

## **Impact of Trade Liberalization on Cropping Pattern Change and Income Distribution in Tamil Nadu, India\***

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Freer trade, views of the many of the trade analysts, provides significant benefits to the farmers of the developing countries as the farmers realize comparative advantage and it also leads to a more efficient use of resources resulting in high productivity and efficiency gains. However, many researchers are of view that how India ought to respond to higher world prices because agriculture has the bulk of rural poor whose real incomes are sensitive to food prices change (Maunder and Valdes, 1989; Subramanian, 1993). Due to price policy, prices of food commodities in India are not being allowed to fall below the procurement / support prices fixed by the government through the procurement system. Relative prices of agricultural commodities in India are quite different from world price relatives and it was argued that dismantling of restrictions on international trade would in general worsen the terms of trade (Kulkarni, 1992). Another important argument put forth is that free trade creates high instability in the world prices of agricultural commodities and such instability would be directly transmitted to domestic prices since domestic prices move closer to international prices. These sorts of upheavals affect the stability of export earnings and that lead to deterioration of terms of trade (Hazel, 1988).

### **Adverse impact – does it really affect the peasantry?**

Trade negotiations have not really brought out liberalizations in agricultural trade to the desired extent. Distortions in agricultural trade have not been reduced as expected and anticipated increase in exports of agricultural produce from developing countries has not been realized due to adoption of trade distorting policies of the developed nations. Doha round of negotiations held in Geneva during July 2008 also failed as per reports due to impasse in agreement on agriculture. It is also expected that the contemplated fair trade regime would help the efficient producers in realizing higher prices for their produce, but prices of most of the commodities are declining in the international market. Only recently, the prices of food articles are skyrocketing due to many factors but the important one is crop diversification from food crops to bio-fuels. Few crops have witnessed deterioration in production growth compared to pre liberalization period and the reason for such decline is economic rather than climatic. Another important reason in slower growth rate was due to liberalization of input prices, which, as a result, rose sharply. According to a survey by the World Bank (1991), inputs affected include fertilizers, diesel, high yielding variety seeds and irrigation charges. For instance, the cost of production of rice per quintal was Rs. 73 during 1981-82 and it jumped to more than Rs. 300 during 2004-05.

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The Indian government's reforms have provoked mixed reactions from farmers. While the large export oriented agro-based farmers seem to be reaping some rewards, the smaller ones argue that the effects of the Uruguay Round agreements will be adverse. The reforms have opened up trade in agriculture and given a boost to exports, which have been growing at 20 per cent per year since 1991. At the same time, they have resulted in hardships for many small farmers. The gainers include farmers with the capital to buy new technology and inputs and those with the ability to switch to the production of cash crops that enjoyed higher prices over food crops, whose production has declined. The losers include the small farmers and landless labourers whose incomes declined. So what went wrong? The reforms failed to reach the small farmer due to structural and institutional bottlenecks ranging from the pattern of landholdings to poor market access. The small-scale sector comprises pockets of fragmented plots owned by individual farmers. This prevents economies of scale and makes it difficult for farmers to compete with large farmers having wide range of technology options and resources.

### **What has been happening in Tamil Nadu?**

Apprehensions are expressed in certain quarters about the adverse effects of the trade agreement on Tamil Nadu farmers. Agriculture is the mainstay for 60 percent of the population in Tamil Nadu. Agricultural sector contributes 14 percent of the Net State Domestic Product. Among crops, foodgrains is losing their importance due to profitability and urbanization. Though the Green Revolution helped to tide over the food crisis, which occurred in 1970s and ensured food security to the vulnerable section of the society, the growth rate in foodgrains production started to decline in the recent past in the State. The task is made further more difficult by extreme pressure of population on land and the fast declining size of operational holdings. Further, to achieve the targeted growth rate of four per cent in agriculture, diversification into less water intensive high value products including fruits, vegetables, spices and livestock products is construed as one of the most promising strategies for increasing agricultural growth in Tamil Nadu. Of the total gross cropped area, only 50 percent of the area is irrigated in the State. Similarly, of the total area under foodgrains, only 60 percent of the area is irrigated. Nearly, 52 per cent of area is under dry farming conditions in the State apart from stable cropping intensity which is hovering around 120 per cent over the period.

The broad objective is to examine the implications of trade liberalization (exports and imports) on cropping pattern, technology adoption and farmers' income.

#### **Specifically,**

1. Instability in agricultural prices (both domestic and international), area under crops, their productivity and cost structure of important crops before and 1995 onwards were analyzed and their relationships were established.
2. Implications of freer trade on farmers' income and household welfare as a result of change in cropping pattern, prices, access to technology and market were assessed.
3. Domestic and trade reforms needed to address the problems faced by the small and marginal farmers in order to sustain the economic viability of their farms were suggested.

## **Research Hypotheses**

Have international agricultural prices affected domestic prices? Whether agricultural imports have led to lowering of agricultural product prices thereby resulting in poor income for farmers? Did liberalization bring out efficiency in use of resources resulting in high productivity and efficiency gains? Did cropping pattern change? Whether the farmers realize comparative advantage and consequent significant benefit? Did cost structure of agricultural production change during WTO regime? With the shift away from food to non-food crops, what is the impact on farm incomes?

## **Methodology and Data Sources**

Under the Cost of Cultivation of Principal Crops (CCPC) scheme 600 farm holdings are selected throughout the Tamil Nadu State of India for estimating cost of cultivation and the scheme is sponsored by Ministry of Agriculture and Cooperation, Government of India. This scheme is being operated from 1972 in the Department of Agricultural Economic, Tamil Nadu Agricultural University, Coimbatore. As per the norms of the GOI, 600 farmers, spread over various agro-climatic zones of the State, selected based on the prescribed procedure are to be retained for three years to study the trend in costs and prices and every three years another set of 600 farmers are chosen. The scheme generates panel data for three years. Farm size distribution across the zones under CCPC for the block year 1992-95 is set out in Table 1. In the proposed study 200 farmers selected under the scheme prior to 1995 were chosen. Further, farm survey was conducted during 2008 by selecting the same 200 farm households. Sample of farm households interviewed during 2008 is presented in Table 2 and zones and district covered are provided in the State map. Data pertaining to all the relevant variables were gathered for the two time periods. Data on agricultural prices – domestic and international, cost of production of major crops, gross revenue from crops, price indices, area and productivity before 1995 and 1995 onwards were gathered from various published sources.

**Table 1. Farm size distribution across the zones of CCPC scheme (1992-95 block year)**

Farm Size Groups	Zones					Total
	I	II	III	IV	V	
<b>Marginal (&lt;1 ha)</b>						
Number	106 (92.8)	8 (7.01)	-	-	-	<b>114</b> <b>(19.62)</b>
Average size of holding (ha)	0.54	1.02	-	-	-	-
<b>Small (1-2 ha)</b>						
Number	3 (2.38)	105 (83.33)	18 (14.29)	-	-	<b>126</b> <b>(21.69)</b>
Average size of holding (ha)	1.36	1.35	1.81	-	-	
<b>Large (&gt;2 ha)</b>						
Number	9 (2.64)	8 (2.35)	165 (48.39)	102 (29.91)	57 (16.72)	<b>341</b> <b>(58.69)</b>
Average size of holding (ha)	2.83	3.43	2.71	5.16	8.36	
<b>Overall</b>						
Number	<b>118</b> <b>(20.31)</b>	<b>121</b> <b>(20.83)</b>	<b>183</b> <b>(31.50)</b>	<b>102</b> <b>(17.56)</b>	<b>57</b> <b>(9.81)</b>	<b>581</b> <b>(100.00)</b>
Average size of holding (ha)	0.74	1.43	2.62	5.16	8.36	
Total area	87.32	173.03	479.46	526.32	476.52	1742.65
Per cent to total area	5.01	9.93	27.51	30.20	27.34	100.00

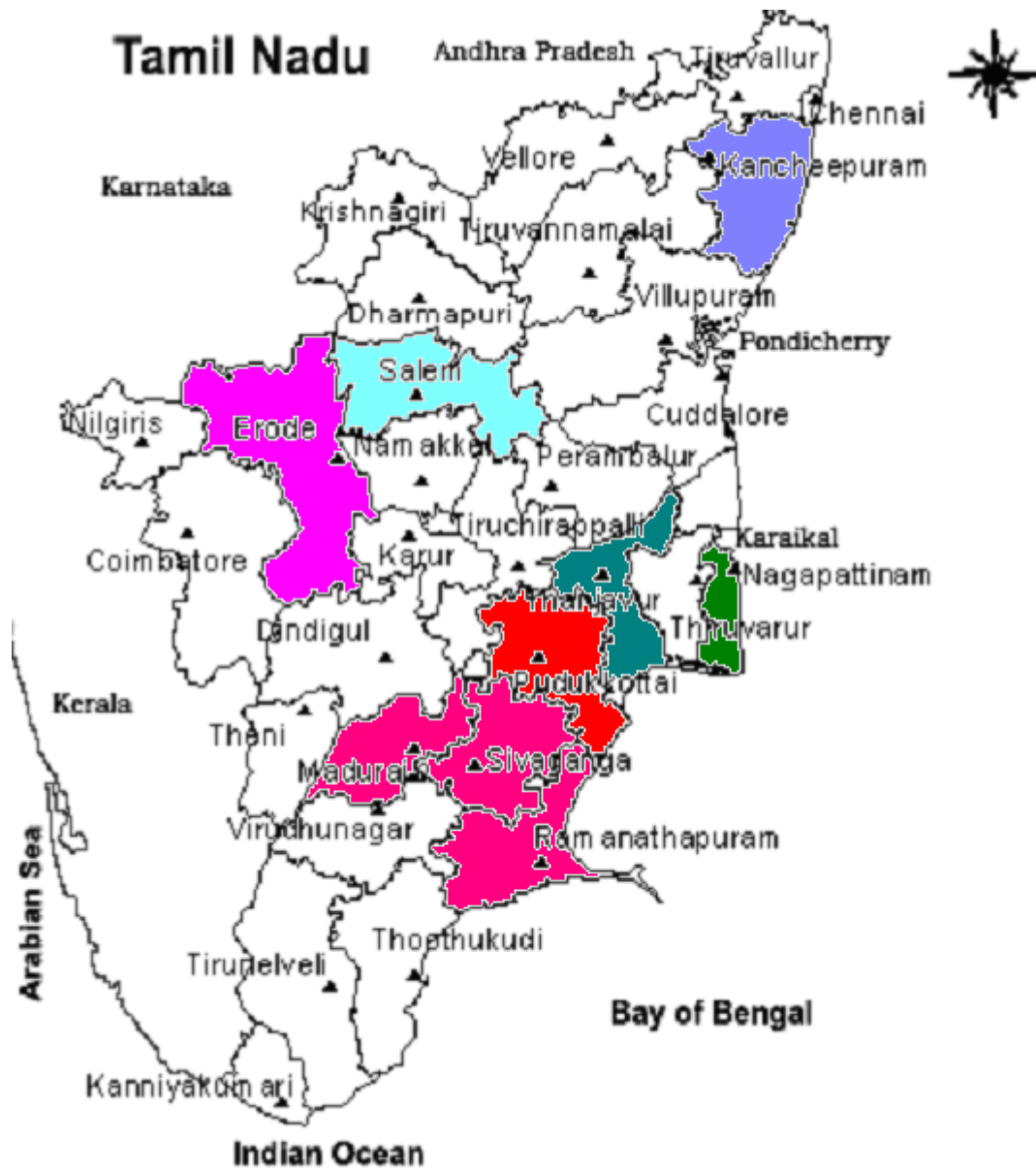
(Figures in parentheses are percentages)

Zone I – Kancheepuram. Zone II – Vellore, Tiruvannamalai and Villupuram. Zone III – Thanjavur and Nagapattinam. Zone IV - Madurai , Dindugal, Trichy and Pudukottai. Zone V - Virudhunagar, Sivagangai, Thirunelveli and Tuticorin

**Table 2. Farm households distribution across the zone and district, 2008 farm survey.**

<b>Zone</b>	<b>Name of the District</b>	<b>Code No. of Taluk</b>	<b>Name of the Taluk</b>	<b>Name of the Village</b>	<b>Number of Sample farms</b>
I	Kancheepuram	01	Chengalpattu	Thirukatchur	10
		02	Maduranthagam	Melavalam	10
		04	Kancheepuram	Kilottivakkam	10
III	Thanjore	17	Thanjavur	Palliagraharam	10
		18	Orathanadu	Kannanthangudi – Keelaiyur East	10
		19	Kumbakonam	Asur	10
		20	Pattukottai	Thuravi Kadu	10
III	Nagapattinam	22	Mannargudi	Moovanallur	10
		24	Myiladuthurai	Manakkudi	10
IV	Madurai	26	Malur	Narasingampatti	10
		27	Usilampatti	Karumathur	10
		28	Periyakulam	Veerapandi	10
IV	Pudukottai	37	Kulathur	Mathur	10
V	Ramanathapuram	39	Aruppukottai	Kovilangulam	10
V	Sivagangai	40	Thiruppathur	Thirukkotyur	10
VI	Erode	51	Gobichettipalayam -I	Padapalligramam	10
		52	Gobichettipalayam -II	Elathur-I	10
		53	Erode	Nedavandy	10
VI	Salem	55	Salem	Baireji	10
		56	Attur	Keeripatti	10
				Total	200

**Tamil Nadu Map showing the Study zones of Districts**



## Findings

### (i) Crop Diversification

Marginalization of farm holdings, decelerating technological advances in staple crops, declining investment in agriculture and increasing degradation of natural resources have thrown many challenges and diversification of agriculture in favour of more competitive and high-value commodities is reckoned an important strategy to overcome many of these emerging challenges (Joshi, *et.al*, 2004). Estimated Herfindhal Index for Tamil Nadu State (Table 3 ) revealed that much of crop diversification was observed during 1990s as compared to 1980s (Figure 1) as the rate of growth of Herfindhal index was higher (2.23 per cent) during 1990s as compared to 1980s (-3.95 percent). However, there are some apprehensions about the sustainability of small farmers producing high value crops due to small and scattered production, price risk associated with high value crops and need to maintain stiff quality standards as the size of processing units increase to reap economies of scale (Pingali and Khwaja, 2004). Small farmers are willing to diversify towards fruits and vegetables after meeting their food security needs provided suitable technology and marketing outlets at remunerative prices for high value crops are readily available (Shanmughasundaram, 2003).

Compositional change is presented in the Table 4. Major food crops grown in the state are rice, jowar, ragi, bajra, maize, and pulses. Cotton, sugarcane, coconut, as well as a number of horticultural crops like banana, mango, tea and coffee, oilseeds like groundnut, sesame and sunflower are the other crops cultivated in Tamil Nadu. To achieve the targeted growth rate of 4 per cent in agriculture in the 11<sup>th</sup> plan period, new initiatives like the private sector participation in precision farming and contract farming have been taken up. Agricultural production is also linked to both domestic and external markets through establishment of agricultural export zones for floricultural and horticultural commodities. Consequently, area under food crops has contracted and cash crops have expanded. The crops most affected were foodgrains. Area under foodgrains in Tamil Nadu, which stood at 4.03 million hectares during 1993-94, declined sharply. Similarly, area under spices and condiments, sugarcane, cotton and oilseeds decreased during the period from 1993-94 to 2005-06. On the other hand, area under fruits and vegetables, which was 0.43 million hectares during 1993-94 increased to more than 0.51 million hectares during 2006-07 (Table 5).

Table 3. Extent of crop diversification in Tamil Nadu – pre and post liberalization periods

Pre Period	Herfindahl index*	Post Period	Herfindahl index
1980-81	0.16	1995-96	0.13
1981-82	0.15	1996-97	0.14
1982-83	0.14	1997-98	0.15
1983-84	0.16	1998-99	0.15
1984-85	0.16	1999-00	0.14
1985-86	0.15	2000-01	0.13
1986-87	0.13	2001-02	0.14
1987-88	0.12	2002-03	0.12
1988-89	0.12	2003-04	0.11
1989-90	0.14	2004-05	0.14
1990-91	0.12	2005-06	0.15
1991-92	0.13		
1992-93	0.14		
1993-94	0.14		
1994-95	0.14		

- Herfindahl Index given below is computed by taking sum of squares of acreage proportion of each crop in the cropped area.

Herfindahl Index

$$HI = \sum_{i=1}^N P_i^2$$

Where,

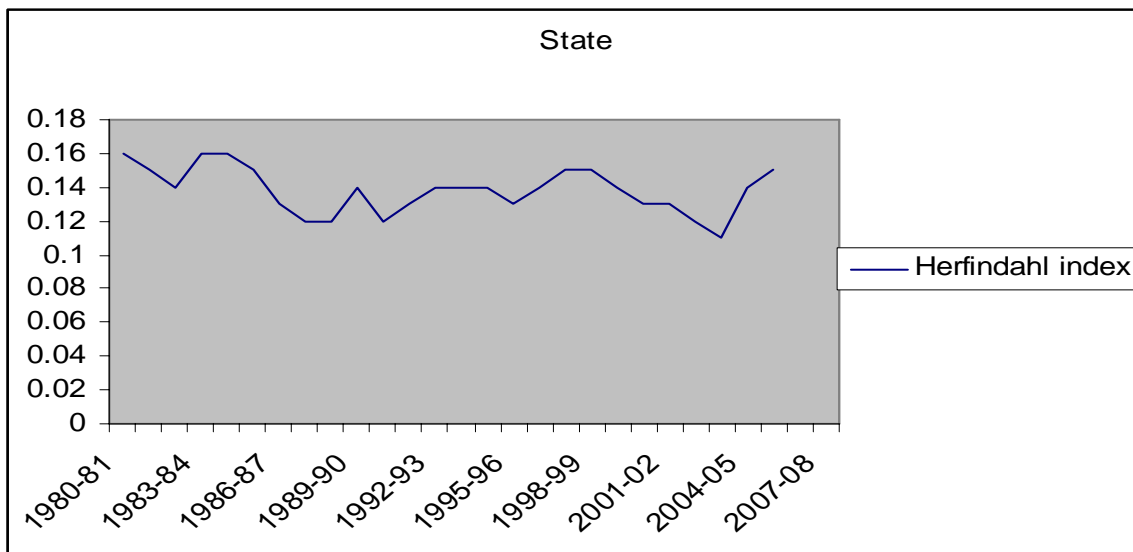
$$P_i = \frac{A_i}{\sum_{i=1}^n A_i}$$

$P_i$  = Proportion of  $i^{\text{th}}$  crop

$A_i$  = Area under  $i^{\text{th}}$  crop (ha)

$\sum_{i=1}^n A_i$  = Total cropped area (ha)

Figure 1. Crop diversification in Tamil Nadu State



Area under food crops, which was 68 per cent of the gross cropped area during the pre-liberalization period declined to 45 per cent during post liberalization period. Area under cereals was 46 per cent of the total cultivated area during pre freer trade period and decreased to 29 per cent in the post period. There was an alarming decline in the rice area by 12 per cent during the post period compared to pre-liberalization period. A sharp decline in rice area from the peak of 2.8 million hectares to less than 2.0 million hectares is mainly caused by interstate water disputes and it is the main reason for slowing down in growth of foodgrains production. Among the foodgrains area under maize tended to increase for the last one decade. Domestic demand for maize has been increasing over the period due to increase in industrial demand particularly animal feed industry. Farmers realize better remunerative price for maize as a result there has been expansion in area under maize.

With regard to pulses production, the state has to depend on imports due to huge demand and supply gap. The momentum of growth in pulses sector has been stagnant and domestic output has begun to trail consumption demand necessitating imports. As a result, the per capita pulses has consistently declined over the years. Black gram and red gram are important pulses in Tamil Nadu. The growth in area and production of these two crops have been rather unsteady and year to year fluctuations have often resulted in the phenomenon of aggregate demand exceeding aggregate supply on one year and falling short of supply in the following year. These wide swings not only adversely affected the adoption of technology and also affected processing industry. Studies found that an increase in cost of production coupled with low and fluctuating prices is the main reason which discourages the farmers to take up pulses cultivation. It is also a fact that the lopsided growth of agriculture production in favour of cereals over pulses as resulted in severe imbalance in the ratio of the two leading to deterioration in the quality of available protein. Demand estimates show that nearly two lakh tonnes per year to be produced additionally to meet the demand with the objective of nutritional security (Selvaraj, et .al.). However increases in pulses production were small and future increases are expected to moderate, because improvement in varieties of pulses has not achieved the substantial increases in yields that improvements in cereal varieties have, as evidenced by the low productions related to cereals.

Technology, expansion in irrigation and market development paved the way for perceptible growth in yield of sugarcane. State has made remarkable progress in achieving higher productivity of sugarcane and groundnut on par with the productivity levels at all India level. The productivity of these crops has been stabilized in the irrigated areas. As a result area under sugarcane increased consistently over the years. Sugarcane, which occupied nearly 18 per cent of gross cropped area during the period 1992-93 to 1994-95 declined to 3 per cent in the recent period.

Cotton growers switched over to maize as it is less labour-intensive and less prone to pest attack. Soil condition too enabled the shift in the cultivation pattern — more so in the black soil belts. Cotton production in the state declined at the rate of 9.40 per cent per annum during the period 1990-2004 mainly due to decline in area by 6.62 per cent. Productivity growth of cotton is negative (1.79 per cent) during 1990-2004 and average productivity of cotton in the state is lesser than the national average particularly due to large scale cultivation under rainfed condition. Rising level of technology has not adequately helped the cotton production industry in Tamil Nadu to grow efficiently as evident from the stagnation in productivity growth. Inefficiency in cotton production and its low level of profitability are reflected in area allocation.

Table 4. Change in composition of crops

Crops	( Per cent to GCA)		Per cent Change
	Pre (1992-95)	Post (2003-2006)	
Rice	31.62	19.67	-11.95
Maize	0.60	2.04	1.44
Total Cereals	45.65	28.80	-16.85
Bengalgram	0.12	0.07	-0.05
RedgGram	1.46	0.47	-0.99
Blackgram	1.66	2.32	0.66
Greengram	0.94	1.54	0.60
Total Pulses	9.98	6.11	-3.87
Total Food Grains (Cereals + Pulses)	55.63	34.90	-20.72
Chillies	1.06	0.71	-0.36
Total Spices	2.48	1.64	-0.84
Sugarcane	17.61	3.09	-14.52
Total Sugar Crops	4.01	4.01	0.00
Banana	1.13	0.00	-1.13
Mango	0.95	0.01	-0.95
Total Fruits	3.55	1.28	-2.27
Potato	0.08	0.03	-0.05
Onion	0.35	0.04	-0.32
Total Vegetables	2.34	3.19	0.85
Cotton	3.54	0.00	-3.53
Total Fibre	3.58	1.26	-2.31
Groundnut	16.12	0.40	-15.72
Gingelly	1.87	2.11	0.24
Coconut	2.94	0.00	-2.94
Sunflower	0.55	0.01	-0.54
Total Edible & Non- Edible Oil Seeds	22.18	8.85	-13.32
Total Dyes	0.09	0.03	-0.06
Total Fodder Crops	2.66	0.02	-2.64
Other Miscellaneous Non - Food Crops	1.93	24.25	22.32
Total Food Crops	68.00	45.02	-22.98
Total Non-Food Crops	32.00	35.77	3.77

Table 5. Comparison of high value crops with food crops – districtwise

	Proportion of area under foodgrains to GCA		Per cent change	Proportion of area under fruits and vegetables to GCA		Per cent change
	1992-95	2003-06		1992-95	2003-06	
Nagapattinam	90.96	47.66	-43.30	0.76	29.15	28.39
Ramanathapuram	75.1	33.57	-41.52	0.25	29.48	29.23
Sivagangai	74.73	34.57	-40.16	3.68	27.21	23.53
Thanjavur	78.63	39.32	-39.31	3	25.87	22.87
Dharmapuri	62.88	27.46	-35.42	6.77	9.96	3.19
Madurai	62.24	30.43	-31.81	7.91	37.73	29.82
Kanyakumari	38.48	8.4	-30.08	16.76	7.64	-9.12
Pudukottai	60.49	30.78	-29.71	7.6	33.8	26.20
Truchipalli	54.79	28.6	-26.19	9.48	6.94	-2.54
Trinelveli	60.6	36.12	-24.48	7.76	8.03	0.27
Erode	38.15	16.57	-21.58	3.11	23.84	20.73
Coimbatore	47.94	27.7	-20.24	3.29	6.59	3.30
Salem	42.12	22.19	-19.93	9.26	26.02	16.76
Dindigul	53.97	34.93	-19.04	11.86	12.53	0.67
Kancheepuram	67.03	49.16	-17.87	2.87	18.58	15.71
Thiruvannamalai	44.47	30.57	-13.90	0.93	3.33	2.40
Viruthunagar	40.77	27.7	-13.06	2.67	5.48	2.81
Thoothukudi	40.07	27.8	-12.27	6.47	7.24	0.77
Cuddalore	42.72	34.15	-8.57	6.4	10.06	3.66
The Nilgiris	3.47	1.6	-1.87	12.12	52.22	40.10
State	55.63	34.9	-20.72	5.89	4.47	-1.42

Studies have indicated that the income elasticity of demand for high value crops was high not only in urban areas but also in rural areas (Kumar et. al., 2003). In all South Asian countries the income elasticity of demand for fruits, vegetables, milk and meat is high compared to staples like cereals, pulses etc (Paroda and Kumar, 2000). Kumar and Mathur (1996) found that structural shifts (urbanization) had a positive impact on demand for vegetables, fruits, meat, fish and eggs. Available estimates reveal that by 2020 the developing countries of Africa, Asia and Latin America will be home to some 75 per cent of all urban dwellers (CGIAR, 2002).

This common observation is attributed not only to changing incomes and prices, but also to structural shifts in demand. Such structural changes can be explained by a number of factors: a wider choice of foods available, exposure to a variety of dietary patterns of foreign cultures, more sedentary occupations, and the move away from food production for household consumption. These trends are highly associated with the general pattern of urban migration (Barghouti et. al., 2003). However, the decline in cereal consumption during 1990s was much higher than what was accounted for by dietary diversification (Chand et.al. 2003). In recent years demand side factors are driving agricultural diversification in India, as also in most South Asian countries. Higher economic growth and consequent income growth in both urban and rural areas are translating into higher demand for high value commodities like fruits, vegetables, and livestock products like milk, meat and fish (Dorjee et. al., 2002; Pokharel, 2003; Wickramasinghe, 2003; Joshi et. al., 2004).

Several forces influence the nature and speed of agricultural diversification from staple food to high value commodities. Earlier evidence suggests that the process of diversification out of staple food production is triggered by rapid technological change in agricultural production, improved rural infrastructure, and diversification in food demand patterns. These are broadly classified as demand and supply side forces. The demand side forces that have been hypothesized to influence the diversification include per capita income and urbanization. On supply side forces, the diversification is largely influenced by infrastructure (markets and roads), technology (relative profitability and risk in different commodities), resource endowments (water and labour) and socio-economic variables (pressure on land and literacy rate).

Several demand and supply variables were considered to examine their influence on crop diversification. Factors determining crop diversification were estimated for major states of India in order to identify factors' difference. The econometric results showed that rainfall had a positive effect, though not significant for many states, on crop acreage diversification except Maharashtra revealing that good rainfall is expected to encourage the diversification. Irrigation intensity (ratio of gross irrigated area to net irrigated area) had a positive and significant effect on acreage diversification suggesting that availability of irrigation water all round the year is expected to promote crop acreage diversification. Coefficients of whole price index and productivity index reveal that farmers in the irrigated environments except Haryana prefer to diversify cropping pattern if they fetch higher income either through increase in productivity or product price (Table 6). However, realisation of higher level of productivity of crops and better product price discourage acreage diversification in rainfed environments since farmers in these fragile environments have limited option to choose crops for cultivation. The results further indicate that if the yield level increases, crop specialization also increases. Higher the yield level more is the incentive to cultivate the crop. There is no incentive to diversify when the output from the crop is increasing. Cropping intensity has negative sign. This shows that when cropping intensity increases, the value of Herfindahl index goes down, which means that crop diversification is taking place.

Table 6. Factors affecting crop diversification (auto correlation adjusted linear estimates)

States	Intercept	GIA/GCA	Fertilizer (kg/ha)	Productivity Index	Rainfall	WSPI	Size of Holding
<b>South Zone</b>							
Tamil Nadu	5.191	0.0917**	-0.0001	0.0070	0.0004	0.0029***	-0.4343
Andhra Pradesh	-2.759	-0.1301	-0.0027	0.0649***	0.0022***	0.0060***	-0.7547
Karnataka	0.9534	0.0063	0.0019	0.0007	0.0002	0.0004	0.2554
<b>North Zone</b>							
Punjab	-1.9668	0.3578**	0.0255	0.0374	0.0032	0.0022	-0.0448
Haryana	4.861	0.1087	0.0247	-0.6719**	0.0027	-0.0014	6.277*
Uttar Pradesh	9.2183	-0.2602	-0.2252	-0.0168	0.0019	0.0305**	0.1723*
<b>East Zone</b>							
West Bengal	-17.0199	3.9874	-0.2942	0.4112	0.0261	0.0258	0.4416
<b>West Zone</b>							
Madhya Pradesh	3.653	0.1919***	-0.0355**	-0.0075	0.00004	0.0014	0.7342*
Maharashtra	3.566	0.0547**	-0.0047***	-0.0081	-0.0002***	0.0006***	-0.2194***

\*\*\* Significant at 1 per cent level

\*\* Significant at 5 per cent level

\* Significant at 10 per cent

Table 7. Determinants of crop diversification of high value crops– log linear estimates

Ratio of value of production to AgGDP	GIA/GCA	Fertilizer consumption (kg/ha)	Productivity Index	Rainfall (mm)	Wholesale Price Index	Average size of land holding (ha)	Intercept	Adj R <sup>2</sup>
Vegetables	0.10 (1.363)	0.0055 (0.826)	-0.0014* (-2.202)	-0.0068 (-1.142)	0.0026 (1.200)	0.13** (2.535)	-0.008 (-.076)	0.73
Fruits	-0.18 (-1.279)	-0.015 (-1.220)	0.025 (0.198)	0.0036 (.316)	0.0026 (.626)	-0.057 (-0.545)	0.28 (1.291)	0.36
Sugar	0.11 (1.361)	0.00076 (0.010)	-0.0036 (-0.479)	-0.0011 (-1.707)	-0.0037 (-1.505)	-0.10 (-1.758)	0.38 (2.936)	0.71
Oilseeds	0.13* (1.814)	-0.0083 (-1.309)	-0.030*** (-4.827)	-0.0030 (-0.526)	-0.0025 (-1.213)	0.027 (0.531)	0.53*** (4.878)	0.98
Total of HVC	0.16 (1.175)	-0.018 (-1.473)	-0.046*** (-3.736)	-0.0017 (-1.596)	-0.0010 (-0.252)	-0.0018 (-0.002)	1.18*** (5.567)	0.95

(Figures in parenthesis are t values)

\*\*\* significant at 1 per cent level

\*\* significant at 5 per cent level

\* significant at 10 per cent level

GIA/GCA: Ratio of gross irrigated area to gross cropped area expressed in percentage

Table 8. Determinants of crop diversification-log linear estimates

	Pre-Liberalization (1980-81 to 1990-91)	Post-Liberalization (1991-92 to 2002-03)
Constant	-17.40* (-1.66)	-6.49** (-2.46)
Cropping Intensity	-3.09* (-1.66)	-0.05** (-2.21)
Yield Index	0.12** (2.20)	0.88* (1.61)
R <sup>2</sup>	0.69	

(Figures in parentheses denote t values)

\* Significant at 1 per cent level of probability

\*\* Significant at 5 per cent level of probability

### Impact of imports on domestic prices

India, to gain from trade, introduced appropriate technology supported with public policies and infrastructure paving the way for introduction of new cropping pattern for export. Indian composition of exports has shown a trend of diversification from export of traditional agricultural commodities to new items such as marine products and value added agricultural and horticultural products either fresh or processed. Horticulture is accorded a very significant sector in the emerging economic scenario due to existence of tremendous potential for export of exotic horticultural products especially fruits, flowers and vegetables. Another important factor in favor of development of the plantation and horticulture sector is the propensity of increasing the income levels of the farmers in rainfed areas by taking up dry land horticultural crops in dry lands as an alternate land use system as well as on cultivable wastes and other fallow lands. Such diversification could induce private investment in the processing for many of the higher value products in agricultural sector, which is likely to generate new rural non farm employment opportunities and contribute to higher rural incomes.

With the shift away from food to non-food crops, what is the impact on farm incomes? Farmers growing non-food crops could actually have a higher standard of living if they earn more and are able to buy/import food cheaply. The import content of agricultural sector is insignificant as compared to that of non-agricultural sector and as a result agriculture was found to be the net foreign exchange earner for the country. The ratio of agricultural imports to total GDP was less and it was around one per cent. Agricultural imports grew by more than 11 per cent and 7 per cent in rupee and dollar terms respectively in the pre reform period, which is almost equal to the export growth. However, during the post reform period, agricultural imports grew more exponentially at the rate of more than 16 per cent in rupee terms and 10 per cent in dollar terms, which is not faster than exports. Reduction and rationalization of tariffs and removal of non-tariff barriers have played a crucial role in increasing imports. The major import component is food and related items in

which pulses and edible oils form major share. The increase was essentially on account of the sharp increase in imports of edible oils. The country imports about 15 to 18 lakh tonnes of edible oil each year to make up for the shortfall in the country. During 2003-04 edible oil imports have risen to more than \$2.54 billion. This has raised Indian's dependence on import for edible oil close to 40 per cent (Chand and Pal, 2003) and is causing adverse impact on domestic oilseed growers (Chand, et.al, 2003). The overall import of vegetable oils may touch 59-60 lakh tons (including import of vanaspathi) for the edible oil year 2007-08 (Edible oil year runs from November to October 2007-08) compared to 55.9 lakh tons in last year.

Oilseeds are the major crops in Tamil Nadu. Major oilseeds such as groundnut exhibited declining tendency in terms of area (5.61 per cent) and production (2.67 per cent). Rainfed production constitutes more than 50 per cent. Though productivity is higher than world average, still yield is lower. The projected supply of oilseeds (based on exponential growth rate of production) would be 30.50 lakh tonnes for 2010. The supply estimates of oilseeds obtained from projected productivity and estimated area would be 31.83 lakh tonnes during 2010. To meet the demand for nutritional security the state has to achieve growth rate of 3.47 per cent in productivity during 2010. The demand estimates worked out based on per capita consumption (exponential growth rate of per capita consumption from 1970-71 to 1990-91 was worked out and assumed) minimum nutritional requirement (per capita minimum need is 0.04 kg per day or 14.31 per year of oils) and per capita consumption with income effect (the rate of change of per capita income is four per cent and assumed expenditure elasticity are 0.724 for rural and 0.560 for urban). For 2010 the estimated demand of total oil would be 12.5, 9.4 and 9.5 lakh tonnes, respectively\*.

On an average India produced 60 lakh tonnes of edible oil against the requirement of 100 lakh tonnes. Imports constitute more than 40 per cent of our edible oil consumption. The major component of import is palm oil forming about 75 percent followed by sunflower and soya oils. The import of cheap palm oil is not a substitute for coconut oil in Tamil Nadu. This is because coconut oil is not a cooking medium in the State. The import of palm oil has eased the situation in oil sector in Tamil Nadu because the lower middle class and poor people largely consume it. Apprehension is that import of edible oil at a cheaper price is affecting the groundnut and sunflower farmers in Tamil Nadu. Further, it is of the view that due to non-lucrative prices, the area under groundnut has also come down. The analysis revealed that the imports of edible oil has increased manifold (1163 percent) in the post WTO era as compared to pre WTO period (Table 9).

The effects of such huge imports on area and prices were evaluated in Tamil Nadu. It is noticed that nominal prices of groundnut in Tamil Nadu during the post WTO period increased by 38 percent as compared pre WTO period. Similarly, there is increase in nominal prices by 31.52 percent in case of sesame during the post WTO era (Table 10). However, area under groundnut and sesame declined by 32.66 percent and 33.82 percent respectively in post WTO era. Productions of groundnut and sesame also declined by 23.10 and 24.71 per cent respectively during the post WTO period. It is clearly evident that a large-scale import of edible oil has not affected the domestic prices and the decline in area of groundnut and

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\* The demand for oilseeds was estimated based on the assumption that 85 per cent for crushing, 15 per cent for seed and direct consumption, 40 per cent oil recovery and 25 per cent for vanaspathi and industrial purposes.

sesame in Tamil Nadu was due to other domestic factors. The prices prevailing in the domestic market are determined by the prices in the national market due to market integration. Though domestic prices increased in post WTO period, there was a decline in area and production, which could be attributed to host of other factors.

Edible oil exporting countries like Malaysia, Indonesia and Brazil are preparing to flood the Indian market with palm and soya oil. The edible oil industry feels that the dumping of palmolin and other oils into the country has hampered the development of oilseeds cultivation. A wide gap exists between the prices of domestic and imported oils and oilseeds severely affecting oilseeds production and the processing units. Evidences show that the domestic producer's price under freer trade for rapeseed declined by 13 per cent due to large scale imports of oils such as palm and Soya oils particularly from Malaysia, Indonesia and Brazil. In the case of groundnut total imports had suppressed prices of groundnut (-0.002), while imports of groundnut and palmolin had no effect on groundnut prices and price flexibility coefficients were 0.002 and 0.039 respectively. Imports of coconut affected prices of coconut in the country as the price flexibility coefficient turned out to be negative (-0.06), while total imports (0.00002) and imports of palmolin (0.043) had no effect on the coconut prices. Linseed prices were affected by total imports and the estimated coefficient was - 0.108. Imports of linseed and palmolin had no effect on linseeds and the estimated coefficients were 0.11 and 0.03 respectively (Ramasamy and Selvaraj, 2002).

Currently import tariff on edible oils is fixed at 45 – 85 per cent and for soya oil' it is only 45 per cent. For refined palm oil tariff rate is 70 per cent. The variable import duty measure could also be considered to restrict imports. Therefore, it is necessary to categorise edible oils as special products inorder to protect oilseeds growers and such categorisation provides leverage to increase tariff rates up to 300 per cent. The negotiations on tariff reduction over the reference point, viz., the "bound" or the "applied" rate was deliberated in the Hog Kong Ministerial Meeting. While developing countries prefer use of "bound" rates, developed countries argued for use of "applied" rates. Already, for several items, India has kept the applied duty at level substantially lower than the bound rate. Depending on policy objectives, India has the flexibility to increase the former to the level of the latter.

Table 8. Trade impact on oilseeds – groundnut

Pre WTO period	Area in 000 ha	Production in 000 tonnes	Price (Rs/ctl)	Edible Oils imports Quantity in 000 tonnes	Post WTO Period	Area in 000 ha	Production in 000 tonnes	Price (Rs/ctl)	Edible Oils imports Quantity in 000 tonnes
90-91	963	1179	895.98	525.80	95-96	933	1520	-	1061.99
91-02	1099	1518	1155.69	226.05	96-97	901	1438	1310.26	1416.79
92-93	1188	1766	895.93	102.77	97-98	988	1408	1286.67	1265.75
93-94	1158	1866	1018.61	114.36	98-99	858.1	1569	1458.02	2621.85
94-95	1079.8	1762	1138.55	346.75	99-00	759	1318	1329.42	4195.64
					00-01	699	1358	1413.00	4267.9
					01-02	663	1250	-	4213.94
					02-03	502	717	-	4365
					03-04	592	918	-	5290
					04-05	616	1005	-	4542
					05-06	619	1098	1641.59	
Avg.	<b>1097.56</b>	<b>1618.2</b>	<b>1020.95</b>	<b>263.15</b>	-	<b>739.1</b>	<b>1236.27</b>	<b>1406.49</b>	<b>2720.55</b>
% change						<b>-32.66</b>	<b>-23.60</b>	<b>37.76</b>	<b>1163</b>

Table 9. Trade impact on oilseeds – sesame

Pre WTO period	Area in 000 ha	Production in 000 tonnes	Price (Rs/ctl)	Post WTO Period	Area in 000 ha	Production in 000 tonnes	Price (Rs/ctl)
90-91	138	42	1302.24	95-96	99.65	38	-
91-02	149	59	1494.24	96-97	103	44.4	1660.76
92-93	141	69	1327.43	97-98	109.4	44.6	1856.99
93-94	129	59	1358.96	98-99	98.80	52	2279.94
94-95	127	59	1804.73	99-00	112	66	1981.78
				00-01	103	64	1625.00
				01-02	84	46	-
				02-03	64	28	-
				03-04	84	29	-
				04-05	73	34	-
				05-06	65	31	2098.16
Avg.	<b>136.8</b>	<b>57.6</b>	<b>1457.63</b>	-	<b>90.53</b>	<b>43.36</b>	<b>1917.11</b>
% change					<b>- 33.82</b>	<b>- 24.71</b>	<b>31.52</b>

India occupies one-fourth of world's cotton area but the production is only 13.5 percent next to China and USA. Though the area has increased over the years the productivity of cotton is only around 50 per cent of world's average. In recent years, India is not able to meet its own demand and import of raw cotton has become a regular feature. Low productivity results in large scale imports of cotton and it is estimated that imports grew at the rate of more than 25 per cent during 1990s. Exports witnessed a negative growth rate of more than 20 per cent during the same period due to production stagnation and increasing demand, which grew at the rate of 2 per cent and 4 per cent respectively leaving a high demand supply gap. Among the other several reasons, it is the lack of availability of desired quality of cotton that has made Indian buyers particularly the export oriented units to opt for purchases of foreign cotton despite enough domestic supplies. Most importing mills in India are ready to pay 5-10 per cent premium for foreign cotton due to its higher quality (less trash, uniform lots, and higher ginning outturn). US Pima and its fibre characteristics meet the needs of the Mills using ELS. US has emerged as an important supplier apart from Egypt, West Africa, CIS countries and Australia.

As against the requirement of 40 lakh bales (60 lakh bales as per trade sources) the State produces only five lakh bales. The rest 35 lakh bales have to be adjusted by imports and purchases within the country. Trade sources indicate that cotton yarn is exported from Tamil Nadu to an extent of Rs.3000 crores apart from export of lint averaging 5000 bales every year. Yarn from MCU-5 variety is the major one being exported from Tamil Nadu. Hence any extra tariff on the import of cotton could adversely affect the functioning of more than 700 textile mills in the State and lakhs of textile workers would be unemployed. Therefore any decision to increase the import tariff has to be taken taking into account the import situation. On the other hand, it is argued that undue reduction in the import tariff will flood the market with imported cotton leading to a reduction in domestic prices of cotton thus affecting the cotton growers of Tamil Nadu. Imports of the cotton increased by 81 percent in post WTO period, and not affected domestic prices as evident from the increase in nominal domestic prices of cotton by 56.64 percent in Tamil Nadu (Table 10). However, area and production of cotton in Tamil Nadu declined by 32.33 and 39.54 percent respectively during post WTO period.

Table 10. Trade impact on cotton

Pre WTO	Imports Quantity (lakh bales of 170 kg)	Area (000)	Production Lakh bales of 170 kg of lint	Farm Harvest Price of Kapas (Rs/ctl)	Post WTO Period	Imports Quantity (lakh bales of 170 kg)	Area (000)	Production Lakh bales of 170 kg of lint	Farm Harvest Price of Kapas (Rs/ctl)
1990-91	-	259.17	4.33	716.91	95-96	8.50	260.84	3.39	-
1991-02	51.0	256.60	4.10	892.91	96-97	5.10	252.18	3.28	1446.02
1992-93	20.40	266.97	4.54	-	97-98	85.00	245.03	3.58	1772.45
1993-94	51.00	254.93	4.26	-	98-99	57.40	242.94	4.06	1731.55
1994-95	100.30	255.26	4.40	1581.67	99-00	237.40	178.33	3.40	1725.57
					00-01	212.30	168.92	3.17	1710.74
					01-02		164.17	2.30	
					02-03		75.57	0.84	
					03-04		97.78	1.23	
					04-05		129.36	1.86	
					2005-06		109.74	1.68	1573.91
<b>Avg.</b>	<b>136.8</b>	<b>258.58</b>	<b>4.33</b>	<b>1063.83</b>	<b>-</b>	<b>100.95</b>	<b>174.99</b>	<b>2.62</b>	<b>1660.04</b>
<b>% change</b>						<b>81.30</b>	<b>- 32.33</b>	<b>- 39.54</b>	<b>56.04</b>

Under WTO rules India can increase the duty to between 40 to 80 percent depending on varieties. Government of India has to take a decision on fighting in the world forum against sanctioning of huge subsidies for cotton growers in USA. Alternatively, it can think of increasing its subsidies to specifically cotton, thus reducing cost of production of it, so that Indian cotton prices could well settle below US prices. In this context provision of subsidies for pesticides is one of the alternatives, since pesticides alone form 25 per cent of cost of cultivation. Also, introducing machineries for harvest of cotton kapas at field level at subsidized rates could be another alternative since this also forms around 25 per cent of cost of production. By these, it is possible to reduce the cost of production of cotton in Tamil Nadu which in turn could reduce the prices of the same. Hence from the production and trade point of view, provision of subsidy to growers and maintain the current bound rate and forcing the developed countries to eliminate the cotton subsidy would enable the growers to improve the productivity and returns from cotton production in Tamil Nadu. The import could also ease the production gap. These estimates shows that impact is low however, dumping would affect majority of the cotton farmers, depending on cotton production particularly in rainfed environment for their livelihood.

### **Impact on trade on price variability**

The argument put forth by the developing countries is that fair trading regime would help the efficient producers in realizing higher prices for their products but, prices of most agricultural commodities are declining in the world markets due to continuation of the high domestic support to agriculture in many developed countries, which is a cause of concern as they encourage over-production in these countries leading to low levels of international prices. By artificially depressing the international prices, these subsidies in developed countries lower the farm incomes of others efficient producers in importing countries and thus adversely affect their livelihood. Several commodities like wheat, coarse grains, oilseeds, vegetable oils, sugar, dairy products, fruits and vegetables which are of great significance for food security in developing countries have been subjected to high levels of export subsidies by the developed countries. The entry of large consuming countries in the world foodgrain markets can lead to an upswing in the prices, which would in turn compound the problems of these countries. Moreover, the world commodity market for basic food grains is significantly more volatile than the domestic foodgrain market in most of the developing countries. International price fluctuations, if transmitted to the domestic economies of developing countries, can seriously affect the prices of foodgrains and food entitlement of the poor. Many argue that price distortion in the global markets due to trade liberalization is one of the major causes for many agricultural commodities losing their importance.

Several approaches have been proposed (Demeocq and Guillaumont, 1985; Knudsen and Parnes, 1975; Offutt and Blandford, 1983; Scandizzo and Diakosawas 1987) to measure variability. The present approach is based on the test proposed by Gleiser (1969) and Johnston (1972), Scandizzo and Diakosawas (1987) and Hazell (1988). There is a concern about the divergence between border and domestic prices and an increase in the degree of openness is bound to increase domestic price variability due to direct transmission of world price volatility. The estimates in Table 11 show that domestic price variability is higher among vegetables compared to grains due to product characteristics and lack of farm level scientific storage. Price variability of many of the agricultural commodities is very high with more than 50 per cent in certain crops. Such high variability of prices affects profitability of

crops because input prices are consistently increasing over the period. The results of residual trend (Table 12) has not shown any evidence that the variability of domestic prices of major agricultural commodities increased in the post-reform period, rather the variability was found significant in both the pre and post reform periods for most of the crops. However, there was significant increase in variability of international prices in the post reform period (Table 13). Further, the results of cross product residual trend model revealed that international price volatility has not imparted instability in the domestic market except for tea in the post-reform period (Table 14).

Table 11. Variability in farm harvest prices (1996-97 to 2005-06)\*

Crops	Coefficient variation (per cent)	Crops	Coefficient variation (per cent)
<b>Cereals</b>		<b>Fruits and Vegetables</b>	
Paddy(Common)	10.02	Banana(100Nos)	18.72
Jowar	13.15	Cauliflower	10.41
Bajra	15.50	Tomato	21.16
Ragi	10.27	Ladies Finger	29.59
Maize	11.54	Brinjal	35.06
<b>Pulses</b>		Potato	70.72
RedGram	25.38	Onion Bellary	45.37
Bengalgram	43.75	Topioca	83.53
Blackgram	26.60	<b>Others</b>	
Greengram	16.77	Cane-Gur	20.02
Horsegram	46.04	Palm Gur	42.68
<b>Oilseeds</b>		Cotton Kapas	7.53
Groundnut pods	15.57	Tabacco	164.38
Gingelly Seed	19.06	Arecanut	11.43
Castor Seed	53.05		
Coconut (Husked)100 no	22.87		
<b>Spices and condiment</b>			
Chillies	25.18		
Coriander	32.16		
Turmeric	33.44		
Garlic	40.88		

\* Tamil Nadu

Table 12. Domestic (farm harvest) price instability – Residual Trend Approach

Crop	Pre	Post
Banana	0.2381 (1.4068)	-
Black gram	5.3381 (1.6327)	41.4789** (3.0036)
Sugar Cane	3.6698*** (2.8155)	17.3079** (2.8566)
Chillies	12.1911*** (2.9287)	44.1858 (1.1982)
Onion	0.4729 (1.1401)	-3.3349 (-0.2257)
Cotton	6.3968** (2.4313)	24.0616** (2.3372)
Maize	0.8012 (1.4717)	1.3060 (0.7048)
Green gram	3.2822* (1.9476)	29.5208** (2.7019)
Groundnut	1.2775 (1.1721)	2.2148 (0.4230)
Paddy	1.5465*** (3.3201)	6.4241** (3.0399)
Red gram	4.6196** (1.9936)	6.9379 (0.3784)

(Figures in parentheses are t ratios)

\* P < 0.10 (two tailed test)

\*\* P < 0.05 (two tailed test)

\*\*\* P < 0.01 (two tailed test)

Pre – 1980-81 to 1994-95

Post – 1994-95 to 2005-06

$$W_t = \beta_0 + \beta_1 t + u_t$$

Where,  $W_t$  is the world price and  $t$  is the time variable.

$$D_t = b_0 + b_1 t + u_t$$

$D_t$  = Domestic price.

Regressing the absolute value of the residuals from the initial trend regression against time and testing for significant trend to indicate the variability. The residual trend regression model is given

$$|u_t| = \alpha_0 + \alpha_1 t + v_t$$

$$|u_t| = a_0 + a_1 t + v_t$$

The slope coefficient  $\alpha_1$  and  $a_1$  are tested for significant difference from zero, where the slope coefficient  $\alpha_1$  denotes world price variability and  $a_1$  indicates domestic price variability. The extent of transmission of world price instability to domestic prices was studied using correlation coefficients of detrended data. The following cross product trend regressing model was followed to test the changes in covariance patterns over time.

$$W_t = b_0 + b_1 t + u_t$$

$$D_t = a_0 + a_1 t + v_t$$

$$|u_t v_t| = \gamma_0 + \gamma_1 t + e_t$$

The slope coefficient ' $\gamma$ ' is tested for significant difference from zero in order to test for changes in covariance patterns over time.

Table 13. International price instability (1990-91 to 2005-06) – Residual Trend Approach

Crop	Oil seed prices		Vegetable oil seed		Protein meal prices	
	Trend	Residual trend	Trend	Residual trend	Trend	Residual trend
Soya	288*** (4.98)	-53.71 (1.63)	253.82 (1.49)	-220.13 (2.91)**	438*** (6.86)	-31.88 (0.68)
Peanut	1268.61*** (16.48)	-64.40 (1.70)	2167.65*** (9.17)	-142.72 (-1.11)	88.76 (1.06)	-80.18 (-1.58)
Sunflower	249.74*** (3.84)	-69.38** (2.27)	271.85 (1.69)	-222.07 (2.49)	279.05*** (7.88)	-15.99 (0.66)
Rape seed	444.01*** (5.86)	-73.19*** (1.97)	678.52*** (3.70)	-195.40** (2.18)	356.34*** (9.02)	-17.39 (0.65)
Copra	213.88 (1.08)	-102.16 (1.01)			97.04*** (3.61)	-26.95 (1.33)
Linseed	565.49*** (8.31)	-12.55 (0.29)				
Palm			120.55 (0.46)	239.68*** (1.86)		
Coconut			393.8 (1.26)	-156.85 (0.96)		
Corn			34.02 (0.17)	-97.65 (0.80)	97.16*** (4)	-18.60 (1.00)
Cotton			307.11 (1.53)	197.85*** (1.96)	406.5*** (7.70)	-38.61 (1.17)
Fish					1334.27*** (7.85)	-22.06 (0.19)

(Rs / metric tonne). Figures in parentheses are t ratios

\*\*\* P ≤ 0.01 (Two tailed test)

\*\* P ≤ 0.05 (Two tailed test)

\* P ≤ 0.10 (Two tailed test)

Table 14. Estimates of cross product residual trend regressions for testing transfer of price variability\*

Commodity	β co-efficient	t value	Probability
Pepper	7.864	0.7498	0.4817
Chilli	-1.596	-0.1056	0.9193
Coffee	1.0069	0.0308	0.9766
Tea	10.0559	2.2564	0.0648
Tobacco	0.2385	1.36854	0.18
Cashew	3.2474	0.3556	0.74
Sugar	0.0010	0.0304	0.97
Cotton	0.1609	0.0627	0.95
Rice	0.0059	0.5199	0.6252

\* 1990s (1991-92 to 1998-99)

## **Trade and Farm Profitability**

Trade flows are influenced by various factors like domestic production, availability of marketable surpluses, domestic price, prices prevailing in the other markets, availability of commodities at the other markets, and state policies. The prices in the domestic market fluctuate according to the demand and supply. The questions are related to the net return relationship between cropping options and how these net returns relationships will affect cropping decisions. At what net return ratio does a farmer decide not grow a particular crop, taking in to account the value of the crop in a rotation? These calculations will need to consider yield relationships between crops under a range of growing conditions, risk factors associated with crop production and marketing. Price supports have been the principal means by which Indian farmers have received some protection against market risks. In some of crops, the support prices have been consistently fixed higher than the counter-factual market price. Public support price mechanism played a crucial role in minimizing the market aberrations.

There are also private mechanisms that can potentially help farmers to cope with private risks. Some crops are characterized by substantial market risks and contracting allows the transfer of these market risks from the farmer to the processor. In specialty crops and vegetables, contract farming is gaining ground as a mechanism by which private processors obtain supplies from farmers. This system takes its appeal among growers because of the price insurance that it offers. It has been found that price stability is a major benefit of contract farming for producers. Although production risks have consequences for price risks, the latter is not just because of production risks alone. Prices can vary also because of demand shocks as well as instability in expectations formation. In the absence of private mechanisms to minimize price risk in crops, though such crops are under the government price controlled mechanism, it is of view that farm profitability is affected by freer trade as both input and output markets are exposed to open trade. Net farm incomes was estimated for both the pre and post periods for major crops and reported.

The quantity of inputs used in the production process necessarily varies over the period of time. It was evident from the estimates of cost of cultivation of rice gathered from the Cost of Cultivation of Principal Crops Scheme that there was an increasing trend in the cost of cultivation over the period of time due to escalation of input prices. Among the cost components, human labour continued to be the major input sharing more than 30 per cent of the total cost followed by fertilizers with more than 10 per cent. It was found that increase in productivity of rice coupled with output prices resulted in favourable output input ratios. Operational cost incurred by the farmers for production of rice per hectare increased consistently over the years and increase in cost was much higher than the income increase as a result there was a decline in benefit-cost ratio. However, in terms of net revenue there was no decline during the post reform period compared to pre-reform period (Table 15 and Figure 2). State Government operates monopoly procurement in certain pockets of Tamil Nadu to procure rice at the incentive price to supply rice through Public Distribution System (PDS). It is found that price offered through monopoly procurement was found higher than the farm harvest price as a result benefit to cost ratio was higher. It is noticed that of the total rice production in the state over 10 per cent of the production was procured by the

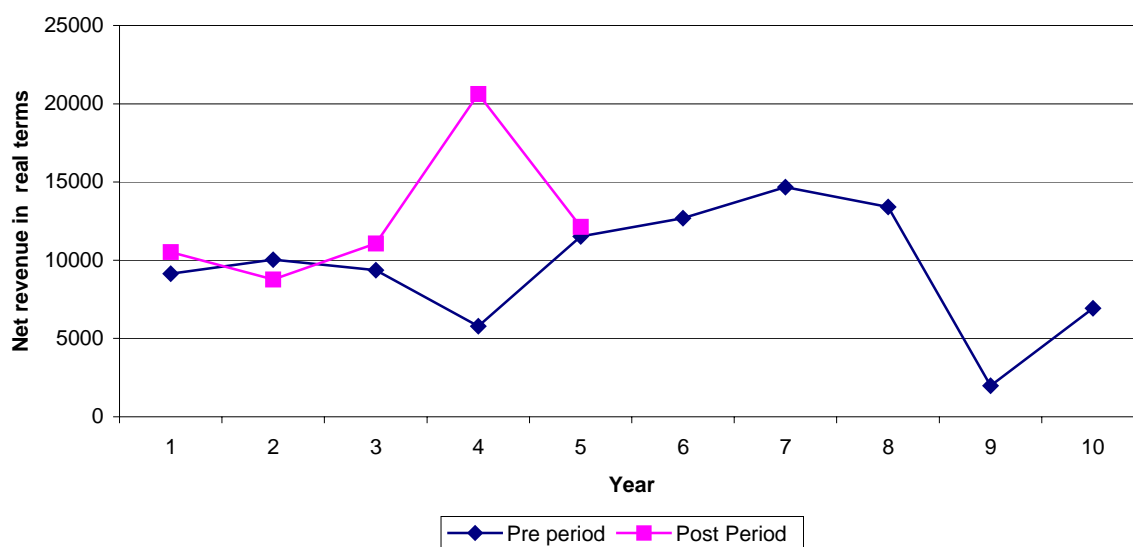
government. In some of the years the government has not adopted monopoly procurement policy and rice was priced based on the market forces. Farmers are also selling their produce through regulated markets for better price realization due to closed bidding system.

Table 15. Trade impact on profitability of rice production

(Rs/ha)

Pre	Inflation factor	Net revenue in nominal Terms	Net revenue in real terms	Post Period	Inflation Factor	Net revenue in nominal Terms	Net revenue in real terms
1981-82	5.02	1821	9142	1995-96	1.59	6620	10526
1982-83	4.7	2138	10046	1998-99	1.27	6905	8769
1983-84	4.24	2208	9363	1999-00	1.26	8787	11071
1984-85	4	1449	5795	2005-06	1.03	20016	20616
1988-89	3.13	3685	11534	2006-07	1.00	12141	12141
1990-91	2.71	4682	12687				
1991-92	2.3	6385	14686				
1992-93	2.14	6268	13414				
1993-94	2	989	1978				
1994-95	1.72	4028	6929				
<b>AVG</b>		<b>3365</b>	<b>9557</b>	<b>17405</b>		<b>10894</b>	<b>12625</b>

Figure 2. Trade impact on profitability of Rice (Rs/ha)



The Central Government fixes the Statutory Minimum Price (SMP) of sugarcane in terms of clause 3 of the Sugarcane (control) Order, 1966 for each sugar season. The SMP is fixed on the basis of the recommendations of the Commission on Agricultural Costs and Prices (CACP) and after consulting the State Governments and Associations of Sugar Industry and cane growers. The SMP is fixed by considering the factors such as cost of production of sugarcane, return to the growers from alternative crops, availability of sugar to consumers at a fair price, price at which sugar produced from sugarcane is sold by sugar producers, and recovery of sugar from sugarcane. The SMP of sugarcane payable by the sugar factories is fixed based on the sugar recovery. This would be varied over years. After fixation of the SMP by the Central Government, most of the State Governments have been advising the sugar factories to pay cane price generally at a much higher level than the SMP. Farmers realized higher net revenue compared to other cash crops. High profitability of sugarcane encouraged the farmers to expand the area under sugarcane. Though international sugar prices has been ruling low in most of the time compared to domestic prices, farmers found it profitable due to high productivity and market price. Reported figures in Table 16 and Figure 3 show that there is no adverse impact of open trade on sugarcane production. Similarly, there was not much change in net revenues of cotton and groundnut production in the post liberalization period compared to pre liberalization period (Tables 17 and 18 and Figures 4 and 5).

Table 16. Trade impact on profitability of sugarcane production (Rs/ha)

Pre period	Net revenue in nominal terms	Net revenue in real terms	Post period	Net revenue in nominal terms	Net revenue in real terms
1981-82	13286	66694	1995-96	28692	45621
1982-83	5969	28053	1996-97	29393	43207
1983-84	8946	37931	1998-99	35836	45512
1984-85	9365	37459	1999-00	44631	56235
1988-89	12684	39701	2005-06	51809	53363
1990-91	16306	44191	2006-07	46701	46701
1991-92	16722	38461			
1992-93	19878	42539			
1993-94	34297	68594			
1994-95	30444	52363			
<b>AVG</b>	<b>16790</b>	<b>45599</b>		<b>39510</b>	<b>48440</b>

Figure 3. Trade impact on profitability of sugarcane production (Rs/ha)

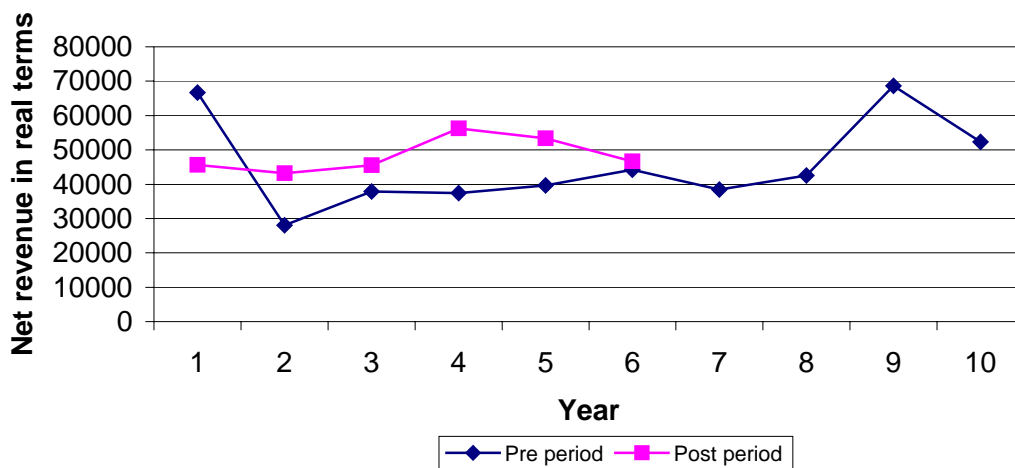


Table 17. Trade Impact on Profitability of Cotton Production (Rs/ha)

Pre period	Net revenue in nominal terms	Net revenue in real terms	Post period	Net revenue in nominal terms	Net revenue in real terms
1981-82	1035	5196			
1982-83	-84	-396	1995-96	4881	7762
1983-84	-233	-989	1996-97	5897	8669
1984-85	-1103	-4411	1998-99	1845	2343
1988-89	7449	23315	1999-00	5475	6899
1990-91	1338	3626	2005-06	5476	5640
1991-92	6694	15397	2006-07	6258	6258
1992-93	5977	12791			
1993-94	5870	11741			
1994-95	7029	12090			
AVG	3397	7836		4972	6262

**Figure 4. Trade impact on profitability of Cotton production (Rs/ha)**

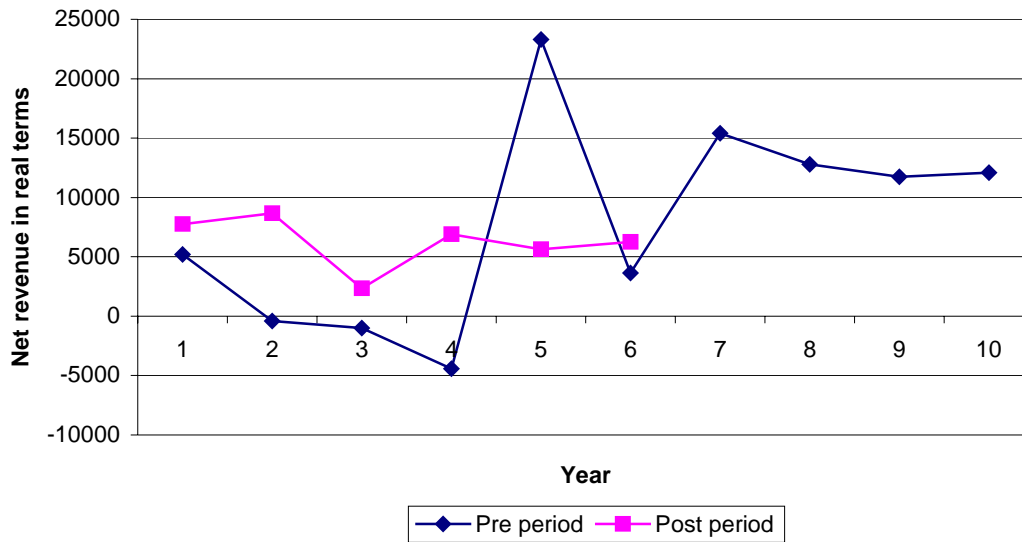
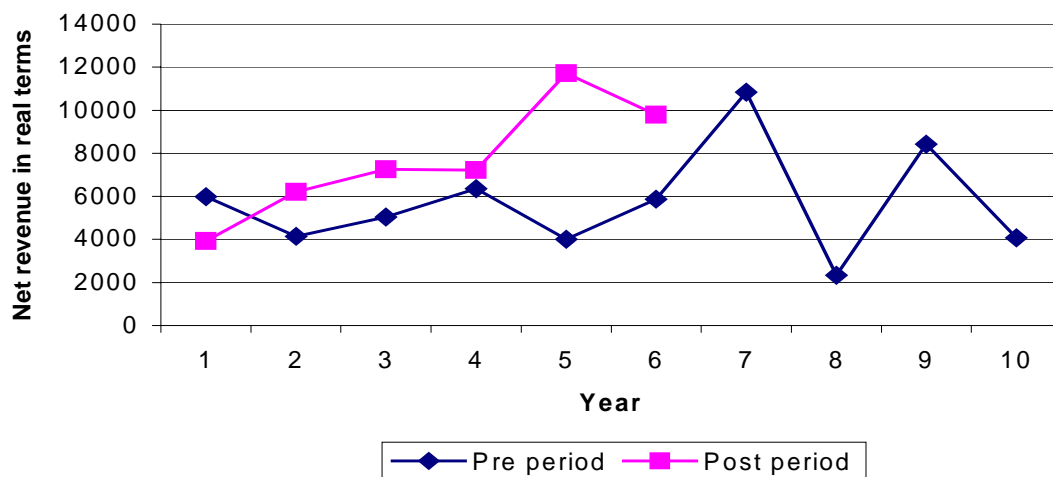


Table 18. Trade impact on profitability of groundnut production

(Rs/ha)

Pre period	Net revenue in nominal terms	Net revenue in real terms	Post period	Net revenue in nominal terms	Net revenue in real terms
1981-82	1193	5988			
1982-83	881	4142	1995-96	2471	3928
1983-84	1189	5042	1996-97	4223	6208
1984-85	1591	6364	1998-99	5711	7253
1988-89	1280	4007	1999-00	5736	7227
1990-91	2165	5867	2005-06	11383	11724
1991-92	4713	10839	2006-07	9784	9784
1992-93	1092	2336			
1993-94	4207	8413			
1994-95	2372	4080			
AVG	2068	5708		6551	7687

**Figure 5. Trade impact on profitability of Groundnut production (Rs/ha)**



## Household Welfare

In recent studies, the growth effects of trade were more systematically analyzed using a large sample of developed and developing countries. A large body of literature has examined the effects of trade on growth and many of these studies have found substantial growth effects of trade. The important question is that how could increased participation in international trade affect the economic growth rate, and what implications will this have for the distribution of income and the incidence of poverty? Experiences suggest that rapid economic growth translates into sustainable reductions in poverty because there is a significant association between trade liberalization and long run improvements in economic growth. Thus, there is likely to be a positive link between liberalization and eradication of poverty in the long run. Incidence of poverty fell by half from 26 per cent to 13 per cent of the population, just five years after trade was liberalized in the mid 1980s in Morocco. Studies shows that countries with open economies (those integrated into the world economy) in developing regions grew, on an average by 2.5 per cent points more than those with closed economies. This, in turn, would have a positive impact on poverty reduction in the absence of an anti-poor bias in domestic policies and investment pattern.

The years of rapid growth in the Tamil Nadu economy coincided with reduction in poverty. Average annual increase of 4.2 percent in AGGDP was observed in 1980s, while it was 3.7 per cent during 1990s. Between 1994-95 and 2004-05, agriculture declined at the rate of 1.17 per cent. Despite slow down in the growth rate of agriculture, there was notable decline in poverty and it declined to less than 20 per cent during 2004-05. Empirical evidences indicate that the trickle down mechanisms have weakened considerably in the later time periods. In the process of weakening of trickle down mechanism, growth in agricultural production alone will not bring about a large reduction in the incidence of rural poverty and there are other important factors that directly influence the living conditions of the rural poor.

Estimates in Table 19 show that even per capita crop income was higher than the per capita poverty line income (Table 20). It is evident that in Tamil Nadu, the poor typically own less land than the non-poor and are highly represented among the near landless. Area allocation among crops by the farm households evidently mostly influenced by the non-price factors like farm endowment, market access, availability of credit especially in the case of small and marginal farmers, government policies. Though farmers respond to market prices, the response is declining due to much influence of non-price factors as indicated above.

**Table 19. Cropwise net income per household per annum, farm survey, 2008**

Crop	Zone III	Zone IV	Zone V	Zone VI
Bajra		10870		
Blackgram	10198	4583	5264	5944
Cotton	7500		13000	8261
Fodder sorghum				3885
Gingelly	15820			19516
Greengram	27355			
Groundnut	14721	27587		16793
Jowar				9550
Maize		6250	17700	16660
Paddy	38354	13823	9274	11738
Ragi		10605		
Sorghum				19308
Sugarcane	51035	45774		25541
Tapioca				9385
Turmeric				64606
<b>Trees</b>				
Mulberry				13000
Coconut	10883			13800
Total	175867	119492	45239	237986
Average family size	4	4	5	3

Table 20. Per capita poverty line income (Rs/annum)

YEAR	India		Tamil nadu	
	Rural	Urban	Rural	Urban
1993-94	2470.08	3376.2	2358.36	3559.56
1999-2000	3930.72	5449.32	3691.68	5707.2
2004-05	4275.6	6463.2	4222.32	6569.04

Source: Planning Commission Estimates.

**Table 21. Area under crops, farm survey 2008**

	Zone III	Zone IV	Zone V	Zone VI
Bajra	-	3.17	-	-
Blackgram	1.48	0.85	0.93	0.50
Cotton	1.00	-	1.00	3.25
Fodder sorghum	-	-	-	2.33
Greengram	2.50	-	-	-
Groundnut	3.10	4.25	-	3.00
Jowar	-	-	-	1.00
Maize	-	1.00	1.00	1.32
Paddy	5.83	2.88	1.08	4.99
Ragi	-	1.80	-	-
Sesamum	1.88	-	-	1.80
Sorghum	-	-	-	2.58
Sugarcane	5.39	2.58	-	3.93
Tapioca	-	-	-	1.60
Turmeric	-	-	-	4.67
Trees				-
Coconut	2.00	-	-	2.00
Mulberry	-	-	-	1.00
Total	23.19	16.53	4.01	33.97

### Implications

In the State much of crop diversification was observed during the later period as compared to 1980s. Area under food crops declined to 45 per cent from 68 per cent during post liberalization period. Area under cereals decreased to 29 per cent from 46 per cent in the post period. There was an alarming decline in the rice area by 12 per cent during the post period compared to pre-liberalization period. However, there are some apprehensions about the sustainability of small farmers producing high value crops due to small and scattered production, price risk associated with high value crops and need to maintain stiff quality standards. Area allocation among crops by the farm households evidently mostly influenced by the non-price factors like farm endowment, market access, availability of credit especially in the case of small and marginal farmers, government policies. The econometric results also showed that rainfall had a positive effect on crop acreage diversification revealing that good rainfall is expected to encourage the diversification. Irrigation intensity (ratio of gross irrigated area to net irrigated area) had a positive and significant effect on acreage diversification suggesting that availability of irrigation water all round the year is expected to promote crop acreage diversification. Coefficients of whole price index and productivity index reveal that farmers in the irrigated environments prefer to diversify cropping pattern if they fetch higher income either through increase in productivity or product price. However, realization of higher level of productivity of crops and better product price discourage acreage diversification in rainfed environments since farmers in these fragile environments

have limited option to choose crops for cultivation. The results further indicate that if the yield level increases, crop specialization also increases. Higher the yield level more is the incentive to cultivate the crop. There is no incentive to diversify when the output from the crop is increasing. Cropping intensity has negative sign. This shows that when cropping intensity increases, the value of Herfindahl index goes down, which means that crop diversification is taking place.

The effects of imports on area and prices were evaluated and the results reveal that large-scale import of edible oil and cotton has not affected the domestic prices and the decline in area under groundnut, sesame and cotton in Tamil Nadu was due to other domestic factors. The prices prevailing in the domestic market are determined by the prices in the national market due to market integration. Results further indicate that domestic price variability is higher among vegetables compared to grains due to product characteristics and lack of farm level scientific storage. Domestic price variability of many of the agricultural commodities is very high with more than 50 per cent in certain crops. Such high variability of prices affects profitability of crops because input prices are consistently increasing over the period. The results of residual trend has not shown any evidence that the variability of domestic prices of major agricultural commodities increased in the post-reform period, rather the variability was found significant in both the pre and post reform periods for most of the crops. However, there was significant increase in variability of international prices in the post reform period. Further, the results of cross product residual trend model revealed that international price volatility has not imparted instability in the domestic market except for tea in the post-reform period. Prices can vary also because of demand shocks as well as instability in expectations formation. In the absence of private mechanisms to minimize price risk in crops, though such crops are under the government price controlled mechanism, it is of view that farm profitability is affected by freer trade as both input and output markets are exposed to open trade. However, in terms of net revenue there was no decline for major crops during the post reform period compared to pre- reform period. Per capita crop income was higher than the per capita poverty line income. It is evident that in Tamil Nadu, the poor typically own less land than the non-poor and are highly represented among the near landless.



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