-farm sector through the Tamil Nadu Khadi and Village Industries Board established in 1960**. The Board promotes Khadi and Village Industries in order to create employment opportunities for rural artisans. Khadi industries are involved in the production of cotton, wool, silk and muslin while village industries engage in production activities that are mineral-, forest-, polymer and chemical-, agro-, engineering-, textile-, and service-based. The Board provides financial assistance to artisans to start their own industries. In 2000-01 Khadi and Village Industries provided employment for approximately 1 million workers. Among the various industries, almost 71 percent of employment was in agro-based industries with Palm Gur production alone accounting for 60 percent of employment in Khadi and Village industries (Figure 2.6:). Total earnings of the Khadi and Village based industries in 2000/01 amounted to approximately Rs 2.7 billion. Other important industries in terms of employment creation were pottery, bee-keeping and village leather production.

Figure 2.5: Non-farm Income Share in Rural Tamil Nadu, 1993/94



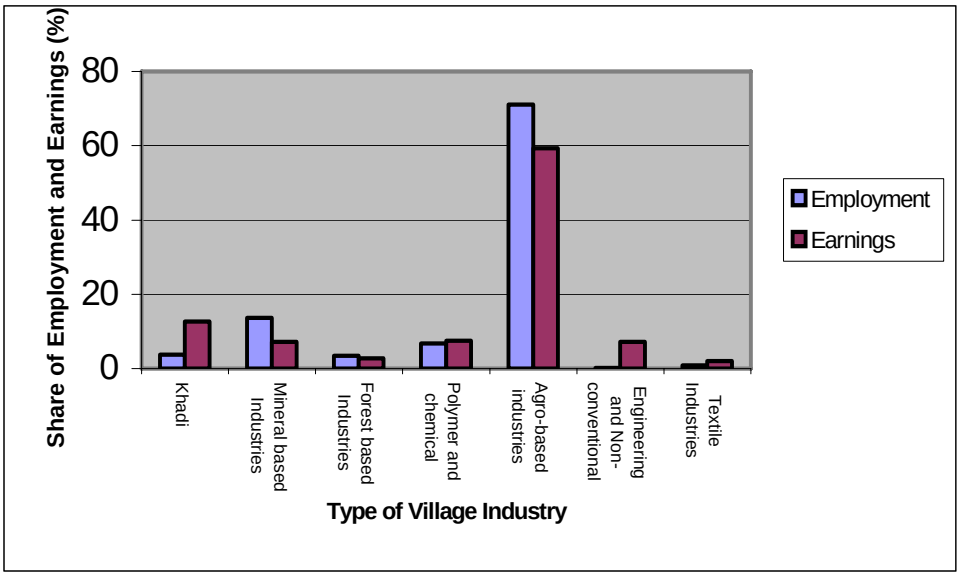
Source: Lanjouw, Jayaraman and Kijima, 2003

2.30 **Continued growth of the agro-processing sector is likely. Value added in the agro-processing sector in Tamil Nadu grew by 3.4 percent between 1989/90 and 1997/98, the latest year for which data is available** (Table 2.12). Population growth, rising incomes, and increased urbanization will foster an increasing shift in demand from raw, unprocessed products to high value processed foods. Food products and cotton textiles accounted for 10 percent and 28 percent of net value added by the industrial sector in the late 1990s (1997/87). By 1997/98 four agro-processing industries, cotton spinning, weaving and processing, processing, manufacture and refining of sugar, processing and blending of tea and grain milling accounted for 87 percent of value added in the agro-processing sector and close to 80 percent of employment in the sector (Figure 2.7:).

2.31 **In order to encourage growth of the agro-processing sector Tamil Nadu has recently launched the New Anna Marumalarchi Thittam**. The 2002-03 Budget speech announced the restructuring of the existing Anna Marumalarchi Thittam scheme into the New

Anna Marumalarchi Thittam which will place special emphasis on the agro-processing sector. The new scheme in effect since June 2002 encourages the development of small scale agro-based industries such as processing of horticultural products, flower based extracts, coir and food processing. Under the scheme, investment in agro-based industries will be encouraged in each of the 385 Blocks of Tamil Nadu through a packages of subsidies and incentives.

Figure 2.6: Employment and Earnings in Khadi and Village Industries, 2000/01



Source: Authors' calculations using data in Ramasamy, et al., 2003.

Table 2.11: Employment by Major Agro-processing Industries, 1989/90-1996/97

(Millions of Man Days)

	Grain Milling	Manufacture and Refining of Sugar	Processing and Blending of Tea	Cotton Spinning, Weaving and Processing in Mills	Other	total
89-90	4.9	6.7	2.3	55.1	13.4	82.4
90-91	4.8	6.7	2.9	50.1	16.7	81.2
91-92	5.1	6.1	2.6	51.5	17.5	82.9
92-93	5.9	6.1	2.8	3.5	19.0	37.4
93-94	6.1	7.2	3.4	62.9	21.0	100.6
94-95	4.8	6.3	2.9	62.5	22.5	99.0
95-96	5.0	5.9	3.0	56.9	23.4	94.2
96-97	6.1	6.3	3.6	68.1	20.2	104.2
Growth (%)	1.8	-1.0	4.6	6.9	6.7	4.8

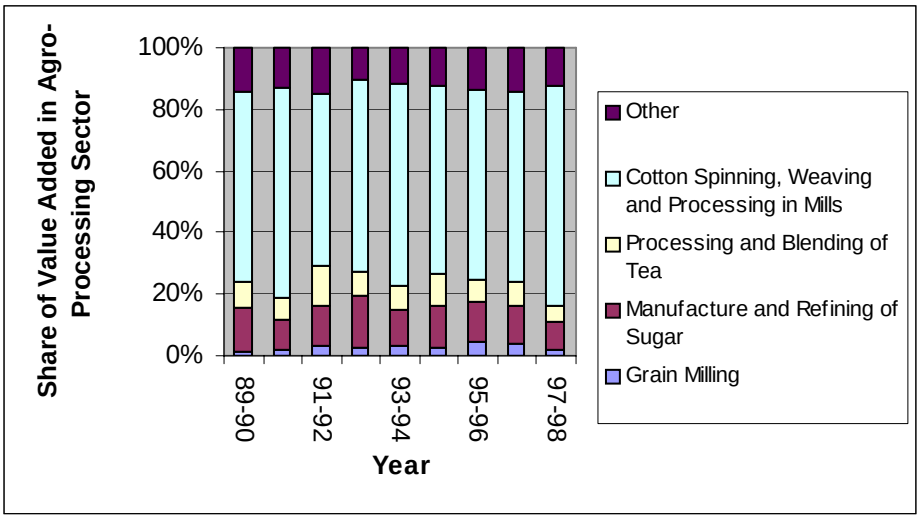
Source: Authors' calculations using data in Ramasamy, et al., 2003.

Table 2.12: Value Added in the Agro-processing Sector by Major Agro-processing Industries, 1989/90-1997/98 (Rs Billion in constant 1993/94 Rupees)

	Grain Milling	Manufacture and Refining of Sugar	Processing and Blending of Tea	Cotton Spinning, Weaving and Processing in Mills	Other	total
89-90	0.2	2.7	1.6	11.6	2.7	18.8
90-91	0.4	1.7	1.3	12.5	2.4	18.4
91-92	0.6	2.2	2.3	9.4	2.5	17.0
92-93	0.4	2.9	1.3	10.6	1.8	17.1
93-94	0.6	2.4	1.5	12.7	2.3	19.4
94-95	0.6	2.8	2.1	12.3	2.5	20.2
95-96	0.7	2.0	1.2	9.8	2.2	15.9
96-97	0.8	2.4	1.6	12.2	2.8	19.9
97-98	0.6	2.5	1.5	20.5	3.6	28.8
Growth (%)	12.6	1.1	-1.2	4.1	2.9	3.4

Source: Authors' calculations using data in Ramasamy, et al., 2003.

Figure 2.7: Value Added in the Agro-Processing Sector by Industry



Source: Authors' calculations using data in Ramasamy, et al., 2003.

3. Water for Agriculture

3.1 Tamil Nadu is a water scarce state. The annual per capita availability of water resources of Tamil Nadu is only 900 cubic meters compared to an all-India average of 2200 cubic meters. The rainfall received by the state is highly variable and drought conditions prevail in three out of every 10 years. Water is an essential factor of production for agriculture, which consumes 75% of the state's water resources. Faced with growing scarcity, increasing demand for water from industries and commercial uses, and intensifying interstate competition for water, improving the productivity of water ("getting more crop from every drop") in irrigated and rainfed agriculture is of great urgency in Tamil Nadu.

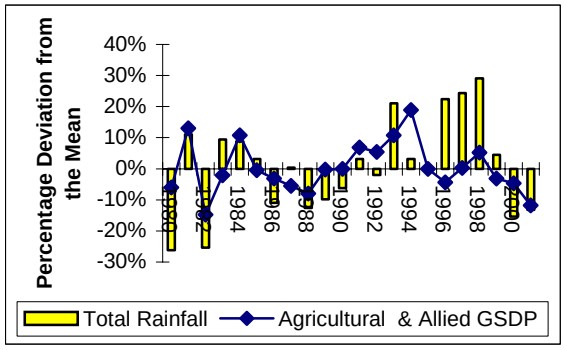
3.2 Improving the productivity of water in agriculture needs commitments to policy, institutional and management reforms as well as investments in crop research, technology and infrastructure. Tamil Nadu has already embarked on a process of reform including decentralizing water resources management along river basins, formalizing irrigation management transfer to users, revising water tariffs, and promoting water saving technologies. Commencing with a brief introduction to water resources in the state, the following chapter elaborates on recent reforms and the challenges that lie ahead for the state to increase agricultural growth while meeting the needs of other uses.

Water Resources

3.3 **Geographically, most of Tamil Nadu is a dry plain, with river valleys surrounded by low hills**. The normal rainfall in the plains in the state is 925 millimeters per year, concentrated during two monsoon seasons-the southwest and the northeast monsoon (Agrostat, 2001).[18] Most of the rains from the southwest monsoon extending from June through September are blocked by mountains (the Western Ghats), on Tamil Nadu's western border with Kerala and Karnataka. Except in the southern tip of Tamil Nadu (especially Kanniyakumari district), the southwestern monsoons are highly variable. The northeast monsoon rains, from October through December are more reliable and on average account for 47 percent of annual rainfall in the state. Little rain falls during the winter (January-February) or summer (March-May).

Figure 3.1: Rainfall and Agricultural & Allied GSDP

3.4 **Rainfall in the state is highly variable and has a pronounced effect on the performance of the agricultural sector** (Figure 3.1, Table 3.1). In six years between 1980 and 2001 total rainfall was less than 90 percent of the average for the two decades. For these years, real agricultural GDP was on average 8.1 percent below trend GDP. A regression analysis shows that a one percent increase in rainfall relative to the mean is associated with a 0.3 percent increase in real agricultural GDP relative to the trend agricultural GDP. [19]



Source: Authors' calculations

[18] India's average annual rainfall is 1,100 mm per year.

[19] The regression equation is y=0.001+ 0.298x where y is the percent deviation in agricultural GDP from its logarithmic trend value, and x is the percent deviation in total rainfall from its mean value over the period. The standard deviation of the estimated coefficient on x is 0.100, t-statistic is 2.97 and the R^2=0.31.

Table 3.1: Rainfall in Tamil Nadu

Season	Months	Normal Rainfall (mms)	Share of Normal Annual Rainfall (percent)
Winter rains	Jan – Feb	42.2	4.5
Summer rains	Mar – May	136.5	14.8
Southwest monsoon	Jun – Sep	307.6	33.3
Northeast monsoon	Oct – Dec	438.7	47.4
Total Rainfall		925	100

3.5 **Tamil Nadu has 17 river basins** (including groups of minor basins), all flowing eastwards from the Western Ghats and Deccan plateau.[20] The major rivers in the state are the Cauvery, Palar, Vellar, Vaigai and Tambaraparani. The Cauvery delta, the largest river basin in the state, has been the rice bowl of Tamil Nadu for over 1500 years since the construction of the Grand Anicut (dam), which diverted water from the Cauvery to a system of irrigation canals. Water from the Cauvery is used to irrigate approximately 20 million hectares of land in Tamil Nadu. Cauvery water is shared with Karnataka (located upstream) and is the subject of ongoing disputes between the two states.

3.6 **The state's water resources are divided nearly evenly between surface water (23.6 billion cubic meters) and groundwater (22.3 billion cubic meters)**. Utilization rates are estimated to be 93% for surface water and 60% for groundwater. In many parts of the state, the rate of extraction of groundwater has exceeded recharge rates contributing to falling water tables. Out of 385 blocks in the state 23 percent are dark (extraction exceeding 100 percent of the recharge), another 23 percent of blocks are grey (extraction exceeding 65 percent of the recharge). The dark and grey blocks are particularly concentrated in the Western and North-Western Zones.

3.7 **Water quality issues are of increasing importance**. Effluents discharged from industries involved in dying and bleaching, as well as increasing use of fertilizers and pesticides, have had a major impact on surface water quality, soils and groundwater. For example, in the Noyyal river, a tributary of the Cauvery river, uncontrolled discharge of total dissolved solids have adversely affected agriculture as pollutants have contaminated water sources and soils.

Overview of Water Use in Agriculture

3.8 **Most farmers own only irrigated land or non-irrigated land; few farmers own significant amounts of both irrigated and non-irrigated land**. According to data from the 55th round of the Indian National Sample Survey (NSS), in 1999/00 approximately 25 percent of farms in Tamil Nadu used little or no irrigation; by contrast, 65 percent of farms consisted of almost entirely irrigated land. Only about 10 percent of farms had significant shares (at least 20 percent) of both irrigated and non-irrigated land. Thus, agricultural programs that focus on irrigated crops will generally not directly benefit 25 percent of farm households. Similarly,

[20] Some of these basins, including the Cauvery, are partially located in neighboring states.

programs that focus on non-irrigated crops will generally not directly benefit the 65 percent of farm households with essentially no non-irrigated land (Figure 3.2,Table 3.2)

Figure 3.2: Area Cultivated by Share of Irrigated Land Per Farm

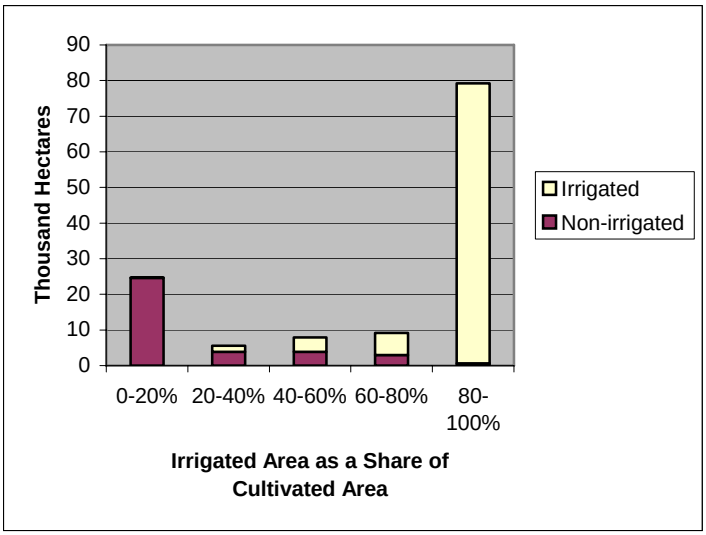


Table 3.2: Access to Irrigation by Farms

Percent of Cultivated Area Irrigated	Average share of irrigated land per farm (%)	Distribution of Farms (%)	Average Farm Size (Ha)
0-20%	0.43	24.80	0.69
20-40%	30.75	2.27	1.7
40-60%	51.19	4.09	1.34
60-80%	67.99	4.15	1.53
80-100%	99.23	64.69	0.85
Total	71.69	100.00	0.88

Source: Authors' Calculations from the 55th Round of the NSS (1999/00)

Rainfed Agriculture

3.9 **Rainfed agriculture accounts for 45 percent of the gross cultivated area of 6.5 million hectares in Tamil Nadu and approximately 25 percent of farmers in the state are engaged in rainfed agriculture**. Despite its importance as a source of income and employment, productivity in rainfed agriculture has been low. Tamil Nadu has implemented a number of centrally sponsored and donor funded watershed development schemes aimed at improving the production potential of rainfed agriculture. These schemes include the Drought Prone Areas Programme (DPAP), the National Watershed Development Project for Rainfed Areas (NWDPRA), the Integrated Wasteland Development Programme (IWDP) and the DANIDA funded Comprehensive Watershed Development Projects.

3.10 The DPAP implemented in Tamil Nadu since the early 1970s promotes natural resource management in watersheds so as to mitigate the adverse effects of drought, prevent further degradation and generate employment through non-farm activities. IWDP has the broad

objectives of sustainability, equity and environmental conservation to meet timber, fodder and fuel needs and to increase employment opportunities for Schedule Caste and Schedule Tribes and other socio-economically disadvantaged groups. This program has been implemented in the state since 1993/94 in non-DPAP blocks. NWDPRA focuses on sustainable production of biomass and restoration of ecological balance in watersheds and has been operational since 1990-91. This initiative has recently been restructured into the Watershed Areas Rainfed Agricultural Systems Approach (WARASA). All of these programs are jointly funded by the Central government and GoTN, with the center responsible for at least 75 percent of the costs.

3.11 **The recently launched Comprehensive Wasteland Programme is a major initiative promoted by the GoTN which holds potential for improving water productivity in rainfed lands**. The program aims to reclaim current fallow wastelands through a micro watershed development program focusing on soil and water conservation. Roughly 17 percent of Tamil Nadu's land area is classified as wastelands.[21] The program has two main components. The first promotes participatory watershed development of patta lands.[22] The second component seeks to encourage development of government owned wastelands by corporate houses, small companies, cooperatives and Federations of Women's Self Help Groups.

3.12 Farmers participating in the participatory watershed approach will receive a subsidy to partially cover costs for planting and irrigating horticultural and agro-forestry crops such as mangoes, cashew, sapota, tamarind, neem, silk cotton in the watersheds. The involvement of corporations in wasteland development will be encouraged by offering 30 year leases for wastelands of up to 1,000 acres to corporations that are interested in raising horticultural crops or bio-mass plantations on wastelands. Corporations leasing land under this program will pay concessional amounts of rent proportional to land value for use of the land.

3.13 **Although watershed projects have been widely promoted throughout India the success of these projects in terms of curbing land degradation, improving the productivity of rainfed agriculture and reducing rural poverty has been limited**. Reviews of watershed development programs in India have found that successful approaches to watershed development have entailed extensive community participation with sound technical inputs. The evidence also reveals that benefits of these projects have been skewed towards landowners, with landless people benefiting indirectly. In some cases women and landless may have actually been made worse off as their access to common property resources may be restricted as a result of project interventions. Adequately addressing these equity issues remains a challenge for governments and NGOs involved with implementing watershed projects. It has also been found that subsidies for soil and water conservation, and the opportunities for employment, can induce farmers to accept soil conservation strategies that they do not really want and are hence difficult to sustain in the long run once the project ends (Kerr et al, 2002). Tailoring conservation strategies to practices that farmers really want will be important in ensuring the success and long run sustainability of future initiatives. **For programs such as the Comprehensive Wasteland Programme, it is also important that the state adopts a basin perspective in implementation to ensure that these initiatives do not have negative impacts on downstream human and ecological uses**.

3.14 **Rainwater harvesting is being promoted on a large scale in the state in an effort to supplement ground water resources**. As much of the rainfall is received in a very short period,

[21] Wastelands include barren and uncultivable land, cultivable waste, permanent pastures and other grazing lands, other fallow lands, 50 per cent of current fallows and 40 per cent of dry land.

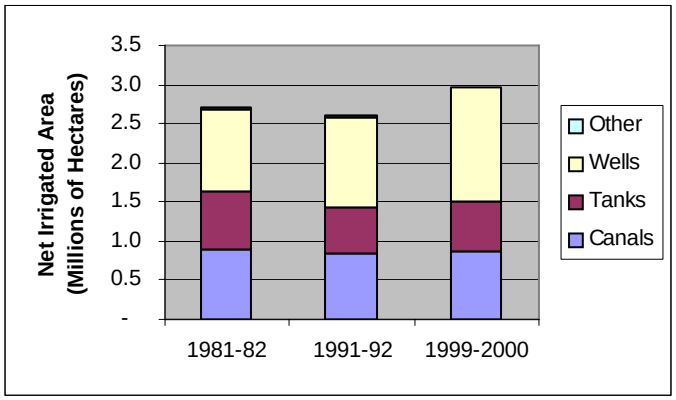
[22] Private lands where owners are issued a Patta Pass Book

rain water harvesting offers the ability to capture a transitory resource and can provide sufficient water to grow less water-intensive crops.[23] In urban areas, rainwater harvesting is a potential source of water for consumption purposes. As of July, 2003, the Government of Tamil Nadu has passed an ordinance requiring all buildings in the state to install rainwater harvesting structures before the monsoon.

Irrigated Agriculture

3.15 Tamil Nadu has a net irrigated area of 3 million hectares (1999/00). Most irrigated lands are only irrigated for a single season and the state's irrigation intensity of 121 percent is relatively low.[24] Today the state is equally reliant on surface and groundwater sources for irrigation, although its reliance on groundwater sources has been steadily increasing (Figure 3.3). Approximately 30 percent of the net irrigated area is irrigated by water from canals. An additional 21 percent is irrigated by tanks, while wells are used to irrigate 49 percent of the net irrigated area. The remaining area is irrigated by other sources such as streams and springs. Net irrigated area has increased by about 10 percent in the past two decades from 2.7 million ha in 1981/82, due mainly to a 39 percent increase in area irrigated by wells. Over the same period, area irrigated by canals and tanks decreased by approximately 4 percent and 14 percent, respectively.

Figure 3.3: Net Irrigated Area by Source of Irrigation



Source: CMIE Yearbook, Various Years

Surface irrigation

3.16 Tamil Nadu has constructed more than 85 large and medium dams since independence. As the surface irrigation potential has virtually been exhausted, modernizing and rehabilitating existing systems is crucial to improve the efficiency of surface irrigation. The majority of canal systems in the state are old and have very poor efficiency as a result of seepage and silting in the canals (GoTN, 2001a). In recent years the state has undertaken some major canal modernization projects with the aide of World Bank funding under the Water Resources Consolidation Project.

[23] On average there are 30 rainy days during the southwest monsoon and 55 rainy days during the northeast monsoon.

[24] The all-India irrigation intensity is 132%.

3.17 **In the 1960s, tank irrigation accounted for almost 37 percent of net irrigated area in Tamil Nadu**. Area irrigated with tanks has steadily declined over time, however, because of siltation in tank beds and supply channels, encroachments in the tank bund, foreshore, and supply channels, and damaged sluices, weirs and bunds,. There are currently 41,948 tanks in the state of TN irrigating an area of 0.63 million hectares, the average area irrigated by a tank is 15.1 ha. Due to water shortages a large number of tanks in the state are defunct. A recent study found that in a 10 year period, tanks are only full for 2 years, they are partially full for 5 years and fail for 3 out of 10 years. Water markets are becoming increasingly important in the tank command areas and provide a means to supplement inadequate tank irrigation water particularly at the end of the paddy season. Farmers normally spend about 20 percent of their rice crop income on buying water from well owners. Since only 15 percent of farmers own wells in the tank command, demand for supplemental irrigation is high (Palanisami, 2003).

Groundwater Irrigation

3.18 Factors including rural electrification, the availability of affordable irrigation pump sets and cheap or free electricity for agriculture have contributed to the increasing reliance on groundwater for irrigation in Tamil Nadu. Both the number of wells and area irrigated by them registered significant increases over the years. The number of wells (dug and tube wells) had increased from 1.68 million during 1981-82 to 1.83 million in 1999-2000, the area irrigated by them rose from 1.05 million ha. to 1.45 million ha.

3.19 **Overexploitation of groundwater resources is a major problem facing the state**. Of a total of 1.8 million wells in the state, approximately 10 percent are now defunct. The depth of bore wells in hard rock area has increased to as much as 600ft to 1000ft. Today, use of dug wells as a source of irrigation is only possible in canal and tank command areas; only bore wells remain operational in hard rock areas (mainly in the western part of the state).[25] Due to acute water scarcity the Government of Tamil Nadu has recently announced its plans to ban the drilling of bore wells, particularly in hard rock areas. This however has had a perverse effect as farmers are rushing to drill additional wells before the ban is officially imposed. Spacing norms have been prescribed based on the guidelines issued by NABARD (National Bank for Agricultural and Rural Development). Dug wells must be at least 150 m apart; deep tube wells must be at least 600 m apart. These spacing norms for the construction of new structures for minor irrigation purposes are applicable throughout the state for wells that are constructed with the aide of institutional finance.

Institutions

3.20 **Institutional weaknesses undermined proper management and development of water resources in Tamil Nadu**. Institutional arrangements did not adequately address water resources management, allocation and planning. There has also been a lack of expenditure prioritization; inadequate priority to and funding for operations and maintenance (O&M) has led to rapid deterioration of surface irrigation. Farmer involvement in the operation and maintenance of irrigation systems has been minimal. Recently, however, effort has been made to address many of the policy and institutional issues plaguing the water sector.

3.21 The state is now undertaking **comprehensive water planning on a river basin basis** and has decentralized water resource management along river basins. The Public Works Department has been divided into the **Water Resources Organization (WRO)** and the Buildings

[25] Personal communication with K. Palanisami (TNAU).

Organization in 1995. The WRO is to be formalized as a separate agency with a specialized cadre of staff in 2004. Chief Engineers of the WRO have been reorganized along a river basin basis and Government Orders setting up the Palar Basin Development and Management Board and the Thambaraparani Basin Development and Management Board were issued in January, 2000. Preparation of macro-level basin development plans and formulation of decision support systems for development and management of the water resources of the state has been underway since 1997.

3.22 **The state has also drafted a Water Policy and steps for irrigation management transfer have also been initiated**. The Tamil Nadu Farmers Management of Irrigation Systems Bill was passed by the State Legislative Assembly in May, 2000. The state was one of the first in India to pass a Groundwater Regulation and Management Act. Development of requisite skills in environmental aspects of water resources for staff in specified units of the Public Works Department has been a substantial achievement.

Irrigation Management Transfer

3.23 Traditionally rural communities have played a central role in the management of water resources in Tamil Nadu. Informal arrangements under the system of "kudimaramathu' were widespread for the maintenance and management of irrigation tanks up until the middle of the 19th century. Various other spontaneously created farmer organizations also played an important part in the management of canal systems, as well.

3.24 Between 1988 and 1994 as part of the Command Area Development Programme, the Tamil Nadu Agricultural Engineering Department organized Water User Associations in five major systems. By 1994, 3,300 outlet level WUAs and 118 distributory canal level WUAs had been formed, though most were not functioning well (Brewer et al., 1999). The motivation for formally transferring irrigation management to canal irrigation users in the state was largely driven by the pressure of maintaining canal systems in a situation of fiscal stress, increasing inter-sectoral competition for water resources, and advice from the World Bank as part of the WRCP project.

3.25 **To enable management transfer to farmers, the Tamil Nadu Farmers Management of Irrigation Systems Bill was passed by the State Legislative Assembly in May, 2000**. This Act will be in force in an area covering 1.5 million hectares in the system command areas under the management and control of WRO.

3.26 The Tamil Nadu Farmers Management of Irrigation Systems' (FMIS) Bill created a three-tier system management organization, including WUAs at the outlet, WUAs at the 500 hectare command levels and a joint management committee(JMC) (a committee including representatives of the WUAs and of key government agencies) at the project level.[26] The Bill also allows for the full or partial transfer of O&M responsibilities to these bodies. Each WUA has complete responsibility for water distribution and maintenance in the area under its jurisdiction. The JMC is afforded the responsibility of deciding on water allocations and distribution each season and for solving problems as they arise.

3.27 Irrigation Management Transfer (IMT) is at an early stage in Tamil Nadu and evaluations of its impact in Tamil Nadu are yet to be carried out. However, there is a growing body of evidence on the impact of IMT from other states in India which is likely to be relevant for Tamil

[26] The JMC's are known as Farmer Councils

Nadu as WUAs and JMCs begin to play a larger role in the management of irrigation systems (Text Box 3.1).

Text Box 3.1: Pro-poor Irrigation Management Transfer

A recent study undertaken by the International Water Management Institute (IWMI) and the Gujarat Institute of Development Research (GIDR) sheds some important insights into pro-poor IMT in large-scale canal irrigation systems. The study is based on a survey of 700 landowning and tenant farmers from seven WUA's in the two states. The study found that IMT in AP and Gujarat led to improved access to water for 15% and 25% of farmers surveyed and extension of the irrigated area for 2% and 3% of farmers in the two states, respectively. However, the authors also find that poor farmers are less informed about their rights and tend to loose out on many of the potential benefits of IMT.

The report makes the following recommendations in terms of making IMT more pro-poor.

1. The rights of farmers need to be clearly defined. Individual farmers within the WUA should have equal decision making power regardless of farm size.
2. The awareness of poor farmers and access to information on the IMT process should be raised. Differences in access to information between poor and wealthy farmers contribute to inequities. Wealthy farmers tend to be better informed of their rights and responsibilities as WUA members and participate more in the decision-making processes. Small farmers were more likely to be unaware of the existence of WUAs. The absence of small farmers from committee and general meetings means that they are excluded from key decisions taken within the WUA including decisions on the use of funds, site selection for R&R (Resettlement and Rehabilitation), future self-management of water distribution etc.
3. The election process within the WUA should be competitive and transparent. Election of new presidents and committee members should be vote-based rather than consensus-based, to promote competition between several candidates.
4. The levels of participation (in WUA elections, decision-making processes, fee collection etc) by farm size and location should be monitored.. Farm size has proven to be a good indicator of relative wealth and monitoring participation by farm size provides a good indicator of equity trends.

Source: van Koppen, Parathasarathy and Safiliou, 2003.

Water and Electricity Charges

3.28 **Tamil Nadu has an extremely complicated system of water charges for surface irrigation compared to most Indian states**. Currently there are 188 water rates (133 for wet lands and 55 for dry lands) for farmers depending on soil type, irrigation source, crop grown, season etc. Currently water rates form part of the land revenue collected from farmers by village administrative officers. Apart from the basic water rate there is a local cess and a local cess surcharge levied as a multiple of the basic water rate paid by farmers. The revenue from the local cess and local cess surcharge is transferred to Panchayat bodies for general expenditures.

3.29 At present the revenue department is involved in both assessments of water charges and collection. The VAOs (village officials) are supposed to inspect the field and record the cropped area, the area under government sources of irrigation (e.g. canals, tanks, etc.) and crop conditions. A sample check is conducted by higher officials such as the Revenue Inspector/Deputy Tasildars.

At the end of the agricultural year (fasli year), the accounts are prepared and water charges are collected along with the land revenue. The myriad of water rates provide considerable discretionary power to assessors.

3.30 **Until recent revisions, water rates had been untouched since 1962**. Beginning in July 2003, however, an additional water charge of Rs 150/ha ,de-linked from any additional cess, was imposed. Thus the farmer will pay the original charge plus the Rs 150/ha. In addition, the FMIS Act empowers the water users' associations to charge users between Rs 250/ha to Rs 500/ha. This additional charge can be retained by the WUA for operation and maintenance of the systems turned over to them.

3.31 In 1999/00 total O&M expenditures on irrigation amounted to Rs 45.6 Crores. Total revenue collected was roughly Rs 11 Crores. Hence cost recovery was less than 25 percent (Table 3.3).

Table 3.3: Irrigation Expenditures and Revenues (1998/99-2000/01)

	Command Area ('000 ha)	O&M expenditures and Recoveries (Rs. Crore)			O&M expenditures (Rs/ha)		
		98/99	*99/00*	*00/01*	*98/99*	*99/00*	*00/01*
O&M Works Expenditures							
Major	737.8	36.89	14.11	15.09	500	191	205
Medium	824.4	18.34	18.21	18.26	222	221	221
Minor	729.9	11.20	12.23	12.23	153	168	168
Total	2292.1	66.43	44.55	45.58	290	194	199
Cost Recovery							
Recovery from major & medium		8.25	8.25	8.50			
Recovery from minor		2.63	2.60	2.49			
Total Recovery		10.88	10.85	10.99			
Cost recovery as percent O&M works expenditure		16%	24%	24%			

Sources: Expenditure data from WRO, GOTN; Revenue data from RBI Bulletin on State Finances, Dec. 2000 as cited in Palanisami, 2002.

3.32 **Low water charges and poor cost recovery has meant that canal irrigation users have received an implicit subsidy**. In 2000/01 the implicit irrigation subsidy (defined as the difference between O&M expenditures and actual collection of water charges) amounted to Rs 333.5 million. Based on an estimated gross canal irrigated area of 0.87 million hectares this translates into a per hectare subsidy of Rs 649.[27]

3.33 **The vast majority of rural households in Tamil Nadu do not benefit directly from canal irrigation subsidies; in fact only 7 percent of rural households (15 percent of households cultivating crops) enjoy these implicit subsidies**. However, the distribution of canal irrigation subsidies among households that use canal irrigation is less regressive than in other major Indian states (World Bank, 2003a). In Tamil Nadu over 90 percent of farmers using canal irrigation are marginal and small farmers and these farmers capture approximately 76

[27] Exact data on gross canal irrigated area are not available. Gross canal irrigated area is computed as the net canal irrigated area multiplied by the intensity of irrigation (1.2062).

percent of the canal irrigation subsidy. The average subsidy received by households using canal irrigation in 2000/01 was Rs 493.67. Owing to larger farm sizes, large farmers enjoy average subsidies that are more than four times as large as those enjoyed by marginal and small farmers (Table 3.4).

Table 3.4: Distribution of Canal Irrigation Subsidies in Tamil Nadu (2001/02)

Size of landholding	Average farm size (Ha)	% of Ag HHs using canals	Distribution of HH using canals (%)	Distribution of Canal Irrigated Area	Subsidy/HH (S1)
All	0.96	15.4	100.0	100.0	493.7
Marginal (<1 Ha)	0.47	12.6	81.8	52.2	314.9
Small (1-<2 Ha)	1.33	1.9	12.4	24.1	957.4
Medium (2-<4 Ha)	2.47	0.7	4.6	14.5	1561.74
Large (>=10 Ha)	5.30	0.2	1.2	9.2	3885.9

Source: Authors' computations using the 54th round of the NSS (1998). Households that cultivated crops anded own less than 1 hectare (Ha) were classified as marginal farmers, those owning 1 to less than 2 Ha were classified as small farmers, those with 2 and less than 4 Ha are classified as medium farmers. Households owning 4 or more hectares are classified as large farmers.
Note: HH indicates household. Ag HH (agricultural households) are any households that reported cultivating crops.

Agricultural Power Tariffs

3.34 **Until recently farmers pumping groundwater for irrigation with the use of electric pump sets have benefited from free electricity**. Free electricity for agricultural consumers coupled with irrigators not internalizing the environmental costs of their water use, has reduced incentives for conservation (encouraging over extraction of groundwater) and encouraged the cultivation of water-intensive crops. Provision of free electricity for agricultural power consumers has also contributed to the deteriorating finances of the state's power sector affecting the economy's growth and fiscal health.

3.35 **In Tamil Nadu, as in the rest of India, the electricity tariff charged from industrial and commercial consumers cross-subsidizes domestic and agricultural consumers**. This policy has contributed to rapid expansion in consumption from subsidized categories and stagnation in consumption from subsidizing categories (World Bank, 2003). Industries, commercial users and even many domestic consumers have had to make large investments in self generation capability which is highly inefficient. This, along with the cross subsidy, has an impact on the competitiveness of the state's industries and economy. Tamil Nadu Electricity Board's financial distress has contained its ability to make investments, resulting in uneven quality of supply and generation shortages.

3.36 **Apart from these environmental and fiscal issues, the distribution of power subsidies to farmers is also a concern, since the subsidy reaches only the 16 percent of Tamil Nadu farmers who own pump sets**. The vast majority of rural households have not benefited directly from agricultural power subsidies because they do not own electric pump sets. The majority of electric pump set owners are small and marginal farmers (79.4 percent), 14 percent are medium farmers and 6 percent are large farmers (Table 3.5). [28] It is important to note,

[28] Households that reported cultivating crops and own less than 1 hectare (Ha) were classified as marginal farmers, those owning 1 to less than 2 Ha were classified as small farmers, those with 2 and less than 4 Ha are classified as medium farmers. Households owning 4 or more hectares are classified as large farmers.

though, that insufficient new investment and maintenance have made rural electric supply erratic in many places. Surveys in other states in India indicate that farmers would be willing to pay for electricity, provided that it was more reliable (World Bank, 2001).

3.37 **In 2001/2002 agricultural power consumers in Tamil Nadu received a subsidy of Rs 27.09 billion**.[29] According to available data, total official power consumption by agricultural consumers was 9,484 million Kwh and the average cost of supplying power to farmers was Rs 3.05/Kwh. Although small and marginal farmers constitute the majority of electric pump set owners in Tamil Nadu, medium and large farmers (representing 21 percent of all agricultural pump set owners) receive a disproportionately large share of the total agricultural power subsidy compared to their representation in the population (i.e. while medium and large farmers represent 21% of electric pumpset owners, they operate 48 percent of the area irrigated by electric pump sets) (Table 3.5).[30] Poor rural households in Tamil Nadu receive less than 17% of the agricultural power subsidy.

Table 3.5: Distribution of Agricultural Power Subsidies in Tamil Nadu (2001/02)

Farm size	Distribution of electric pump set owners (%)	Distribution of area irrigated by electric pumps (%)	Total subsidy received by Farm Size (Rs/year in Billions)	Average subsidy per pump set owner (Rs/year)
Marginal (<1 ha)	55.53	26.84	7.27	13,092.79
Small (1-2 ha)	23.84	24.89	6.74	28,276.87
Medium (2-4 ha)	14.1	24.66	6.68	47,371.37
Large (>=4 ha)	6.53	23.62	6.4	97,972.53
Total	100	100	27.09	27,090.00

Source: 54th round of the NSS (1998). Households that reported cultivating crops and own less than 1 hectare (Ha) were classified as marginal farmers, those owning 1 to less than 2 Ha were classified as small farmers, those with 2 and less than 4 Ha are classified as medium farmers. Households owning 4 or more hectares are classified as large farmers. HH represents household

3.38 **In March 2003, The Tamil Nadu Electricity Regulatory Commission (TNERC) notified its first tariff order, reducing the cross-subsidy on electricity with the introduction of an agricultural tariff**. After 12 years of free power to farmers, the new tariff order has introduced a flat rate for unmetered connections of Rs.250 per HP per annum and a charge of Rs.0.20/kWh for metered connections. The government also announced an income support scheme for small and marginal farmers. This was a significant step toward creating a more direct and transparent system of subsidies to farmers and other target groups and ensuring the separation

[29] Estimates from Rajesh Sinha. The cost of supply excludes depreciation (a non-cash expenses).

[30] The analysis of agricultural power subsidies in Tamil Nadu presented is based on data from the 54th round (1998) of the Indian National Sample Survey (NSS). [30] This round of the NSS included a module on Common Property Resources, Sanitation and Hygiene which contained information on cultivation practices of households, and the ownership and use of irrigation technology (electric pumps, diesel pumps, canals, and conjunctive sources) in cultivating five principal crops. By using the amount of area irrigated by electric pumps as a proxy for the benefits of subsidized electricity, these data can be used to examine the distribution of agricultural power subsidies across various landholding categories. In reality, in addition to farm size, power consumption by different groups of farmers is likely to depend on the water requirements of crops grown, the depth of the water table, and the availability, reliability and quality of the power supply. The magnitude of agricultural power subsidies going to different land holding categories can be estimated by combining data on the ownership of electric pump sets, the distribution of area irrigated by electric pumps by land holding, and an estimate of the total agricultural power subsidy.

of commercial operation of the power utility from the need for subsidy. However, the reintroduction of agriculture power tariff became a highly contentious issue in Tamil Nadu during the recent national election, forcing the government which suffered severe electoral loss for the national parliament seats to reverse the policy.

3.39 **Under the income support scheme, GoTN provided small and marginal farmers a transfer of up to Rs.1250 per year**. However, this disbursement was restricted to Rs.1000 in the case of small and marginal farmers owning pump sets of 3 HP capacity. These farmers, 0.94 million, accounted for about 57% of the agricultural connections or 12% of farmers. This direct subsidy would have amounted to about Rs.1 billion for farmers.

3.40 On June 10, 2003, the Central government enacted the Electricity Act 2003 (Act) which replaces the earlier central laws on electricity viz. the Indian Electricity Act-1910, Electricity Supply Act-1948, and the Electricity Regulatory Commission Act of 1998. The new act is expected to have a far reaching impact on the power sector in India (World Bank, 2003). The provision for mandatory metering of supply of electricity within two years will put pressure on States to meter agricultural consumers. TNEB has started metering new agriculture connections since July 1, 2002. Like rest of India, metering the 1.65 million existing agricultural consumers in the state is politically challenging, and is expected to take time. However 100% metering is a mandatory requirement under the Act and an essential pre-requisite to improve the information on power supply and consumption. Full metering of retail consumption along with bulk metering is also required to establish energy accountability among utility staff. Metering of agriculture would be the first step towards better targeting of the agriculture subsidy based on actual consumption and provide better incentives for efficient usage of scarce water resources in Tamil Nadu.

The Impact of Water, Agricultural Power and Fertilizer Subsidies on Incentives in TN Agriculture

3.41 **Government policies have major effects on crop profitability in India**. Trade policies (tariffs, export subsidies, and quantitative restrictions) affect domestic market prices of local commodities that compete with international goods. Moreover, agricultural-related subsidies (the national fertilizer subsidy, inadequate cost recovery in irrigation systems, electricity subsidies) and investments involve major public expenditures.

3.42 **In order to examine the impacts of major policies on incentives in agriculture, this section presents measures of crop profitability with and without subsidies and other market distortions**. Given the importance of increasing water efficiency in agriculture, a major focus of the analysis is on the effects of changes in irrigation costs (water charges in canals and electricity charges for wells). The impact of other major policies is also considered through estimates of crop productivity at economic prices (i.e. at prices that reflect the opportunity cost of each resource).

3.43 The analysis is based on costs of cultivation and crop budgets (average of 1999/2000 and 2000/01) as calculated from farmer surveys by the Tamil Nadu Agricultural University (TNAU) for selected crops and sites. These sites are chosen as representative of each crop under the irrigation system specified. It should be noted that costs and returns of individual farmer fields depend on particular soil conditions, local rainfall, farm management skills, and other factors.

3.44 **The amount of water used and its marginal (operational) cost varies considerably across types of irrigation and crops** (Table 3.6). Sugar cane requires the most water (1800 mms/unit area) and occupies the land essentially year-round. Paddy requires 135 mms/unit area in only 4 months. Cotton and groundnuts require less than half the water of paddy. Financial

costs of irrigation to the farmer (not including capital costs) vary from about 289 Rs/ha for paddy under canal irrigation[31] to 1,250 Rs/ha (the annual tax on a 5 horsepower pump set) for sugar cane and banana. (Pump set taxes for crops that are grown as part of a two-crop sequence are estimated as one half of the annual charges for pump sets, i.e. 625 Rs/ha.)

3.45 **Estimates of the full marginal cost of irrigation under meter charges vary more substantially, given the large variation in estimated electricity use**. Electricity use for paddy irrigated solely with pumps is more than five times that of paddy irrigated by tanks with only supplemental irrigation from pumps. Likewise, estimated electricity use for groundnut and cotton irrigation by pumps is only about half that for paddy given lesser water requirements. Estimated economic costs of irrigation (excluding capital costs) for paddy irrigated by wells is about 10 times the estimated economic costs of canal irrigation (4600 Rs/ha for pumps compared with 450 Rs/ha for canals).[32]

3.46 **Given variations in costs as well as value of output, net financial returns per hectare of rice, sugar cane, cotton and groundnuts under various forms of irrigation range from 9,849 Rs/ha for rice cultivation under tank and well irrigation to 17,956 Rs/ha for sugar cane with well irrigation (**Table 3.7**)**. These costs and financial returns of cultivation for irrigation with pumps are adjusted to include the tax on electric motors which is planned to take effect in late 2003.

3.47 **For well irrigation, the tax on pumpsets (adjusted for the number of crops grown on the land) is equal to only 4.9 to 6.5 percent of net returns to land and management with no irrigation costs**. These figures represent the reduction in crop profitability in these systems if no direct payments are given to offset the new tax on pumpsets. If a system of meters is used and electricity costs remain at 0.2 Rs/kw-hr, then electricity charges as a percentage of returns to land and management with no irrgation costs actually falls to 0.8 to 2.3 percent.

3.48 **However, if electricity charges are raised to the estimated marginal economic price of electricity to agriculture of 3.05 Rs/Kwhr, electricity costs rise to about 4,600 Rs/ha for paddy and sugar cane, reducing returns to land and management by 35.9 percent for rice and 23.8 percent for sugar cane**. Likewise, total returns to land, labor and capital (value added) falls sharply for paddy and sugar cane irrigated by wells when the cost of electricity for pumping is included. If electricity is costed at its economic price, total income generated from cotton cultivation (23,949 Rs/ha) is 53 percent greater than that for rice.[33]

3.49 **Full cost of electricity for pumping would thus reduce profitability per hectare of rice in favor of cotton, groundnuts and other less water-intensive crops (for which costs and returns are not calculated here).** This does not imply that all, or even most of the land planted to rice would shift to these crops. For example, current cotton area irrigated with wells is only about 62 thousand hectares, compared with an estimated 202 thousand hectares of rice irrigated with wells, but cotton may not be suited to all the rice land, because of drainage and other soil characteristics. Marketing problems might slow shifts to other crops, as well. Nonetheless, charging full cost for electricity would seriously change the incentives for rice production, and

[31] Canal water charges are those for the Cauvery delta.

[32] For pumps, the economic cost of electricity is assumed to be 3.1 Rs/kw-hour. For canals, the economic cost of water is assumed to be 450 Rs/ha. Note that these figures do not include the cost of capital of the pumps, however.

[33] Note that if the farmer hires outside labor or rents the land, farm income will be less than total value added.

promote water conservation. Water thus saved would be available for more productive uses either in agriculture, for household consumption, or industrial use.

Table 3.6: Irrigation Costs by Crop and Type of Irrigation

Crop	Paddy	Paddy	Paddy	Sugar	Cotton	Groundnut	Bananas
Form of Irrigation	**canal**	**tank/well**	**Well**	**well**	**well**	**well**	**well**
Crop duration (months)	4	4	4	11	6	4.5	10.5
Water Use (mms/ha)	1350	1350	1350	1800	650	500	1800
Months w/ irrigation	4	1	3	11	6	4.5	10.5
Frequency of irrigation		1/6 days	1/3 days	1/10 days	1/8 days	1/6 days	1/7 days
Number of irrigations		5	40	33	22.5	22.5	45
Hours/irrigation (for 1 ha)		14	10	12	8	10	10
Total hours of irrigation/ha		70	400	396	180	225	450
Energy consumption (kw-hrs/ha/season)	---	261	1,492	1,477	671	839	1,679
Full Irrigation costs (Rs/ha)	450	809	4,625	4,579	2,081	2,602	5,203
Actual canal/electricity charges (Rs/ha)	289	625	625	1,250	875	625	1,250
Subsidy on irrigation (Rs/ha)	161	184	4,000	3,329	1,206	1,977	3,953
							-
Crops of all kinds / year	2	2	2	1	2	2	1
Second crop	paddy	non-rice	gnuts/maize	------	pulses	maize/other	------

Notes:

Electricity cost (Rs/kwhr)	3.1
Horsepower of pump	5
Kilowatt/horsepower	0.746

Tanks with wells: Tank water used for 3 months; well water for 1 month.

Canal irrigation fees: Land revenue: 1-2 Rs/acre (2.5-5.0 Rs/ha); rice water charge to irrigation dept: 15 Rs/acre (37.5 Rs/ha);

2 cesses (500 + 100%) of (land tax plus rice water charge); total = Rs 280 to 297.5 / hectare.

Source: AgroStat 2001; K. Palinasami, TNAU Water Resource Center.

3.50 Fertilizer is also subsidized: farmer prices of urea, di-ammonium phosphate (DAP) and potash (K_20) are 33, 5 and 48 percent below estimated border prices, respectively.[34] These subsidies significantly affect profitability: estimated fertilizer subsidies per hectare range are 810 to 914 Rs/hectare for paddy and 2408 Rs/hectare for sugar cane (Table 3.8), equivalent to 6.6 to 9.3 percent of net financial returns for paddy and 13.4 percent of net financial returns for sugar cane.

3.51 **Total input subsidies (both irrigation and fertilizer) thus account for 32.0 percent of net financial returns (calculated with a flat rate cost of electricity/irrigation) of sugar cane and 39.2 percent of net financial returns to paddy under well irrigation.** The share of total input subsidy for other crops is much smaller: (9.5 to 15.2 percent). Net returns for cotton and groundnuts at economic prices of fertilizer and water are about 13,600 Rs/hectare, 1.9 times higher than those of paddy cultivated with well irrigation and 1.27 times higher than sugar cane.

3.52 **Current charges for irrigation (electricity costs) for paddy cultivated with tubewells in Tamil Nadu (Rs 625/ha) are less than irrigation costs per hectare of paddy cultivated in other major rice producing states in India (Figure 3.4).** These electricity costs are only two-thirds average irrigation costs in Andhra Pradesh and 45 percent of irrigation costs in Punjab. If full costs of irrigation were charged for tubewells, in Tamil Nadu (Rs 4,625/ha) , however, these costs would be 2.3 and 3.4 times the irrigation costs per hectare of paddy cultivated in Punjab and Haryana, respectively.

3.53 **Comparisons of gross profits per hectare of rice cultivation between Tamil Nadu and other states nonetheless suggest that there is ample scope for a moderate increase in electricity charges.** Gross profits per hectare of rice cultivation using C1 costs (i.e. returns to land and management) for Tamil Nadu (well irrigation) are 5.3 percent higher than the AP average. Charging a flat rate cost for electricity/pump makes returns for TN/wells essentially equal to average returns for AP (12,261 vs 12,242 Rs/ha). Charging full irrigation/electricity costs for TN/wells reduces returns to 8260 Rs/ha, comparable to West Bengal (8,279 Rs/ha).[35]

[34] Border prices of fertilizer are calculated using the 2010 World Bank Commodity forecasts for world prices (expressed in 2002 prices) and the December 2002 nominal exchange rate. Freight and marketing costs are from Gulati and Narayanan (2003, Table A3.2).

[35] Yields in Tamil Nadu are below those of AP and Punjab (4.0-4.1 tons/ha versus 4.8 and 5.1 tons/ha), but average output price in Tamil Nadu is higher than AP (5.9 vs 5.5 Rs/kg) and especially Punjab (4.8 Rs/kg). Varietal differences account for some of the price difference. Note that measures of financial returns are greatly influenced by output prices and yields which may vary from year to year.

Table 3.7: Financial and Economic Returns by Crop and Type of Irrigation

	Paddy Canal (Madurai)	Paddy Tank-well (Tirunaveli)	Paddy Well (Vellore)	Sugar Cane Well (Madurai)	Cotton Well (Madurai)	Groundnuts Well (Coimbatore)
Area (thousand hectares, 1999-2000)	1,411	403	202	316	62	265
Water Use (mms/ha)	1,350	1,350	1,350	1,800	650	500
Total Water Use (ha-cms)	190,512	54,432	27,216	56,880	4,030	13,250
Flat Rate Electricity/Water Charges (Rs/ha)	289	914	625	1,250	875	625
Meter Electricity Charge (current rate, Rs/ha)	-	341	298	295	134	168
Economic Cost Electricity/Water (Rs/ha)	450	1,259	4,625	4,579	2,081	2,602
Average Economic Cost Water (Rs/cm)	3.3	9.3	34.3	25.4	32	52
Financial Returns (flat rate, Rs/ha)	11,113	9,849	12,261	17,956	16,180	16,827
Financial Returns (w/ electricity meter, Rs/ha)	-	10,422	12,587	18,911	16,921	17,285
Financial Returns (econ cost irrig, Rs/ha)	10,952	9,504	8,260	14,627	14,974	14,851
Economic Returns (econ cost irrig, Rs/ha)	10,056	8,589	7,451	10,723	13,648	13,619
Flat rate irrig cost/Fin return (no irrig charge)	2.50%	8.50%	4.90%	6.50%	5.10%	3.60%
Meter elect cost/Fin return (no irrig charge)		3.20%	2.30%	1.50%	0.80%	1.00%
Economic cost irrig/Fin return (no irrig charge)	3.90%	11.70%	35.90%	23.80%	12.20%	14.90%
Value Added (flat rate cost irrig, Rs/ha)	18,574	17,357	19,665	31,097	25,155	25,802
Value Added (econ cost irrig, Rs/ha)	18,412	17,012	15,664	27,768	23,949	23,826
VA (flat rate cost irrig)/water use (Rs/mm)	13.76	12.86	14.57	17.28	38.7	51.6
VA (econ cost irrig)/water use (Rs/mm)	13.64	12.6	11.6	15.43	36.84	47.65
Labor VA	7,461	7,508	7,404	13,141	8,975	8,975

Source: TNAU Crop Survey cost of production and yield data for 1999/2000 and 2000/01; TN Water CGE model.

Notes:

Flat rate for electricity denotes charge for 5 h.p. pump set; flat rate for water denotes water charges and other taxes for canals.

Economic cost of electricity and water include only operating and maintenance costs, not full depreciation of capital.

Average economic costs of water calculated as water use (mms/ha) divided by economic cost electricity/water (Rs/ha).

Average economic costs of water are low in canals and tanks since much of water supplied by surface water.

Economic returns figures include only temporary adjustments to output prices, and no adjustment to input prices.

Add tank costs to flat rate.

Table 3.8: Estimated Input Subsidies for Various Crops in Tamil Nadu, 2000-01

	Paddy Canal (Madurai)	Paddy Tank-well (Tirunaveli)	Paddy Well (Vellore)	Sugar Cane Well (Madurai)	Cotton Well (Madurai)	Groundnuts Well (Coimbatore)
Irrigation charges (flat rate, Rs/ha)	289	914	625	1,250	875	625
Irrigation subsidy (relative to full cost, Rs/ha)	161	346	4,000	3,329	1,206	1,977
Irrigation subsidy / financial returns (w/ flat rate)	1.50%	3.50%	32.60%	18.50%	7.50%	11.70%
Fertilizer cost (Rs/ha)	2,597	2,651	2,347	6,981	2,673	1,688
Fertilizer subsidy (Rs/ha)	1,148	1,172	1,038	3,904	1,326	1,232
Fertilizer subsidy / financial returns (w/ flat rate)	10.30%	11.90%	8.50%	21.70%	8.20%	7.30%
Total input subsidy / financial returns (w/flat rate)	11.80%	15.40%	41.10%	40.30%	15.60%	19.10%
Economic Returns (econ cost irrig, Rs/ha)	9,803	8,332	7,222	10,723	13,648	13,619

Note: Fertilizer subsidy calculation based on estimated nominal protection coefficient for urea, DAP and K20 estimated at 0.67, 0.95 and 0.52, respectively following Gulati and Narayanan (2003) and World Bank 2010 commodity price projections. Economic cost of electricity and water include only operating and maintenance costs, not full depreciation of capital.

Technology

3.54 **The prevailing water scarcity in Tamil Nadu has provided impetus for the adoption of drip and sprinkler irrigation technology**. Today the state along with Maharashtra is one of the leading adopters of drip irrigation technology in India. In 2002, 72,816 hectares in Tamil Nadu (slightly more than 1 percent of net sown area) was cultivated under drip and sprinkler irrigation (GoTN, Agriculture Policy Note, 2003-04). These water-saving technologies are primarily used for horticultural, fruit and flower crops including Coconut, Grapes, Banana, Cashew, Citrus, Guava, Mango, Pomegranate, Sapota. The potential water savings from the use of drip irrigation as opposed to conventional well irrigation have been estimated to be large, ranging from 39 percent for tomatoes to as much as 68 percent for papaya (Muthuchamy, Palanisami and Rajagoapl, 2000). The government is also trying to promote the use of drip irrigation for sugar cane cultivated under private mills.

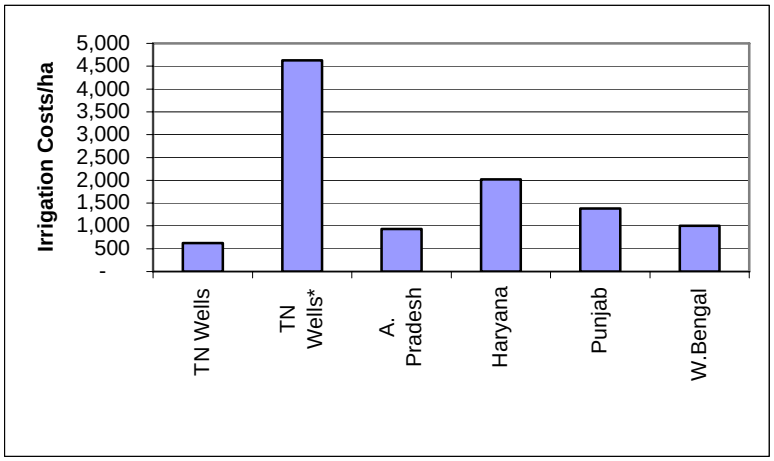
3.55 **The cost of a micro-irrigation system depends on the crop, spacing, water requirements and the distance from the water source**. The cost of installing drip irrigation is estimated to range from Rs 20,000 to Rs 25,000 per hectare for wide spaced crops such as coconut and mangos to Rs 60,000 to 75,000 for close spaced crops such as sugarcane, cotton, vegetables etc. The high capital cost of drip irrigation poses a constraint to widespread

adoption by marginal and small farmers although the use of this technology has been encouraged though the provision of centrally funded subsidies to farmers.

Environmental Management

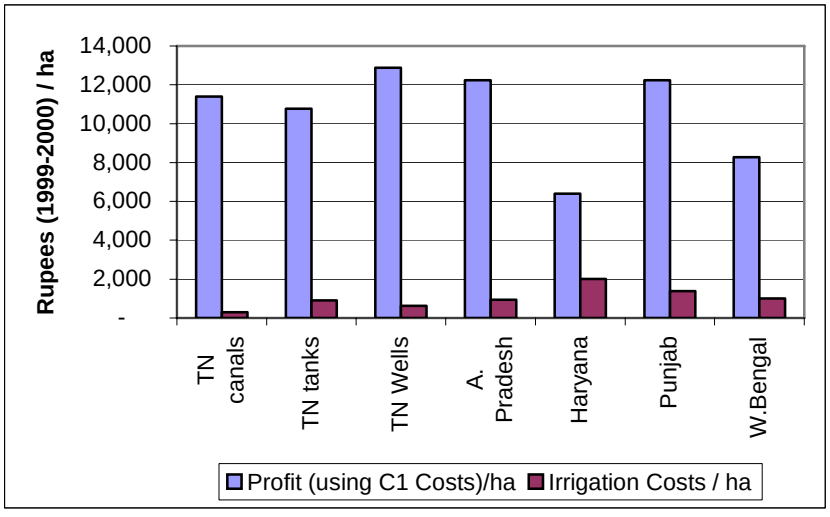
3.56 **An environmental action plan (EAP) has been drawn up with the aim of fully integrating environmental management in planning, investment and management of the State's water resources**. A key element of the EAPs was to strengthen WRO's environmental monitoring and analysis capabilities via the creation of specialist Environmental Units/Cells. Two such units have been established in the main planning departments (basin- and project-level).

Figure 3.4: Irrigation Costs for Rice Cultivation in India (Rs 1999-2000/ha)



* Indicates irrigation costs at economic price of electricity.

Figure 3.5: Irrigation Costs and Gross Profits for Rice Cultivation in India



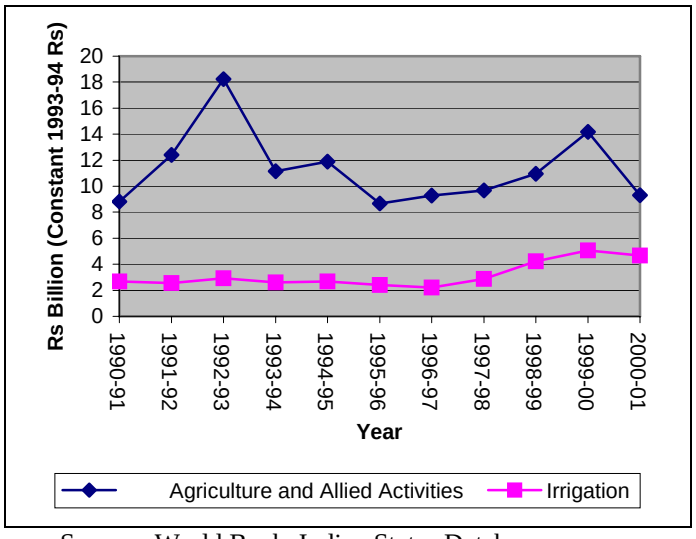
4. Public Expenditures and Agricultural Extension

Public Expenditures on Agriculture and Irrigation

4.1 **Agriculture related public expenditures in Tamil Nadu (expenditures on agriculture and allied activities and irrigation) as a share of agricultural GSDP are higher than most major agricultural states in India (World Bank, 2003b)**. These expenditures (both capital and revenue) totaled Rs 17 Billion in 2002/03. Between 1998-2000 agricultural expenditures have accounted for approximately 11 percent of total Agricultural GSDP in Tamil Nadu; the comparable figure across Indian states was 7.8 percent.[36] In Tamil Nadu agriculture related capital expenditures are relatively low compared to the all-India average, although revenue expenditures as a share of Agricultural GSDP are significantly higher than most major agricultural states in India. This is a situation for concern since capital investments are important for future growth, furthermore a large share of revenue expenditures are incurred on staff salaries and the food and irrigation subsidies leaving operating expenses under funded.

4.2 **In 2002 capital expenditures on agriculture and allied activities and irrigation accounted for 4.3 percent and 13.5 percent of the total capital outlay of Rs 22.1 billion in Tamil Nadu, respectively**. Of a total revenue expenditure of Rs 268.62 billion approximately 5 percent (Rs 13.02 billion) was spent on agriculture and allied activities and 1.5 percent was spent on irrigation and flood control (Rs 3.96 billion). Total expenditures (capital and revenue expenditures) on agriculture and allied activities during the 1990s exhibited a slight downward trend with an average annual growth rate of –1.1 percent while total expenditures on irrigation have grown at an average annual rate of 6.2 percent (Figure 4.1:). Gross capital formation in agriculture increased by 15 percent in during the 1990s and this growth was primarily due to private capital formation which grew by almost 16 percent between 1989/90 and 1998/99.

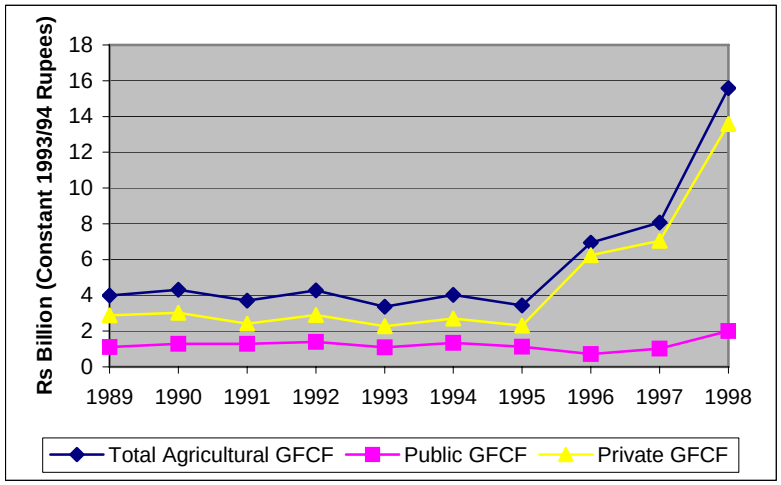
Figure 4.1: Total Expenditures (Capital and Revenue) on Agriculture and Irrigation



Source: World Bank, Indian States Database

[36] Agricultural public expenditures as a share of expenditures on Economic Services and Agricultural GSDP are averages of data from 1998/99-2000/01.

Figure 4.2: Gross Fixed Capital Formation (GFCF) in Agriculture



Source: Authors' calculation using data from GoTN, Tamil Nadu-An Economic Appraisal, 1999-2000, Chapter 3, p. 23

4.3 **During the 1990s, the share of agricultural and allied expenditures devoted to crop husbandry has declined, while expenditures on animal husbandry, dairy development and agricultural research and education have increased**. In 2001 expenditures on crop husbandry represented the single largest category of expenditures on agricultural and allied activities accounting for approximately 45 percent of expenditures (Table 4.1). Expenditures on animal husbandry, dairy development and agricultural research and education averaged 8.8 percent, 3.2 percent and 7.1 percent of total expenditures on agriculture and allied activities, respectively. Real expenditures on crop husbandry have decreased by an average annual rate of 2.4 percent during the 1990s, while expenditures on dairy development, agricultural research and education and irrigation have increased by an average annual rate of 12 percent, 4.2 percent and 6 percent, respectively.

Table 4.1: Breakdown of Expenditures on Agriculture and Allied Activities (1997-2001)

	1997	1998	1999	2000	2001
Agriculture and Allied Activities (1993-94 Rs Billion)	9.7	11.0	14.2	9.3	9.1
Share of Expenditures (%)					
Agriculture (Crop Husbandry)	64.4	60.8	68.6	53.3	44.8
Soil and Water Conservation	2.8	3.4	2.6	3.8	5.7
Animal Husbandry	7.2	7.8	5.9	7.9	8.8
Dairy Development	0.6	1.0	1.3	3.0	3.2
Fisheries	2.1	2.4	1.5	2.1	2.7
Forestry and Wild Life	8.6	10.9	8.4	13.5	13.3
Plantations	0.0	0.0	0.0	0.0	0.0
Food Storage and Warehousing	0.1	0.1	0.0	0.0	0.0
Agriculture and Research Education	5.8	5.2	5.7	7.8	7.1
Co-operation	7.2	7.0	5.0	11.0	16.9
Other Agricultural services	2.6	2.0	1.5	2.4	2.4

Source: World Bank, India -States Database

Tamil Nadu's Public Distribution System

4.4 **Tamil Nadu's Targeted Public Distribution System (TPDS) is one the central pillars of the state's strategy to ensure food security**. Under the TPDS, eligible households can purchase a specified amount of food grains and other essential commodities at subsidized prices from a network of public distribution outlets, known as Fair Price shops, throughout the state. Of the 18 GoI essential commodities, four commodities namely, rice, wheat, sugar and kerosene are supplied through the public distribution system (PDS) in TN. Ooty tea and Iodised salt are also sold through the PDS in the state. Beginning in July 2002, TN introduced some significant reforms to its PDS to address fiscal concerns the main elements of which included a coupon system to eliminate leakages, decentralized procurement, and restructuring of the issue price of rice.

4.5 Although substantive PDS reforms were undertaken between 2002 to 2003, these reforms have recently suffered a setback. Rice coupons introduced to reduce the number of households eligible for PDS rice have been abolished by the GoTN after the national election in April-May 2004. Income criteria to determine PDS eligibility have also been withdrawn.

4.6 Coverage of TPDS in Tamil Nadu has been significantly higher than in the majority of Indian states. In 1999/00 85 percent of BPL households in Tamil Nadu were estimated to use the TPDS, a 14% increase since 1993/94. The proportion of APL households accessing TPDS is also high in Tamil Nadu with approximately 66% of APL households accessing TPDS shops in 1999/00 (Deininger, Umali-Deininger and Tritah, 2003).

4.7 Under the TPDS system operating in TN (through August 2003), households had the option of drawing rice from the PDS or additional quantities of sugar or kerosene in lieu of rice. Based on the family's choice, a different colored family card is issued. As of March 2003, approximately 16 million family cards had been issued in the state of which 84.7 percent were rice cards (pink cards), 8.1 percent were kerosene cards (yellow cards), 7 percent were sugar cards (yellow cards) and 0.2 percent were kerosene cards issued to police (khaki cards). Approximately 4.6 percent of households in the state qualified under the Antyodaya Anna Yojana (AAY), a scheme sponsored by the Government of India which targets the poorest households in the state enabling them to draw food grains at a specially subsidized rate specified by GoI.

4.8 As part of its reform efforts the GoTN had attempted to reduce the number of bogus cards that had come into circulation in the state by introducing a coupon system for drawing rice from the PDS. Twelve million rice card holders were issued coupons. Coupons were only issued to the person whose photograph has been affixed to the family card. The coupon as well as the family card were needed to withdraw rice.

4.9 **Each rice cardholder was entitled to draw a specified quantity from the PDS system depending on their family size**. The maximum monthly issue amount was 20 Kgs for a family with "3 or more units". [37] Families that opted for a yellow card were eligible for an additional 3 Kgs of sugar or 5 litres of kerosene per month in lieu of rice. In the Nilgiris district, card holders were entitled to an additional 4 Kgs of rice per month in addition to the normal entitlement. All AAY households were eligible to draw 35Kgs of rice per month irrespective of family size.

4.10 Family cardholders in the city and district headquarters could draw 10 Kg of wheat and those in rural areas could draw 5Kg each month in addition to the rice entitlement. Each family cardholder was also eligible to receive 500 grams per head up to a maximum of 2 Kgs per card per month. Those who opted for yellow cards were entitled to an additional 3 Kg of sugar per

[37] An adult counts for 1 unit while a child is counted as ½ an unit.

month in addition to their regular entitlement. Kerosene was supplied to cardholders on the basis of the number of LPG connections they had and was also supplied to some public institutions and hospitals through the PDS system.

4.11 Food grains in the public distribution system are sold to the public through a network of Fair price shops that are run by the TN Civil Supplies Corporation. Private traders are not allowed to operate these shops. Each revenue village has a fair price shop and the government's policy is to try to ensure that no card holder should have to walk more than 2 km to reach a fair price shop. There is an additional stipulation that the maximum number of cards attached to a shop should not exceed 800 in urban areas and 500 in rural areas. In very remote areas, or areas where the existing fair price shops has to serve more than the maximum stipulated number of family cards, women's groups are allowed to distribute PDS commodities.

4.12 The PDS rice requirement is met through allotments made by the GoI (allotment from the Central Pool) and paddy procurement within the state. In October 2002 the state adopted a decentralized procurement system under which the Tamil Nadu Civil Supplies Corporation procures rice on behalf of FCI at the Minimum Support Price (MSP) fixed by the GoI. TNCSC procures paddy by opening Direct Purchase Centres in the Cauvery Delta Area and through taluk godowns in other areas, on behalf of the GoI. The paddy that is procured is converted into rice by the Tamil Nadu Civil Supplies Corporation, stored in its godowns and issued in the PDS outlets. TNCSC adheres to the quality norms of FCI and the paddy procured by the state may be re-allotted to the state as part of the GoI allotment to the state. The difference between the central issue price and the economic cost of rice (set by GoI) is reimbursed to the state for the central pool allocation of rice. If the quantity procured falls short of the allocation from the central pool the balance will be allocated from the central pool and if the quantity procured is in excess of the requirement for the PDS it will be taken over to the central pool.

4.13 In 2002/03 the GoI allocation to the state was 495 thousand tons per month. The allocation varies by month and the allocation from the central pool is more than adequate to meet the requirement of rice under the PDS . The central issue price of rice under TPDS is Rs. 5.65 per kg of BPL rice and Rs. 8.30 per kg for APL rice. The GOI also allows states to charge an additional 50 paise per kg to cover costs of transportation, storage cost etc. The economic price of rice obtained by the TN CSC is approximately Rs 12 per kg. As of October 1, 2002 the state has adopted a two tier-pricing system for issuing rice whereby the first 10 kgs of rice is sold for Rs 3.50 per kg, any amount above 10 kg is sold for Rs 6 per kg. The PDS issue price of rice for AAY families is Rs 3 per kg.

4.14 Sugar required for the PDS is met out of the allotment of levy sugar by the GoI and by purchases of non-levy sugar from Tamil Nadu Co-operative Sugar Federation. For Kerosene the state is restricted to the allocation made by the GoI. GoI supplies APL wheat to Tamil Nadu at Rs 6.10 per kg. As of July 2002, TN has been selling this wheat though its PDS system at Rs 7.50 per kg. The retail price of sugar issued through the PDS was Rs 13.50 per kg. If the state has to procure non-levy sugar to meet requirements, the state government has to bear the costs. The issue price of kerosene was Rs 8.40-Rs 9 per litre. GoI recommends that the issue price under the PDS should be between Rs 9-Rs 9.60. The difference in cost is met by the GoTN.

4.15 **As a result of the reforms of the public procurement system, the GOTN had estimated that the food subsidy would be dramatically reduced from Rs.1500 crore in 2001/02 to projected Rs.700 crore in 2003/04, a reduction of Rs. 800 crore**. Cessation of local procurement (except on behalf of the FCI) reduced government expenditures on procurement by eliminating the costs of the extra procurement incentives paid and the costs of milling the paddy into rice. State procurement of paddy in 2000/01 and 2001/02 were 2.61 and 1.24 million tons, respectively, (equivalent to 1.75 and 0.83 million tons of rice). For this procurement the paid

incentives and "incidental charges" of Rs. 350 to 400 per ton (a bonus of about 7.2 percent of the GOI procurement price of fine rice). In total, these costs were approximately Rs 101 crore in 2000/01 and Rs 50 crore in 2001/02 (Table 4.2).

4.16 **The bulk of the savings on food subsidies, however, were achieved through reduction in number of cards (and ultimately the sales of rice), and in the subsidy per kilogram of rice sold**. Total ration sales dropped from 2.10 million tons in 2000/01 to 1.62 million tons in 2002/03. In addition the unit subsidy paid by the GOTN fell by 64 percent from Rs. 5.13 /kg to Rs/ 1.85 as the average sales price rose from Rs 3.0/kg to an estimated Rs 4.07/kg, and the average cost of rice from the GOI fell from Rs 8.13/kg to Rs. 5.92/kg. (This reduction in the average cost was due to an increase in the allocation of BPL rice and a lowering of the cost of APL rice.) Thus, the reduction in the subsidy due to reforms in distribution was about Rs 7.79 billion (Rs 779 crore). The total estimated reduction in subsidy (combined effect of reforms on procurement and distribution) was thus about Rs. 8.80 billion (Rs 880 crore), (Table 4.3).

4.17 Effective 1 September 2003, the two-tiered pricing of rice according to the amount of ration purchased was scheduled to end, with the entire ration to be sold at Rs. 3.5/kg. As a result, if the quantity sold through ration shops remains at an average of 135 thousand tons per month, revenues will fall (and the subsidy will increase) by Rs 0.93 billion (Rs 93 crore or about $21 million), equivalent to 11 percent of the total subsidy reduction of Rs. 8.80 billion, shown above. If quantity of rice sold per card rises to 16 kgs/card, the increase in costs relative to 2002/03 would be Rs. 3.74 crore (about $84 million). The implications of the most recent policy reforms following the national election in April-May 2004 remain to be examined.

Agricultural Extension

4.18 **The agricultural extension system in TN is still organized around a modified Training and Visitation (T&V) extension approach, but with reduced levels of in-service training and fewer farmer visits**. It is important to note that T&V Extension projects only strengthened the Department of Agriculture's (DOA) extension system; extension programs in the other line departments, including Horticulture (DOH), Animal Husbandry (DAH), Fisheries (DOF), etc., were not improved. Therefore, Tamil Nadu's basic, multiple agency extension structure remaining largely intact since the introduction of T&V Extension in the 1980s. In short, each line department is still responsible for its own extension staff and programs, with little coordination at any level. Also, since state government funding primarily goes for salaries and personal emoluments, most extension activities across all line departments are funded through "top-down" central government schemes, plus other subsidy and incentive programs that the extension field staff are expected to implement.

4.19 **New agricultural development priorities in Tamil Nadu are likely to bring about changes in the extension system**. The GOTN has recognized the income generating and value-added possibilities of the horticulture, sericulture, livestock and fisheries sectors. In the Tenth Plan period there is an emphasis on horticultural development, including agro-processing and marketing. For example, the districts of Dharmapuri (Hussur), Nilgiri (Ooty) and Madurai have been earmarked for mango development, both for processing and export. The Agriculture and Processed Foods Export Development Authority (APEDA) is assisting the state in this venture. In addition, the GOTN plans to strengthen research and extension for the development of other horticultural crops, including fruit, vegetable and floriculture crops, plus cashews and medicinal plants. This program is expected to focus on the organization and management of new supply chains, including domestic and export market development and investigating the feasibility of different types of value-added processing. Since the GOTN has very limited extension capacity

for horticulture development, it plans to link agricultural, horticulture and agricultural engineering extension systems/units.

Table 4.2: Estimates of the Impact of Policy Reforms on GOTN Costs of Rice Procurement

Year and Rice Season	Quantity (th. Tons)	GOI Proc. Price[a] (Rs/ton)	GOTN Incentive[b] (Rs/ton)	Incentive (% of Proc. Price)	GOTN Subsidy (mn Rs)
2000 Samba (23/12/99 to 20/03/00)[c]	1,085	5,200	470	9.0%	510
2000 Samba (21/3/00 to 30/6/00)	82	5,200	350	6.7%	29
2000 Kuruvai (1/9/00 to 15/12/00)	550	5,400	350	6.5%	193
2001 Samba (16/12/00 to 1/9/01)	1,974	5,400	400	7.4%	790
2001 Kuruvai (15/10/01 to 15/12/01)	223	5,600	400	7.1%	89
2002 Samba (1/1/02 to 11/4/02)	1,019	5,600	400	7.1%	408
FY 2000-01 (est.)	2,606	5,400	388	7.2%	1,011
FY 2001-02 (est.)	1,242	5,600	400	7.1%	497

Note: Samba and kuruvai denote the two rice crop seasons in the Cauvery delta region of Tamil Nadu. [a] Fine or super fine quality. [b] Incentives include "incidental charges" paid to sellers of paddy. [c] Assumes 80 percent of procurement in Cauvery delta areas with 500 Rs/ton incentive and 20 percent of procurement in non-delata areas with 350 Rs/ton incidental charge. Procurement in this period was monopoly procurement; thereafter, all procurement was parallel (non-monopoly) procurement.
Source: Government of Tamil Nadu 2002. Cooperation, Food and Consumer Protection Department, Policy Note 2002-03 (Demand No. 12).

Table 4.3: Estimates of the Impact of Policy Reforms on GOTN Fiscal Costs of Rice Distribution

Year		2000/01	2000/01	2000/01	2000/01
Channel / Source of Rice		BPL	APL	GOTN	Total
(1) Number of cards	million				13.5
(2) Distribution	'000 tons	1,131	79	890	2,100
(3) Unit cost of rice to GOTN[a]	Rs/kg	5.65	11.30	11.00	8.13
(4) Estimated cost of procurement to GOTN, (2)*(3)	bn Rs	6.39	0.89	9.79	17.07
(5) Sales price	Rs/kg	3.00	3.00	3.00	3.00
(6) Estimated average sales revenues, (2)*(5)	bn Rs	3.39	0.24	2.67	6.30
(7) Estimated GOTN subsidy, (4)-(6)	bn Rs	3.00	0.66	7.12	10.77
Year		2002/03	2002/03	2002/03	2002/03
Channel / Source of Rice		BPL	APL	GOTN	Total
(8) Number of cards	million				10.4
(9) Distribution[b,c]	'000 tons	1,458	162	-	1,620
(10) Unit cost of rice to GOTN[a]	Rs/kg	5.65	8.30	-	5.92
(11) Estimated cost of procurement to GOTN, (9)*(10)	bn Rs	8.24	1.34	-	9.58
(12) Sales price[d]	Rs/kg	4.07	4.07	-	4.07
(13) Estimated average sales revenues, (9)*(12)	bn Rs	5.94	0.66	-	6.60
(14) Estimated GOTN subsidy, (11)-(13)	bn Rs	2.30	0.68	-	2.98
(15) Change in GOTN subsidy, (14)-(7)	bn Rs	(0.70)	0.03	(7.12)	(7.79)

(a) Central issue prices from FCI for BPL and APL; Estimated figure of GOTN procurement from GOTN, Dept. of Civil Supplies.
(b) Assumes 90 percent of rice procured at BPL price; 10 percent at APL price (figures from GOTN, Department of Civil Supplies.
(c) Assumes 135 thousand tons/month for 12 months (approx. monthly distribution in mid- 2003).
(d) Assumes that all ration card holders purchase at least 10 kgs/month with average ration purchase calculated as distribution divided by number of cards = 12.98 kgs. Average sales price = [(10kgs @ 3.5/Rs/kg) + (2.98 kgs) @ 6.0 Rs/kg)] / 12.98.

4.20 **Increasing public-private partnerships and private sector involvement in extension is an encouraging development in the state.** Public-private partnerships are also planned as industrial houses cooperate with extension by focusing on agricultural export and value-added processing opportunities. For example, the New Anna Marumalarchi Thittam is focusing on small scale agro-industries. Some industries being considered include edible oil extraction, paddy hulling, cashew processing, extraction of coconut oil, ice cream making, etc. To date, no sustained expansion in the marketing of horticultural crops has taken place because extension has not been reorganized, strengthened and given a new mandate for organizing farmer organizations that can systematically supply these planned new value chains. If the ATMA model (see Box 4.1) could be introduced into Tamil Nadu, a more coordinated and systematic extension program could be organized at the district and block level to develop production and marketing arrangements for high-value commodities and to organized value-added processing enterprises.

4.21 The state could also draw on a variety of international experiences with transforming extension systems into more client responsive services. For example, Chile introduced a system of contracting private service providers in 1978, involving farmer organizations that propose defined projects for commercialization and modernization of small-farm agriculture at a decentralized level. In Kenya, the Agricultural Technology and Information Response Initiative implemented by the Kenyan Agricultural Research Institute since 2000, provides grants averaging $3000 to farmers organizations or community-based organizations to finance acquisition of technologies, exchange visits to other farmers, and visits by institute staff. Similarly, Bangladesh provided funding ($1,500 per year) to *upazilas* (sub-districts) to promote collaboration between public and private agencies through an average of four to five small-scale projects in each sub-district (World Bank, 2004b).

4.22 **One innovative public-private sector initiative involves the disseminating of extension information to farmers through the use of internet kiosks in rural areas**. The system allows farmers to obtain up-to-date information on major crop prices, advances in production technologies, as well as other information on various social services including schools and health facilities. Through these kiosks, called Parry's Corners, farmers can also send their queries regarding agricultural problems faced in the field to extension workers in the Department of Agriculture and researchers at the Tamil Nadu Agricultural University. The kiosk attendant owns a digital camera that can be used to photograph crop damage, pests infestations etc. These photographs can then be transmitted to researchers and extension workers for diagnosis. This strategy has been successful in prompting early responses to several outbreaks of plant and animal diseases.

Text Box 4.1: The ATMA Approach to Extension

Several states in India have moved away from the T&V approach to a more decentralized extension approach that integrates extension programs across the major line departments, and introduces participatory, bottom-up planning procedures, resulting the creation of a more responsive, transparent and accountable extension system. In the mid-1990s the Government of India and the World Bank undertook a systematic assessment of the post-T&V Extension situation and then carried out a pilot project under the Innovations in Technology Dissemination (ITD) component of the National Agricultural Technology Project (NATP). This project, which was launched in 1998, was designed to field-test a new extension model that focused on improving farm income through agricultural diversification. The new model involved decentralized, restructured and reoriented extension activities at the district and block levels through a new institution called the Agricultural Technology Management Agency, or ATMA. (In Hindi, ATMA means "soul;" therefore, this new institution was to become the *soul of agricultural development* within each district.) This ATMA approach has now been pilot tested in 28 project districts across 7 states. As a result of the successes achieved, in 2002 the Government of India (GOI) adopted a new *Policy Framework for Agricultural Extension* that endorsed this new integrated approach.

The new extension system promoted through the ATMA model places more emphasis on agricultural diversification and improving rural incomes. The GOI's new extension policy reflects the current agricultural development situation in India. First, there is recognition that the country has achieved food security; therefore, extension priorities need to shift towards agricultural diversification and improving rural household income. Second, this new policy recognizes that a) the private sector is assuming more responsibility for extension activities related to the major food and commercial crops; b) most productivity gains associated with high yielding varieties have already been exploited, therefore, further investments in DOA extension will result in minimal returns on investment; and c) hunger in India today is essentially a poverty problem, therefore, further investments in field crop extension will do little to alleviate rural poverty and hunger.

Given the successes achieved through the ATMA model, the GOI now recognizes that there is considerable scope to increase rural household income and reduce rural poverty by focusing on high value crop and livestock enterprises, including value-added processing. This new policy agenda reflects a shift in focus from extension promoting field crop technology (i.e. supply driven), to a new focus on market driven opportunities for high value commodities. In addition, many project districts have been successful in building "social capital" by organizing and mobilizing rural women and unemployed young farmers to undertake these high value commodities and enterprises.

The combination of new goals, a decentralized approach and a new integrated structure has created new enthusiasm for a public extension system that is more responsive to rural people and capable of increasing rural household income. In addition, the ATMA framework provides mechanisms for cost recovery and strengthening research-extension linkages. The combination of Block Technology Teams (BTTs), Farmer Interest Groups (FIGs) and Farmer Associations (FAs) is also a more effective approach in disseminating information on specific high value commodities and/or enterprises. , making it possible to to reduce the long-term cost of extension by phasing out village extension workers through attrition.

5. Agricultural Markets and Market Policies

5.1 **Development of agricultural markets will be essential for agricultural diversification and accelerated farmer income growth**. Significant reforms in markets have taken place in recent years, giving a larger role to the private sector and removing movement restrictions. Promising institutional developments in marketing include an expansion of contract farming, long established for sugar cane, which has begun on a small scale through private sector initiatives in cotton, gherkins (cucumbers), poultry and rice.

5.2 **As in most states of India, the public sector has historically played a major role in Tamil Nadu's agricultural markets**. The initiatives of the government focused on framing rules and regulations to ensure fair trade practices, establishing institutional markets, building storage and warehousing facilities, creating institutions for standardization and grading, and building awareness among farmers regarding the public marketing infrastructure that was provided.

5.3 **Government intervention in markets involved three major channels: direct procurement and sales, regulated markets, and cooperatives.** In Tamil Nadu, the government intervened directly in paddy, rice, sugar and cotton markets through **direct procurement and sales**. It also placed restrictions on private trade, and set up **regulated markets** to facilitate transactions between **farmers and licensed traders**, in order to provide fair prices for farmers and ensure fair trading practices. Restrictions on movements of commodities were designed to prevent sales to importing regions from causing shortages in exporting regions. Licensing requirements helped the government monitor traders and limit their scales of operation. **Cooperatives** were actively encouraged and had significant roles in milk markets. **Private trade in unregulated markets** operated only on a small scale, mainly at the village level, yet accounted for the large majority of sales of most crops other than paddy and sugar cane .

5.4 **Significant reforms have taken place in the 1990s in Tamil Nadu, increasing the role of the private sector in general.** The scale of direct procurement of paddy has been reduced (and the GOTN no longer procures paddy on its own account), though regulated markets and cooperative sectors continue. More recently, the GOTN has actively encouraged private marketing through lifting of stock and movement restrictions for rice, waiving of the cess on cotton sales, promotion of contract farming, and planned investments in rural market infrastructure.

Market Structure: Regulated and Private Markets

5.5 **Tamil Nadu has 270 regulated markets** and 15 sub-markets, located at major assembling centers, **managed by 16 market committees at district level.** At the top of the organizational structure is the state-level **Tamil Nadu State Agricultural Marketing Board,** an autonomous and advisory body that helps the market committees to organize and implement development activities, and plans for improvements in marketing of agricultural produce in the state. It is also responsible for development of infrastructural facilities at market committee level, enabling publicity and propaganda activities of the regulated markets, and training the market committee personnel.

5.6 **Market committees** are headed by a chairman who is selected from among the members. The market committees collect cess for the marketed agricultural produce in their respective defined operational areas. Market cess for the sale of notified commodities, whether sold within the premises of regulated markets or outside, were increased from 0.45 per cent to one per cent during the last decade. Selling notified commodities within the premises of regulated market is

purely voluntary. Tax assessments on sales outside of regulated markets are based on sales declarations of traders to tax collectors. Traders who pay the cess on their sales outside of regulated markets receive no direct benefit from the regulated markets. For these traders, the cess functions as a general sales tax.

5.7 The **regulated markets** have been provided with infrastructural facilities like godowns, commercial grading centres and drying yards. Welfare schemes to encourage farmers to bring their produce to regulated markets such as pledge loans and Tamil Nadu Farmers Development Welfare Scheme are also operated.

5.8 **Overall, regulated markets account for only about 10 percent of the total value of sales of all foodgrains.** For the major crops with significant sales in regulated markets (paddy, maize, ragi, green and black gram, groundnuts, sesame, turmeric and cotton) these markets account for only 15 percent of the value of production.) (Table 5.1). There are large variations across region and by commodity, however, with regulated markets in Cuddalore, Villupuram and Thiruvannamalai districts (northeast zone) having high volumes of transactions and markets in Madurai, Ramanathapuram and Tirunelveli districts (southern zone) with relatively few transactions. Surveys by the Department of Agricultural Economics, Tamil Nadu Agricultural University indicate that farmers are aware of the regulated market, but that small and marginal farmers with very small marketable surplus tend to sell their produce to village traders.

5.9 **Regulated markets account for a higher percentage of sales of turmeric (42 percent), sesame (55 percent).** Market committees for turmeric in Erode and Trichy districts (western zone and Cauvery delta) have been particularly successful in spurring production, sales and exports.

5.9 **Marketing through Primary Co-operative Marketing Societies (PCMS) account for an even smaller share of trade (Table 5.2).** Through the PCMS at the local (taluk) level, the Tamil Nadu Co-operative Marketing Federation (TANFED) procures cotton, paddy, chilly, sunflower seeds, coriander, blackgram and other crops. It thus acts as an agent of the National Agricultural Marketing Federation of India (NAFED) to provide price support and promote exports. The PCMS also assists member farmers in processing, storing and marketing their agricultural produce, in some instances providing credit, arranging auction sales, or directly purchasing agricultural produce. The total value of the produce marketed through the cooperatives has increased over time (Table 5.3) mainly due to marketing of cotton and sugarcane.

5.10 **In 1999, the Tamil Nadu Government established Farmers Markets (*Uzhavar Sandhai*) for fruits and vegetables to reduce marketing costs between growers and consumers.** At present nearly 100 Farmers Markets are functioning in the state, in parallel with other marketing channels.

5.10 **Small village markets (shandies) provide markets for sales and purchases of agricultural commodities, as well as agricultural inputs consumer goods.** On an average, each shandy caters to a geographical area of about 15 square kilometers. and a population of about 30,000 spread over about 25 villages. The total volume of marketable surplus of agricultural commodities passing through the periodic markets in India is somewhere between six and twenty per cent of the surplus.

Table 5.1: Marketed Surplus and Market Channels of Major Crops in Tamil Nadu, 2001-02

	Production	Marketed Surplus	Production	Sales	Regulated Markets	
	th tons	percent	mn Rs	mn Rs	th tons	percent
Paddy	6,584	73%	49,918	36,685	786	16%
Maize	118	100%	551	551	58	49%
Cholam (sorghum)	275	87%	1,317	1,142	n.a.	n.a.
Cumbu (pearl millet)	153	90%	681	614	n.a.	n.a.
Ragi (finger millet)	235	83%	1,054	878	7	3%
Red gram	41	100%	529	529	n.a.	n.a.
Green gram	53	100%	983	983	9	16%
Black gram	104	94%	1,820	1,716	15	15%
Sugarcane	37,249	89%	28,453	25,323		
Groundnut	1,250	98%	15,873	15,543	59	5%
Sesame	46	98%	753	738	25	55%
Chilly	42	89%	1,024	914	n.a.	n.a.
Coriander	7	100%	158	158	n.a.	n.a.
Turmeric	118	100%	1,814	1,813	50	42%
Cotton	230	100%	3,560	3,560	68	30%
Tomato	258	100%	720	720	n.a.	n.a.
Onion	279	82%	1,009	832	n.a.	n.a.
Total		84%	110,218	92,699	1,076	10%

Note: Value of sugar cane is calculated using the price of jaggery, assuming an 8 percent extraction rate.
Source: Share of marketed surplus from the Cost of Cultivation of Principal Crops Scheme, Department of Agricultural Economics, TNAU. Farmgate prices from Season and Crop Report, 2000-01, Directorate of Economics and Statistics.

Rice Markets

5.11 **For three decades, from the early 1960s to the early 1990s, the state government controlled the majority of paddy trade, procuring paddy for the public distribution system.** In the early 1960s, the state procured five bags of paddy (65 kgs each) per hectare, for all the farms having about one hectare under paddy. Later, this was restricted to the Cauvery Delta zone (zone IV) under the monopoly procurement scheme, by which the entire marketable surplus of paddy in the region was to be sold only to the Tamil Nadu Civil Supplies Corporation.

5.12 **In 1993-94, a system of parallel procurement was introduced for paddy which continues to date.** Under the system of parallel procurement, farmers have the option to sell their marketable surplus of paddy either to the Tamil Nadu Civil Supplies Corporation at procurement prices or to private traders at market prices. Since October 2002, the state government has not procured rice on its own behalf, but instead the Tamil Nadu Civil Supplies Corporation procures rice on behalf of the Food Corporation of India at the Minimum Support Price (MSP) fixed by the GoI. Unlike in most other states of India, neither the Food Corporation of India nor the state government procures rice through a levy on rice mills.

Table 5.2: Estimated Net Trade in Rice for Tamil Nadu (thousand tons), 1997/98 - 2002/03

	Production ('000 tons)	Public Procurement ('000 tons)	PDS Distribution ('000 tons)	Availability (Production + net PDS) ('000 tons)	Availability (Production + net PDS) kgs/person	Retail Price of Common Rice Rs('01)/kg	GSDP/cap 000 Rs(01)	Net Imports Est. 1 ('000 tons)	Net Imports Est. 2 ('000 tons)
97/98	6,894	1,231	2,238	7,901	131.5	9.67	20.15	56	-698
98/99	8,141	733	2,121	9,529	157	10.87	21.16	-1,493	-2,322
99/00	7,532	891	2,211	8,852	144.5	11.26	22.18	-742	-1,360
00/01	7,218	1,691	2,105	7,632	123.5	11.08	22.95	546	248
01/02	6,873	832	2,201	8,242	132.4	10.76	23.48	-	-
02/03	4,860	-	2,277	7,137	113.8	11.07	22.84	1,164	828
Ave 97/98 - 01/02	7,332	1,076	2,175	8,431	137.8	10.73	21.99	-327	-826
Difference	-2,472	-1,076	102	-1,294	-24	0.34	0.86	1,491	1,654
	-34%	-100%	5%	-15%	-17%	3.10%	4%	-456%	-200%

Figure 5.1: Rice Prices in Chennai 1994: 2003

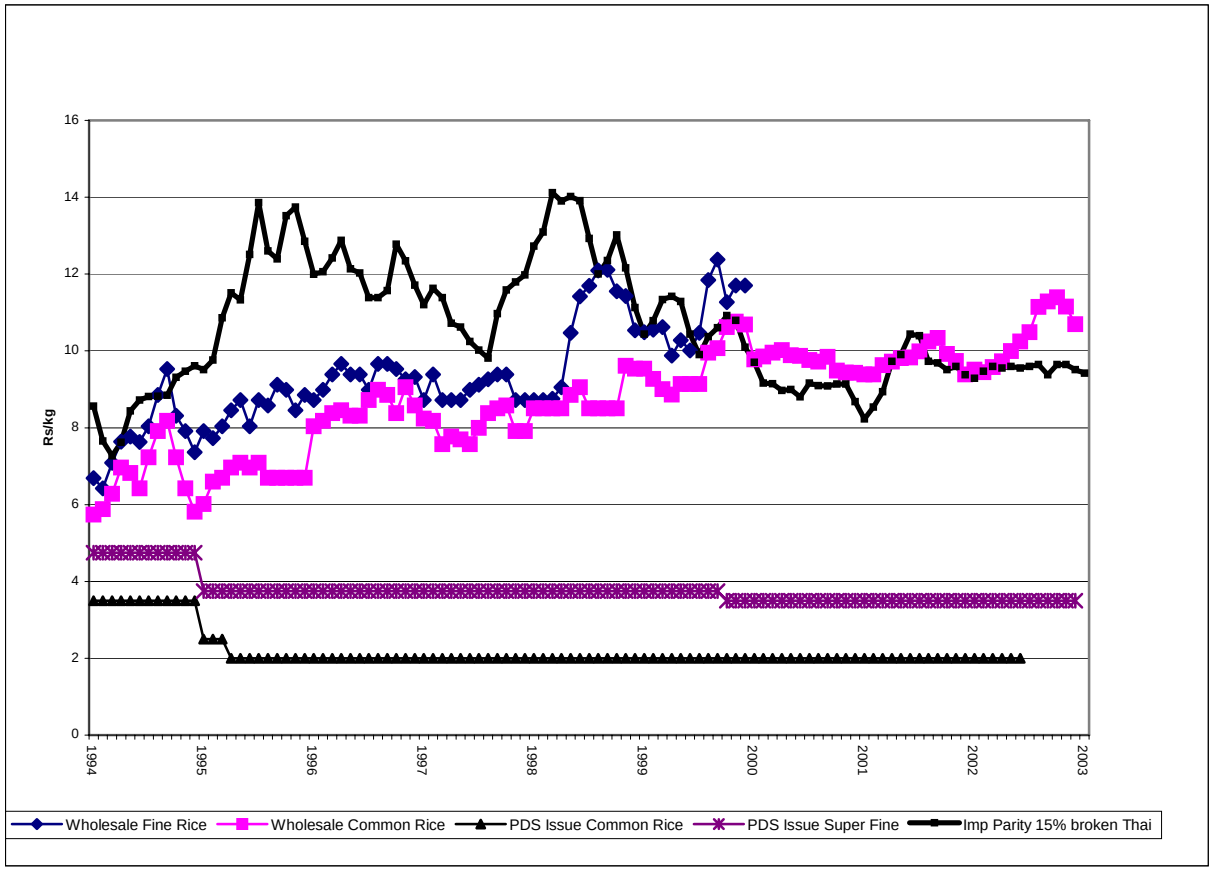


Table 5.3: Estimates of Marketing Channels for Major Crops (Percentage of Farm Sales)

	Direct Procurement		Co-operative Marketing		Private	
	Centers	Regulated Markets	Societies	Mills/	Traders	Total
Paddy	6	20	2		72	100
Coarse cereals		10			90	100
Maize		5			95	100
Pulses		10			90	100
Oilseeds		30		15	55	100
Sugarcane				80	20	100
Chillie		16			84	100
Turmeric		70	5		25	100
Onion					100	100
Vegetables		10	*		90	100
Banana					100	100
Cotton		15	15		70	100
Milk			45		55	100

Note: Private traders include sales directly to consumers, sales of sugar cane to jaggery processors and sales of milk to private dairies. Oilseeds include groundnut and gingelly (sesame).
Source: TNAU (2003). Promoting Agricultural Development in Tamil Nadu

5.13 **Substantial private sector rice trade takes place between Tamil Nadu and the neighboring states of Andhra Pradesh, Karnataka and Kerala,** with exports consistently mainly of coarse rice and imports consisting largely of finer rice varieties. Movement restrictions preventing the export of Tamil Nadu to other states, and storage restrictions for paddy/rice by millers and traders were also lifted during 1993-94.[38] No data on inter-state trade exists, but rough estimates of net trade can be made on the basis of changes in within state supply from production and net public distribution (including both ration sales and various employment programs), together with estimates of demand derived from an assumed base year demand, changes in real prices and incomes, and demand parameters (Table 5.1).

5.14 Demand estimates for various years in Table 5.1 use 2001/02 as a base, and assume that no net private trade took place in that year. Per capita availability from production (less ten percent for seed, feed and losses) and net public distribution (total distribution less procurement of paddy/rice in Tamil Nadu) was 134.8 kgs/person in 2001/02, slightly below the average of 139.2 kgs/person for 1997/98 to 2001/02. Estimates of consumption in other years assume either constant per capita demand (estimate 1) or an own-price elasticity of demand for rice of –0.5 and an income elasticity of demand for rice of 1.0 (estimate 2).[39]

[38] Note that prior to October 2002, monopoly procurement was reinstated in several years (e.g. in 1996-97 when 922 thousand tons were procured, as well as in 1999-00 and 2000-01), in order to assure the GoTN of rice supplies.

[39] Estimates of the income elasticity of demand for rice range from… AIDS model estimates by Kailasam (1991) for households in western Tamil Nadu ranged from 0.956 to 1.241 for rural household groups and 0.695 to 1.121 for urban household groups. Own-price elasticities ranged from –0.262 to -0.530 (rural) and -0.278 to -0.593 (urban). Hazell and Ramasamy (1991) estimates of income elasticities with a pooled data

5.15 **Estimates of demand and net trade indicate that, in years of normal rainfall and water availability, Tamil Nadu is nearly self-sufficient in rice.** From 1997/98 to 2001/02, production of paddy within the state accounted for an estimated 89 to 95 percent of total consumption for the period as a whole. During these years, net public distribution averaged 1.19 million tons, (about 15 percent of consumption), and estimated average private trade net exports were about 300 – 800 thousand tons, (equal to 3 to 10 percent of estimated consumption).

5.16 **In 2002-03 a drought year, private net rice inflows contributed an estimated 1.0-1.3 million tons to total availability, equal to 12-16 percent of consumption.** Because of the severe drought in 2002-03, production of paddy fell by 2.47 million tons (a decline of 34 percent) compared to the average of the previous five years. Net public distribution of rice was 2.15 million tons, equal to the level of total distribution, since no procurement took place. Assuming constant per capita demand, net private trade flows are estimated at 1.32 million tons, 16 percent of consumption. Alternatively, adjusting for the higher price rise and an estimated 2.7 percent decline in per capita incomes relative to 2001/02, per capita rice consumption fell by 2.7 percent and private imports were only about 1.0 million tons.

5.17 **Private trade flows helped stabilize market supplies and prices (Figure 5.1).** The influx of 1.0-1.3 million tons of rice imports from other states (and abroad) through the private market trade helped stabilize prices without a major increase in public distribution in the state. Rice prices in Tamil Nadu closely traced those in Andhra Pradesh (a major source of private rice inflows to the state), reflecting the integration of these markets. As a result, the retail market price of rice in 2002/03 in Tamil Nadu was only 2.8 percent higher in real terms (nominal prices deflated using the GSDP deflator) than in 2001/02 helping to maintain access to food for poor consumers.

5.18 **The experience of 2002/03 suggests that private rice flows can play a major role in stabilizing rice prices and supplies in drought years, even apart from major increases in net public distribution.** Given these private rice flows, made possible in part by the overall rice supply and demand balance in India as a whole, self-sufficiency in rice is not a prerequisite for food security in the state. Nonetheless, availability of low-cost rice through the PDS, coupled with employment schemes remains important for the welfare of poor households, particularly in drought years.

Markets for Sugar Cane and Milk

5.19 **Marketing of sugar cane to sugar mills involves contract farming arrangements between farmers and the state's sugar mills** (2 public sector mills operated by the Tamil Nadu Sugar Corporation Limited, 16 cooperative sector mills, and 19 private sector mills). The total crushing capacity of these 38 mills is 104,550 tons crushing per day (TCD) and about 19.0 million tons per year. During the crushing season 2001-2002, the mills operated at full capacity, crushing 19.14 million tons of cane, and producing 18.39 million tons of sugar, with an average recovery rate of 9.61 percent.

5.20 The contract farming system for sugar cane provides a floor price for sugar farmers (who always get at least the SMP price) and divides the benefits of high market prices between farmers and mills. These explicit sales contracts also help to insure mills of regular supply of sugar cane. Under the contracting system for sugar cane, farmers receive initial payments equal to the

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set from 1972/73 and the early 1980s ranged from 0.32 to 0.39, with own price elasticites ranging from – 0.17 to -0.28.

statutory statutory minimum price (SMP) set by the GOI multiplied by the total quantity of sales to the mill. (Note that the SMP is made known to the farmers well in advance of the sowing season for sugar cane.) When average market sales prices of processed sugar rise above the government-determined approximate average cost of processed sugar (the "5A price", which is determined from industry average rendements[40], average processing costs, and estimated capital depreciation costs), a second payment is made to farmers, in which the sales revenues arising from the positive margin between the actual sales price and the 5A price is split evenly between mill and farmer. (In Tamil Nadu, an even higher price, the State Advised Price (SAP) is paid by state mills, but not by private mills.)

5.21 In Tamil Nadu, as in most of India, milk is sold through Milk Producers Co-operatives at the village level. Farmers supply milk to the society at a pre-determined price based on fat content and solid non fat. The society also provides technical guidance and financial assistance.

Commodity Marketing Boards

5.22 **Commodity boards for plantation crops, such as the Tea Board and Coffee Board, were established by the** Ministry of Commerce, Government of India. Each Board offers various schemes to i) develop new technologies and promote adoption of the same, so as to increase productivity, ii) provide support for various marketing activities, iii) to initiate efforts to promote exports and iv) to maintain a data bank and undertake extension activities.

5.23 The Tea Board promotes tea research and exports of tea worldwide, collects and disseminates statistical data as well as encourages labor welfare programs among a host of other activities all aimed at ensuring the health and vibrancy of the world's largest producer of tea. Until 1995, the Coffee Board had a monopolistic control over the marketing of coffee in India. However, the winds of liberalization swept the Indian coffee industry and since 1995, marketing of coffee is strictly a private sector activity.

Contract Farming

5.24 **The pace of reforms has accelerated in recent years and the state is now supporting new initiatives in contract farming and agricultural exports** (Text Box 5.1). Contract farming involving business agreements for purchase of output and often provision of inputs and extension advice is increasing, particularly for sugar cane, cotton, and horticultural crops. For medicinal plants, contract farming has just begun wherein the wholesaler comes in agreement with the farmer producers. A contract made is for an agreed price under the technical guidance of the buyer and assistance is ensured to the farmers in getting financial support from nationalized banks.

5.25 **Cotton contract farming has just started in about 1200 hectares in 2002-03 season and it is expanding.** The only difference is that the farmers have the option to sell cotton to the contractor or to any other buyer under the market prices prevailing during harvest period. For the services provided by the contractor, a nominal charge will be levied on the farmer on an unit area basis.

5.26 **Gherkin cultivation and processing started in India in the early' 90s and at present is spread over 7,900 hectares in the three southern states of Karnataka, Tamil Nadu and Andhra Pradesh.** Although gherkins can grow virtually in any part of the country, the ideal conditions required for growth prevail in these three states where the growing season extends through out the year. There are about twelve companies operating in the state and each company

[40] The yield of sugar extracted from cane.

has agricultural extension team of 5-25 who identify farmers and then enter into a buyback contract with them.

5.27 Contract farming for poultry is also practiced in Tamil Nadu. For broilers, firms supply chicks, feed, medicines and technical guidance to the farmers. The firms then buy the birds when they are eight weeks old at a predetermined price.

Rural Infrastructure

5.28 **Tamil Nadu's rural infrastructure is relative good compared to most other states in India, but further improvements will have high pay-offs.** Almost 100 percent of Hamlets (47, 838 out of a total of 47,853 Hamlets) in the state are electrified. Access to rural water supply is also fairly high. Ninety-four percent of rural habitations are fully covered in terms of access to rural water supply while the remaining 6 percent are partially covered.[41] Although Tamil Nadu has an extensive road network, further attention to maintenance and upgrading of rural roads in some regions may be warranted.

[41] According to GoTN definitions, a habitation is fully covered by rural water supply if the population has access to 40 lpcd. Partially covered habitations are habitations with a water supply of less than 40 lpcd.

Text Box 5.1: Contract farming in Tamil Nadu: New Initiatives for Rice

Contract farming involves a business agreement between a farmer and a firm in which the firm may provide inputs, extension services, processing and a ready market in return for a guaranteed source of supply of the output product. Such arrangements between sugar mills and cane farmers has long been practiced in Tamil Nadu and other parts of India. For other products, however, restrictions on private sector trade motivated by a general mistrust of traders, along with the structural characteristics of output markets (including the inability to differentiate products by quality or brand) have greatly limited the scope of contract farming.

Contract farming offers several potential benefits: it can reduce market risk for both farmers and firms, facilitate technology adoption as firms with access to capital and knowledge of new production technologies have an incentive to assist farmers in improving quality and productivity, and enhance quality of the final product, increasing value addition in processing. Potential adverse implications of contract farming exist as well, though, since there is a possibility that firms may acquire significant market power as they expand, to the detriment of farmers.

Contractual arrangements between sugar cane farmers and sugar mills have a long history in India. Economies of scale in sugar processing technology, rapid perishibility of the product (the yield of sugar extracted from the cane ("rendement") declines significantly within days of harvesting the cane), and difficulties of transporting bulky sugar cane, make fixed contracts between local sugar mills and farmers desirable from an efficiency standpoint. To protect the interests of both farmers and mills, the Government of India placed marketing regulations on sugar cane and created a system of administered prices.

Beginning in a limited way in 2002/03, EID Parry took tentative steps towards establishing contract farming in rice. EID Parry sold approximately 60 tons of improved seeds for super fine quality ponno rice (enough for about 800 hectares of rice at a seed rate of 75 kgs/hectare) and provided extension services to sugar cane farmers who sold sugar cane to the firm's sugar mill in Cuddalore, and were also wiling to grow rice. With the improved rice technology, paddy yields were approximately 25 percent higher than normal yields of 3.75 tons/hectare. Moreover, because of drought, market prices were about 20 percent higher than the previous year.

EID Parry later purchased the output. In the absence of an explicit sales contract, though, the firm risked not being able to purchase supply for its rice mills. In 2003/04 the firm plans to make commitments to farmers to procure rice at market prices from farmers who purchase seed. If the trial is successful, the firm may providing inputs on credit and establish explicit sales contracts that are binding for farmers in future years. (EID Parry's existing contracts with the same farmers for sugar cane may provide an implicit additional enforcement mechanism to deter farmer default.)

The entrance of large private firms into rice markets has only been possible with the removal of stocking limits (in May 2003), and other restrictions on movements of paddy and rice. Availability of new seed and processing technology, combined with firms' market knowledge could make contract farming arrangements profitable for both farmers and firms. If quality is improved, and is noticeable so that rice achieves higher price, firms will be able to afford to pay higher prices, particularly if brand names can be established. Maintaining competition between traders will remain important, however, since if firms significantly increase their market shares, monopoly power of the firms could reduce benefits for farmers. Institutional arrangements (such as promotion of farmer organizations) may also be needed to make sure small farmers benefit, as well.

6. Agricultural Growth and Rural Poverty

6.1 Rural poverty is concentrated amongst rural landless laborers and small farmers (especially those without significant amounts of irrigated land). The PDS is an important safety net for the rural poor. Ration sales from public stocks, combined with targeted public nutrition and employment programs, and price-stabilizing market flows of rice from neighboring states enabled the state to avoid serious declines in welfare of the poor during 2002-03, a year of severe drought. The extent to which future agricultural growth reduces rural poverty will depend on the degree to which small farmers shift to cultivation of higher value crops and have access to remunerative markets, and labor demand increases, particularly in the dry seasons.

Rural Poverty[42]

6.2 **The latest available data indicate that there were between 7 and 11 million rural poor among Tamil Nadu's population of 62 million in 1999/00 (Table 6.1:).** Findings on the incidence of poverty in rural versus urban areas in Tamil Nadu vary depending on the methodology used to estimate poverty lines.[43] According to the official Planning Commission estimates, the incidence of poverty in rural areas was lower than that of urban areas. The adjusted estimates of Deaton and Drèze (2002) arrive at the opposite conclusion reporting an incidence of poverty in urban areas less than half of that in rural areas. Estimates by Kijima and Lanjouw (2003) also find that urban poverty is below rural poverty. According to Kijima and Lanjouw, the estimated poverty rate in 1999/00 was 31.8 percent in rural areas compared to a poverty rate of 22 percent in urban areas. The same authors also find that Tamil Nadu was the most poor of the Southern states, and had a higher incidence of poverty than India as a whole. These findings differ from those of Deaton and Drèze (2002) that reveal a slightly lower incidence of poverty in Tamil Nadu as compared to India as a whole.

Table 6.1: Poverty Estimates for Tamil Nadu (1999/2000)

	Head Count (%)			No. of Poor (million)		
	Urban	Rural	Overall	Urban	Rural	Overall
Indian Official Estimates	22.1	20.6	21.1	5.6	7.4	13
Deaton and Drèze (2002)	11.3	24.3	20.0	2.9	8.7	11.6
Kijima and Lanjouw (2003)	22.0	31.8	28.9	5.6	11.4	17

Source: Lanjouw, Jayaraman and Kijima, 2003

6.3 **Tamil Nadu's rural poverty rates have declined over time.** All three sets of poverty estimates report declining rural poverty rates although they differ in their estimates of the rate of decline. Kijima and Lanjouw's (2003) estimates suggest a decline in rural poverty in Tamil Nadu between 1993/94 and 1999/00 of about 6.7 percentage points compared to a decline of 14.2

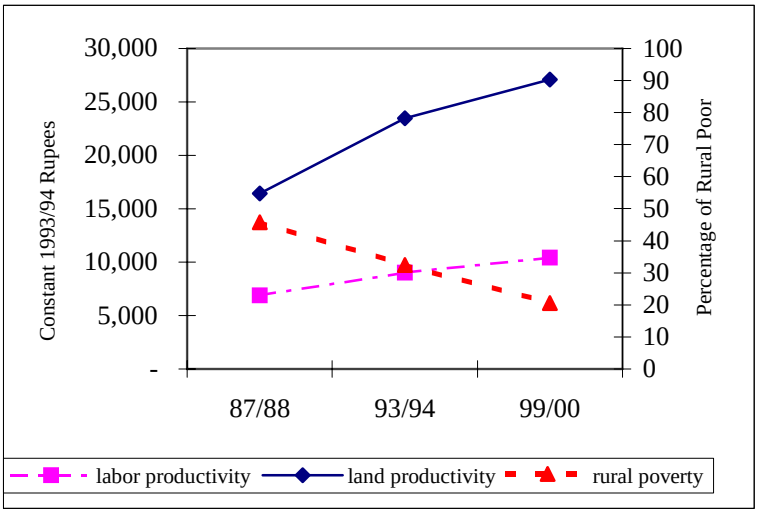
[42] This section draws heavily on the Tamil Nadu Poverty Note: Poverty in the 1990s, A Preliminary Profile and Emerging Issues by Peter Lanjouw, Rajshri Jayaraman and Yoko Kijima. The Tamil Nadu poverty note provides an analysis of poverty issues in the state drawing on existing household survey data and village studies. This section summarizes some of the main findings of the poverty note pertaining to the incidence and profile of rural poverty in the state.

[43] Refer to Lanjouw et al., 2003 for a detailed summary of the various methods and their findings.

percentage points reported by Deaton and Drèze (2002). The official Planning Commission estimates suggest a decline in the rural poverty rate of 12.3 percent.

6.4 **The limited data on rural poverty over time suggests a correlation with labor and land productivity growth, though no definitive conclusions are possible**. From 1987/88 to 1999/00, rural poverty decreased from 45.6 to 20.6 percent. During this same period, land productivity grew by 3.9 percent per year and labor productivity increased by 3.3 percent per year. Given the importance of returns to land for small farm incomes and labor earnings for all rural poor households, these gains in land and labor productivity certainly contributed to raising rural incomes. However, since non-agricultural incomes also account for a large share of incomes of the poor, more data and analysis at the household level (ideally with panel data sets) would be required to quantify the effect of agricultural productivity gains on rural poverty.

Figure 6.1: Productivity and Rural Poverty



Source: Authors' Calculations.
Note: Poverty rates are based on the unadjusted official Planning Commission poverty lines which overestimate the decline in poverty rates due to non-comparability of the expenditure data between the 55th round and previous rounds of the NSS.

6.5 **There are marked regional variations in the rural poverty with a higher incidence of rural poverty in the Coastal North and South**. The incidence of rural poverty (according to the Lanjouw and Kijima estimates) appears to be higher in the Coastal North and South.[44] Between 1993/4 and 1999/0, poverty fell in all NSSO regions with the exception of the Coastal North, where the poverty incidence, based on the Kijima-Lanjouw adjustment methodology, is estimated to have risen from 21 percent to 29 percent.

6.6 **The rural poor in Tamil Nadu typically own less land than the non-poor and are highly represented among the marginal landowners.** Rural poverty is concentrated among those with marginal landholdings, and is lowest among those with relative large landholdings. The incidence of poverty appears to be lower among the landless (non-agricultural households) as compared to marginal landholder (those with less than 0.4 hectares of land). Access to land alone does not

[44] Coastal North districts include Chennai, Thiruvalluvar, Kancheepuram, Thiruvannamalai, Vellore, Villupuram, Cuddalore. South districts include Tiruchirapalli, Parambalur, Ariyalur, Karur, Nagapattinam, Thiruvarur, Thanjavur, Pudukkottai. Coastal districts include Dindigul, Madurai, Theni, Virudhunagar, Sivaganga, Ramanathapuram, Thoothukkudi, Tirunelveli, Kanniyakumari. Inland districts include Coimbatore, Nilgiris, Erode, Namakkal, Salem, Dharmapuri. These regional classifications are based on the National Sample Survey Organization's regional zonal classifications.

allow rural households to escape poverty. Estimates from 1999/00 reveal that 20 percent of households owning more than 4 hectares of land were poor (fell in the bottom two quintiles of per capita consumption) compared to an poverty incidence of 45 percent among marginal landholders.

6.7 **In Tamil Nadu the risk of poverty is considerably more pronounced amongst those whose land is not irrigated.** According to estimates from 1999/00, approximately 42.1 percent of households without irrigation were poor (per capita consumption rank of less than 40 percent) as compared to 33.8 percent of household with irrigation. Among marginal landholders 45.4 percent of households without access to irrigation were poor compared to a poverty incidence of 39.3 percent among marginal landholders with access to irrigation.

6.8 **The rural poor are more likely to be reliant on agriculture as a source of income.** Farming contributes to over 50 percent of rural income. The poorest households (those in the lowest income quintile) receive almost 78 percent of these income from cultivation and agricultural wage labor. In fact, almost 52 percent of the income of the poorest households can be attributed to agricultural wage labor alone. As one moves from the lowest to highest income quintiles, the contribution of agricultural wage income to total income decreases monotonically, while that of cultivation and non-farm sources increases monotically. Wealthier rural households appear to have access to more assets (physical and human capital) allowing them to participate in more remunerative non-farm employment activities.

6.9 **About one-fifth of the population in Tamil Nadu belongs to scheduled castes or tribes whose average standard of living is considerably below the rest of the population.** Eighty-eight percent of SC/ST households owned less than 0.4 hectares of land in 1999/00. SC/ST households have a lower mean per capita consumption as well as lower levels of education as compared to non-SC/ST households. Scheduled caste and scheduled tribe population groups are highly represented in agricultural wage labor activities and are particularly under-represented among cultivators and in regular non-farm employment.

Table 6.2: Farm Income Shares in Tamil Nadu

Quintile	Cultivation	Agriculture wage Labor	Total Nonfarm sources	Other sources	Real Per Capita Income
Lowest	26.3	51.6	19.8	2.3	1,093
Q2	27.8	27.5	43.2	1.6	2,130
Q3	32.6	21.6	44.4	1.4	3,377
Q4	35.7	14.9	45.5	4	5,431
Highest	42.8	5.2	50.4	1.6	12,292
Total	37.7	13.7	46.4	2.1	4,867

Source: Lanjouw, Jayaraman and Kijima, 2003

6.10 In both urban and rural areas, average consumption levels of households where the head had completed secondary education or higher are about twice as high as when the household head was illiterate.

Labor Markets

6.11 **Real wage rates in agriculture have risen steadily in the 1990s.** The average annual increase in the real wage for male labor for harvesting increased from 2.8 percent per year during 1986-92 to 7.2 percent per year during 1993-2001 (Table 6.3). During this latter period (1993-2001), paddy and rice prices declined by an average of 2.0 percent per year in real terms due to increased productivity (yields) of paddy in Tamil Nadu, and in recent years, the declining cost of

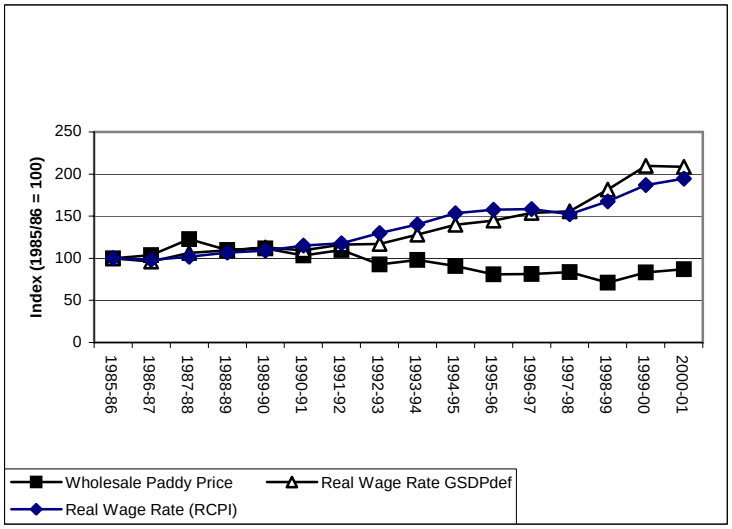
imported rice in neighboring states. Thus, the real wage in terms of paddy (rice) grew by an average of 9.8 percent per year from 1992/93 to 2000/01, again indicating increased purchasing power for rural laborers (Figure 6.2).

Table 6.3: Real rural wages in Tamil Nadu, 1986-2001

	1986-88 Rs(2000)	1999-01 Rs(2000)	Percent Change	1986-92 % growth rate	1993-2001 % growth rate	1986-2001 % growth rate
Rural Wage Rate I (Rs 2001/day)[a, b]	36.7	72.7	98.2%	2.8%	7.2%	5.2%
Rural Wage Rate II (Rs 2001/day) [a,c]	39	71.4	83.0%	3.2%	4.9%	4.8%
Paddy Price Wholesale (Rs 2001/kg) [b]	6.58	4.87	-26.0%	0.7%	-2.8%	-2.5%
Rural Wage Rate I/ Rice Price (kgs/day) [d]	3.75	10.01	167.1%	2.1%	10.3%	7.9%

a Wage rate for male labor for harvesting activities; b Using the state GSDP price index as a deflator;
c Using the state rural CPI price index as a deflator; d Using conversion factor of 1 kg paddy = 0.67 kgs rice.

Figure 6.2: Real Paddy Prices and Rural Wage Rates in Tamil Nadu



6.12 **A declining rural labor force reflecting significant rural-urban migration, is one major factor behind the rise in real agricultural wages.** According to the Population Census, total population in the state increased by 6.25 million people (11.2 percent) between 1991 and 2001. In this period, urban population grew by 8.16 million people (42.8 percent); rural population actually declined by 1.91 million (5.2 percent). The rural population was thus 12.8 percent less than it would have been if both the rural and urban populations increased by the same state-wide rate (11.2 percent).

6.13 **For farmers that hire labor, however, increased labor costs imply reduced profitability.** Increases in labor costs have been partially offset by increases in yields, thus limiting the decline in farmer paddy incomes. Moreover, higher costs of labor have encouraged mechanization, including the use of power tillers for land preparation and mechanical harvesters for paddy. Nonetheless, higher labor costs are adversely affecting incomes of commercial farmers in Tamil Nadu, particularly in areas where urban and rural non-farm employment are

increasing, such as the western zone (with its textile and other industries around Coimbatore) and in the northeast near Chennai.

Technological Change and Rural Poverty

6.14 **Despite concerns that the green revolution technology for rice (improved seeds, increased fertilizer use and irrigation) would lead to increased income inequality, most rural household groups benefited from increased rice production in the 1970s and early 1980s.** Household surveys of farmers in North Arcot district (now Vellore and Thiruvannamalai [check]) indicated that, although the first adopters of the rice technology tended to be larger farmers, by the early 1980s small farmers in villages with access to irrigation had also adopted the new technologies at the same rate as large farmers (Hazell and Ramasamy, 1991). Moreover, land distribution had remained essentially unchanged, and agricultural wage earnings for agricultural laborers increased (though real agricultural wage rates did not increase).

6.15 **Moreover, increased rice production led to substantial rural growth linkages**, adding an additional 0.87 rupees of value added for every 1 rupee of value added from additional rice production. One-half of these multiplier effects were due to increased demand for agricultural inputs, marketing and processing services; the remainder derived from increased consumer demands as household incomes rose.

6.16 Survey results showed that real incomes of small paddy farmers and landless laborers rose by 90 and 125 percent, respectively, between 1973/74 to 1983/84. Incomes of non-agricultural households also rose by 55 percent, due in part to the growth linkage effects emanating from agricultural growth. Real income gains of large paddy farmers were only 18 percent, due to increased costs of fertilizer and labor. Notably, non-paddy with no access to irrigated land saw real income gains of only 17 percent.

6.17 **On an all-India scale, agricultural productivity growth from 1958-1994 played a major role in reducing poverty in India**. [45] During this period, agricultural output per acre of net sown area grew by 2.91 percent per year, contributing to higher real wages for agricultural laborers (which grew by 2.84 percent per year) and a decline in the real price of food. (The price of food relative to agricultural laborers' consumer price index fell by 0.15 percent per year from 1976-94, after having increased by 0.62 percent per year from 1958-75.) Higher farm yields for small producers also contributed directly to their incomes, both directly through increased value of output and indirectly through increased employment.

6.18 **Whether future agricultural growth reduces poverty in Tamil Nadu reduces rural poverty will depend on the extent to which small farmers adopt new technologies and have access to markets, the magnitude of employment and real wage rate gains, and the size of linkage effects with rural non-agriculture**. Further reductions in the real price of food are not likely given the already low food prices (particularly in Tamil Nadu where the poor have access to subsidized rice through the PDS). Land distribution is unlikely to become more egalitarian and thus contribute to a redistribution of incomes, and could even become more concentrated instead.

6.19 **Increasing employment and earnings in the dry season is especially important for the rural poor.** Increased availability of water and greater efficiency of water use in the dry

[45] Datt and Ravallion, 1998, Farm productivity and rural poverty in India, Journal of Development Studies, No. 34, April

season (for example, through the widespread adoption of drip irrigation) could enable cultivation of crops year-round, providing employment in agricultural production and processing. Dissemination of new production technology and establishing markets for dry season crops will be crucial, however. Contract farming may help overcome these problems, if competition between firms helps farmers maintain their share of the value of the final product sales.

6.20 **The reduction in poverty is also likely to be greater if small farmers are able to participate in production and sales gains from off-season crops.** New technologies like drip irrigation require substantial investments, and large farmers to adopt these technologies and shift to cultivation of higher value crops more quickly than small farmers. Government programs to provide credit to small farmers were instrumental in increasing adoption rates of rice technology in the 1970s and 1980s; the feasibility of similar targeted credit programs should be explored.

7. Conclusions and Policy Options

7.1 **Traditional sources of agricultural growth in Tamil Nadu face major constraints**. Seasonal water shortages, increasing land degradation, continually shrinking farm sizes and rising costs of agricultural labor represent serious constraints that need to be overcome if future growth in agriculture is to be realized. Further gains in rice production (a major engine of agricultural growth in the past four decades) will be hard to achieve, and may not be the most efficient use of resources in the context of national grain surpluses and the significant water requirements of rice cultivation.

7.2 **Given the existing constraints, diversification into less water-intensive higher-value products, including fruits, vegetables, spices, and livestock products, is one of the most promising avenues for increasing agricultural growth.** Tamil Nadu's agro-climatic conditions are well suited to diversified agriculture. Furthermore, rapidly increasing incomes and changing food demand patterns provide strong impetus for diversification. Increased agricultural diversification and private investments in processing for many of the higher valued agricultural commodities are likely to generate new rural non-farm employment opportunities and contribute to higher rural incomes.

7.3 **Overcoming the constraints faced by the agricultural sector in Tamil Nadu, and accelerating growth in agricultural production and the rate of rural poverty reduction, will require appropriate policies and investments in four priority areas**: improving the efficiency of water use; increasing the effectiveness of public expenditures and agricultural extension; spurring the development of agricultural markets; and maximizing the real income growth of the rural poor.

Increasing the Efficiency of Water Use

7.4 Long-term growth in agriculture and rural incomes depends in large part on **increasing the efficiency of use of water**.

7.5 Tamil Nadu has already taken some important steps in expenditure and organization reforms in irrigation and drainage institutions that are vital to improving the delivery of surface irrigation services and helping to ensure the longer-term performance of irrigation infrastructure. Further organizational reforms to streamline business processes to enhance efficiency and transparency and professionalize the work culture will be essential to improving service delivery to the client farmers, reduce costs of service provision (especially by modernizing and rightsizing), ensure financial sustainability of operations and maintenance of systems, and reduce the fiscal burden to state governments.

7.6 More specifically, there are several options that Tamil Nadu could consider to manage its scarce water resources. These include: **scaling up the pilot river-basin framework** for managing water resources holistically, **allowing interagency coordination and public-private partnerships**; introducing specific legally enforceable **water entitlements** to various users in a river basin and or aquifer framework; **changes in electricity, water and crop prices** to change the financial incentives for irrigation and crop choice; **improved management practices and irrigation technologies** (such as drip and sprinkler irrigation) and **new investments** in canals and water storage (coupled with improved operation and maintenance).

7.7 **Public administration in the water sector could be improved by separating the responsibilities for water resource management and irrigation service delivery**. Tamil Nadu is the only state in India without a separate department of irrigation: administration of irrigation in the state is part of the Department of Public Works. Two new agencies are needed: a

regulatory agency to allocate the share of water resources to agriculture, industry and other uses, and a irrigation department focusing on irrigation delivery systems. A separate irrigation department would allow for the creation of a specialized cadre of irrigation specialists, instead of the current setup where staff from the Department of Public Works (which also includes administration of public buildings) are responsible for delivering irrigation services.

7.8 **Irrigation Management Transfer (IMT) is at an early stage in Tamil Nadu and WUAs are yet to be fully functional.** There is a need to expedite the transfer of irrigation management to farmers in line with the FMIS Act so that water distribution would be more efficient and equitable.

7.9 **The Government of Tamil Nadu recently announced increases in irrigation water charges and reintroduced a tariff for agricultural power consumers**. While these recent reforms are a step in the right direction, charging for water on a per area basis (as is the case for surface irrigation) or on a flat rate basis (for agricultural power consumers) is not efficient from an economic point of view as the marginal cost for water is almost zero and hence it does not affect the demand for irrigation water.

7.10 **Irrigation water charges were revised in July 2003**. Previously, water charges were levied by the GoTN at a base rate (which varied according to crop, season, soil quality etc) coupled with an additional cess equivalent to six times the base rate. This additional cess was transferred to the local panchayats. Under the new system of charges an additional water charge of Rs 150/ha de-linked from any additional cess has been imposed. Thus the farmer will pay the original charge plus the Rs 150/ha. In addition, the FMIS Act empowers the water user's associations (WUA) to charge users between Rs 250/ha to Rs 500/ha. This additional charge can be retained by the WUA for operation and maintenance of the systems turned over to them. The current provisions for irrigation water charges would be sufficient to allow full cost recovery of required O&M expenditures. The extent to which farmers are actually being charged the proposed water rates remains unclear.

7.11 **In 2002 an agricultural power tariff was introduced bringing an end to 12 years of free electricity for Tamil Nadu's farmers.** The revised agricultural power tariff included a flat rate for unmetered connections of Rs.250 per HP per annum and Rs.0.20/kWh for metered connections. In conjunction with the reintroduction of the agricultural power tariff the government announced a pilot income support scheme for small and marginal farmers. However, the reintroduction of the agriculture power tariff became a highly contentious issue in Tamil Nadu during the recent national election, and after a significant loss of seats in the national parliament, the TN government has reversed the policy.

7.12 Other states also introduced tariffs in recent years (Text Box 7.1). International experience with income support programs also provides several important lessons for providing clear incentives and containing fiscal costs, including the need for targeting to poorer farmers (e.g., paying less per hectare as farm size increases, with a ceiling on the numbers of hectares eligible for payment), an effective delivery system for the transfer payments, and a limit on the number of years for which producers will be eligible for payments (Table 7.1).

Text Box 7.1: Pilot Initiatives in Reforming Power Supply to Farmers

Andhra Pradesh. In 2003, Andhra Pradesh initiated a "tatkal" scheme under which farmers seeking immediate connection are required to pay Rs. 1/kWh to expedite the connection of the utilities. The current rate for farmers is Rs. 0.25/kWh (full cost is Rs. 4/kWh). Under this scheme, 30,000 new connections were provided during the year by the utilities. The government and the utilities are also separating the supply of power to farmers from the other consumers, by splitting the 11kV rural feeders. This initiative has several merits, including the potential to monitor the reliability and quality of power supply to farmers and an increase in cost recovery. However, investment cost is high at Rs. 10 million for each 11kV feeder.

Karnataka. The State Electricity Board in Karnataka recently initiated a program called "Own Your Transformer Scheme for Irrigation Pumpsets," involving the drawing of 11 kV HT line under High Voltage Distribution System to the premise of pumpset consumers and providing them with small capacity transformers. The government is asking farmers to share equally the cost of the investment with the utilities, which is estimated at about Rs. 50 billion. The scheme has the potential to reduce losses and improve the quality of supply. But the cost of the program is substantial. Given the cost sharing arrangement, it is likely that the scheme would benefit mostly large farmers. As a means to target the subsidies, the Karnataka regulatory commission for the purpose of determining different tariffs has classified farmers according to the number of tubewells they own, and to the fact that they do not perceive income from other activities such as civil servants.

User associations. The Electricity Act, 2003, provides for the Union Government to issue a National Policy permitting stand alone systems (including those based on renewable sources of energy and non-conventional sources of energy) for rural areas, and a National Policy for rural electrification and for bulk purchase of power and management of local distribution in rural areas through Panchayat Institutions, users' associations, co-operatives societies, non-Governmental organizations or franchisees. These institutional models have been piloted in India. In terms of internal efficiency, some cooperatives are working well while others are not. In cases where it did not work well, one major cause was the lack of penalties in defaulting in payments to the public electric utility. The institutional model potentially promising, provided there is the willingness to proceed with disconnections in case of non-payments.

Source: Lucio Monari, 2003 as cited in World Bank, 2004

7.13 **Introduction of a flat rate charges of Rs 250/year for a 5 horsepower pumpset (a policy that has now been reversed) would have only a small effect on net returns to land and management, reducing them by only 4.9 to 6.5 percent for major crops grown with well irrigation**. Costs of crop cultivation using well irrigation would rise by only 625 Rs/ha for most crops (the annual charge pro-rated for one season) to 1250 Rs/ha (for sugar cane grown over eleven months). **However, if electricity charges are raised to the estimated marginal economic price of electricity to agriculture of 3.1 Rs/Kwh, electricity costs rise to about 4,600 Rs/ha for paddy and sugar cane, reducing returns to land and management by 35.9 percent for rice and 23.8 percent for sugar cane**. Likewise, total returns to land, labor and capital (value added) fall sharply for paddy and sugar cane irrigated by wells when the cost of electricity for pumping is included. If electricity is costed at its economic price, total income generated from cotton cultivation (23,949 Rs/ha) is 53 percent greater than that for rice. Including the subsidy on fertilizer (through the GoI), raises the total subsidy on rice and sugar cane cultivated with well irrigation to 41.1 and 40.3 percent of net financial returns at the flat rate cost of electricity.

7.14 **Such large policy-induced reductions in returns for farmers are likely to be politically infeasible (as indicated by the recent election results), but gradual step towards marginal cost pricing of electricity, (perhaps combined with compensation to farmers in the form of income transfers or a more reliable electricity supply), would help rationalize water use in Tamil Nadu**. If their costs and incomes varied according to the amount of electricity (and water) used with well irrigation, farmers would have an incentive to shift some land from water-intensive crops (rice and sugar cane) towards less water-intensive crops (including cotton, maize and vegetables). Greater attention to marketing infrastructure, strengthening the research and extension to meet the needs of diversified agriculture, the development of tools for farmers to better manage risks, and improving irrigation pumpset efficiency may create an environment within which higher power charges would be more palatable for farmers.

Table 7.1: Selected Country Experiences with Agricultural Subsidy Reform

Salient Features	Farmer Income Support Programs				New Zealand: Farming without Subsidies
	EU: Common Agricultural Policy	Mexico: PROCAMPO	US: Agricultural Market Transition Act and Farm Security and Rural Investment Act	Turkey Direct Income Support Program	
Objective	Compensate producers from a reduction in support prices	Compensate farmers for reduced income with elimination of support prices on selected crops due to NAFTA	Compensate farmers for removal of deficiency payments, counter-cyclical support of farm income, maintain budget discipline	Compensate farmers for reduced income due to removal of support prices and subsidies	Removal of trade protection and govt interventions in agriculture and agro-industry, public sector & institutional reform & privatization except for public goods aspect of research
Time Frame	Fixed in nominal terms; no expiration date but subject to CAP reforms	Total of 15 years; first 10 years fixed in real terms; declining in the last 5 years	1996 Act expired in 2002. 2002 Act expires in 2007.	No end date.	10 years
Implemented	1993	1994	1996, 2002	2001	1984
Payment basis	Average acreage in support crops during 1989-1991	$78 per ha in support crops up to 100 ha (2000) for each growing season. Must show evidence of land ownership and use, based on average acreage during 1991-93	Fixed payment rate per unit output and variable payment rate that increases as market prices decrease, paid on each farm's historical acreage and yields for supported commodities	$110 per ha of land area sown as shown by cadastral records, originally capped at 20 ha; now 50 ha	Total withdrawal of concessionary loans & support payments, subsidy schemes & preferential tax treatment
Applicable commodities	Wheat, maize, barley, rye, oats, rapeseed sunflower, soybeans, dried pulses, beans, tobacco, beef, lamb	Wheat, maize, sorghum, barley, rice, cotton, beans, soybeans, safflower	Wheat, maize sorghum, barley, rice, cotton, oats	All crops eligible for support under the previous programs	None
Payment limits	None	$ 6,700 per farm	$40,000 + possible $20,000 on each of two subsidiary farms.	$ 5,000 per farm	One time assistance for debt restructuring for some farmers..
Restriction on the use of land	Allocated to support crops; large producers must put into fallow a predetermined level of support-crop land.	Allocated to support crops, but since 1996 land could be used for other agricultural uses	Must remain in farming, no increase in fruit or vegetable area; must be in compliance with existing conservation plans	Land has to be cultivated but includes fallow land.	None.
Estimated Fiscal Costs		$919 million (1998), price support reintroduced for some crops in 2002.	$15 billion per year under 1996 Act; projected; similar levels projected under 2002 Act	$1.8 billion per year (2003)	Fiscal savings
Ag share in GDP		5%	1%	14%	5%
Rural/Total Popn		25%	20%	35%	3%
Total Farmers		5 million	2.1 million	4.1 million	109,000

Source: World Bank, 2004

7.15 **Increases in electricity charges would have only small effects on overall rice production and market prices, but major implications for sugar cane production in the state**. Since only about 10 percent of rice area cultivated is irrigated with well water (about 200 thousand hectares), changes in electricity pricing would have only marginal effects on total rice production in the state. Moreover, since net public distribution (averaging 1.2 million tons per year from 1997/98-2001/02, 18 percent of net production) and private market trade from neighboring states (estimated at 1.0 – 1.3 million tons in the drought year 2002/03) are major sources of supply of rice, the effect of lower rice production from well water-irrigated areas on market prices of rice would likely be small. Impacts on sugar cane production would be much more significant, however, as essentially all of area is irrigated in part with well water.

7.16 **Greater attention is also need for scaling-up the adoption of water saving irrigation technologies and modernizing irrigation infrastructure**. While the use of sprinkler and drip technology has been promoted in the state, the high capital cost of these technologies currently poses a constraint to widespread adoption by marginal and small farmers and greater attention to development of more affordable technologies is warranted or a suitable system of targeted subsidies should be developed to scale-up the use of sprinkler and drip systems.

7.17 **Improving the productivity of rainfed agriculture will require new investments and increased emphasis on community participation with sound technical inputs** to improve the success of watershed programs. **A basin perspective should be adopted in implementation of all watershed programs** to ensure that these initiatives do not have negative impacts on downstream human and ecological uses**.**

Increasing the Effectiveness of Public Expenditures and Agricultural Extension

7.18 **A highly effective research and agricultural extension system is needed to respond to the needs of diversified agriculture**. An assessment of the state's comparative advantage in producing higher value crops for the domestic and export markets would also help in setting future research and development priorities. Re-orienting agricultural research to make it more farmer-responsive would likewise improve the output of a system that has enjoyed much success in rice technology development in the past. Similarly, the current extension system in the state remains organized around a modified Training and Visit approach and continues to be highly focused on major food-grains, though the promotion of public-private partnerships in extension is a very encouraging recent development and offers potential for both cost-savings and greater efficiency (Figure 7.1). Thus, it is recommended that the GoTN develop a new agricultural extension strategy to meet the changing needs of farmers. This could include adopting an integrated and decentralized extension system that could help build farmer organizations that could link with private firms to increase economic growth in rural areas.

7.19 **Rationalizing public expenditures and shifting expenditures from subsidies to investments in key public goods such rural roads, markets and agricultural research and extension will facilitate productivity improvements and diversification of agriculture to higher value products.** Tightening competition for limited fiscal resources heightens the urgency of appropriate public expenditure reallocation. Institutional reforms within government departments to ensure improved quality of delivery of rural-related public goods and services is also important.

Figure 7.1: Alternatives for Public-Private Financing and Provision of Extension Services

Service Provision \ Financing of Extension Services	Public	Private (Farmers)	Private (Other)
Public	♦ Traditional extension	♦ Fee-for-service extension	♦ Contracts with public institutions
Private	♦ Subsidies to private extension service providers ♦ Publicly-financed contracts for extension services	♦ Commercial advisory services ♦ Sale of newspapers, magazines	♦ Information provided with sale of inputs ♦ Extension provided to contract growers ♦ Advertising in newspapers, radio, television, magazines

Source: Source: Alex, et al. 2001, Rural Extension and Advisory Services, New Directions, Rural Strategy Background Paper No. 9, Washington, DC: World Bank.

Promoting the Development of Well Functioning Agricultural Markets

7.20 **Well functioning agricultural markets are also important for successful agricultural diversification**. If recent policy reforms removing restrictions on purchase, movement, stocking and sales of paddy and 13 other crops are consistently implemented at the local level, they can be expected to improve marketing efficiency, reducing the margin between producer and consumer/export prices. Reductions in marketing costs are also necessary in order for production increases to lead to higher agricultural incomes, particularly for perishable high-value products (e.g. fruits, vegetables, animal products). Contract farming and other private sector initiatives should be encouraged, though the impact of these business arrangements on farmer incomes should be evaluated, as well (Text Box 7.2).

7.21 **There remain, however, important roles for the public sector in promoting agro-food system and agro-enterprise development (**Text Box 7.3**).** In addition to policies that establish "rules of the game" and address market failures, public investments in rural roads to strengthen rural connectivity can contribute to reduced costs of marketing. Although Tamil Nadu has an extensive road network, further attention to maintenance and upgrading of rural roads in some regions may be warranted. Given the rapidly changing nature of markets in Tamil Nadu, an in-depth study of market structure and investment needs would be useful.

7.22 **Increasing agricultural diversification will not compromise Tamil Nadu's food security objectives given an effective PDS, well-functioning markets and targeted nutrition programs**. Greater food security has largely been achieved through increases in state production of major staples (especially rice), sales of subsidized rice through the PDS, school feeding programs, and targeted relief programs during droughts. During the recent drought of 2002/03 the wholesale prices of rice only rose 2.8 percent (in real terms) above the previous year's price, despite a 34 percent fall in paddy production in the state, helping to maintain access to food for poor consumers. This was largely due to private sector inflows from neighboring states of Andhra Pradesh and Karnataka and the availability of rice through the PDS.

Text Box 7.2: Contract Farming in Punjab

Contract farming is production and marketing arrangement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at pre-determined prices. In Punjab, the state government has assigned the task of promoting contract farming in the state to the Punjab Agro Foodgrains Corporation (PAFC), for which it has developed a five-year plan that aims to shift one million hectares out of rice-wheat cultivation to a variety of other crops. PAFC sees its approach to be that of a facilitator, tying up farmers with agribusinesses which will supply quality seeds and technical assistance, and buy back the crop. Various models are being tried out, but it is still too early to judge their effectiveness.

Punjab agriculture appears to be well-suited for contract farming in terms of its physical and social environment – highly productive agriculture with assured irrigation, widespread mechanization, all villages connected by roads, good telecommunications, and average farm size more than twice the India average. Moreover, PAFC's venture into this field embodies a more market-oriented approach to agricultural development and a significant shift away from the state's traditional focus on production as an end in itself.

International experience suggests that contract farming tends to succeed only in certain types of crops/activities such as perishable products, or those where exacting market specifications have to be met. Basic field crops like standard rice, wheat, maize, oilseeds, pulses do not normally figure highly in contract farming programs and there is also a high risk of 'side selling' i.e., farmer will sell output to another buyer.

The absence of a quick and effective contract enforcement and dispute resolution system in Punjab (and India) magnifies the risk of farmers 'side selling' if market prices at time of harvest significantly exceed the contracted price, or conversely the risk of buyer default if market prices are well below the contract price. To address this, the state government needs to facilitate initiatives by agribusiness and farmers organizations wishing to develop speedy dispute-resolution systems. This might lead to a system for registration of contracts. The government's role should generally be limited to that of a facilitator, however, since to be successful, dispute-resolutions systems are best designed by the interested parties. Likewise, direct commercial involvement of the state should be minimal. In some of the models being adopted this is not the case as PAFC is exposing itself to a high degree of risk by contracting to buy output from farmers in case the buyer backs out.

Source: World Bank 2003b

Maximizing Real Income Growth for the Poor

7.23 **Increasing employment and earnings in the dry season is especially important for the rural poor**. Increased availability of water and greater efficiency of water use in the dry season (for example, through the widespread adoption of drip irrigation) could enable cultivation of crops year-round, providing employment in agricultural production and processing. Dissemination of new production technology and establishing markets for dry season crops remains an important unresolved issue, however. Contract farming may help overcome these problems, if competition between firms helps farmers maintain their share of the value of the final product sales. The experience of Latin America and the Caribbean suggests that education, transport infrastructure, and engines of non-farm growth that promote female employment are key aspects of a success strategy to promote non-farm growth and rural poverty reduction (Box 7.4).

7.24 **Whether agricultural diversification reduces poverty in Tamil Nadu will depend on the extent to which small farmers adopt new technologies and have access to markets, the magnitude of employment and real wage rate gains, and the size of linkage effects with rural non-agriculture**. An assessment of the implications for rural poverty reduction of an agricultural diversification strategy involving capital-intensive technologies (e.g. drip irrigation) and higher-risk crops is needed. . This assessment should include a review of crop and drought insurance instruments and the potential for innovations in these instruments to enable rural households, particularly the poor, to better manage the new and existing risks they face.

Text Box 7.3: Role of Government in Agro-Food System and Agro-Enterprise Development

Setting and ensuring enforcement of transparent and consistent 'Rules of the Game'

- Establish and enforce rules which define and allocate property rights (i.e. property and bankruptcy laws; intellectual property rights; zoning regulations)
- Establish and enforce rules which define permissible and non-permissible forms of cooperation and competition (i.e. licensing laws, laws of contract and liability, company and cooperative laws; anti-trust laws)
- Establish and ensure compliance with bio-safety, food safety, worker safety, and sanitation regulations
- Negotiate favorable terms for access to international markets and ensure fair practices on the part of international trading partners

Addressing Market Failures

- Ensure that the country is protected from the harmful introduction/spread of plant pests and animal diseases
- Ensure the availability of (production, price, industry) information and statistics to facilitate market activity and to monitor market progress
- Invest in or facilitate risk management instruments for agribusiness system participants (e.g. futures contracts, options, negotiable warehouse receipts, crop insurance)
- Compensate for unbalanced power relationships within the agribusiness system by monitoring potential abuses of market power, by providing training and information, and/or by supporting organizational development among weak participants
- Compensate losers in structural reform processes through safety nets and other transitional targeted programs

Build Physical and Knowledge Capital

- Invest in social overhead infrastructure, especially that related to transport, and energy
- Invest in knowledge-building to accelerate the agribusiness learning process and better enable the emergent private sector to participate/compete (i.e. R&D; academic/technical training)
- Facilitate development of agricultural marketing facilities (i.e. marketplaces; wholesale markets)

Source: World Bank 2003c as cited in World Bank, 2004.

Text Box 7.4: Promoting the Rural Non-farm Economy: Lessons from Latin America and the Caribbean

The experience of Latin America and the Caribbean in promoting the growth of the rural non-farm economy suggests some basic policy principles:

- Agricultural policies can promote non-farm activities such as agro-processing and the other industrial, commercial and service sectors that characterize modern agriculture. Agricultural policies in areas such as technology generation and diffusion, infrastructure, education, agrarian reform, credit, etc., should therefore be designed and developed with these links in mind.
- Projects and policies aimed at promoting the rural non-farm economy should not just focus on improving the capacity of households to become involved in the non farm economy, but should also stimulate the engines that pull rural households into it. Tourism and manufacturing are examples of such engines that are not traditionally viewed as part of the rural landscape. Engines of non-farm growth that offer employment to women in particular, should be emphasized.
- Local governments and institutional participation will need to be engaged in a whole variety of capacities, ranging from land use planning, education provision, infrastructure investment, regulations, training, and financing.
- Efforts must be directed to ensuring public institutions with responsibilities relating to non-farm activities (education, public works, small-scale industry, etc.) coordinate efforts and long beyond traditional competencies to include the non-farm economy. Education and transport infrastructure in particular, must receive concerted attention.
- Richer and poorer zones must be treated differently, with less emphasis in richer zones on subsidization and more on reducing transactions costs. In poorer zones, public interventions to provide the basic enabling environment will continue to be required.

Source: Julio A. Berdegue, Thomas Reardon, German Escobar, 2000 and World Bank 2003d as cited in World Bank, 2004a.

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