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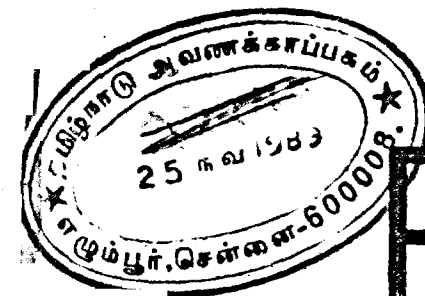
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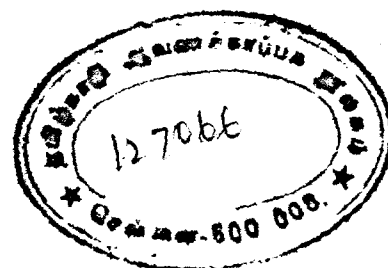
MADRAS DEVELOPMENT
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November 1989

Recent Trends in Industrialisation in Tamil Nadu

'Instrumentalism' and Friedman's Methodology :
A Brief Comment



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EDITORIAL - SOME HIGHLIGHTS

I. General Economic Scene

State

for devolution of resources (and plan assistances) to the state — which again will be known only next year, after the General Election.

VIII Plan

All the 18 task forces and their working groups submitted their reports setting forth their a) assessment of the VII Plan programmes, and b) proposals for the VIII Plan by the end of September. On this basis the task forces on resources is meeting in early October. It is expected that the commission will finalise the draft of the State's Eighth Five Year Plan and present it to the government for review and approval. There are two ponderables in this matter of the state's VIII Plan proposals on the resources side. One is that the IX Finance Commission's report and recommendations as it relates to the state's VIII Plan resources will not be known till sometime early next year, as the commission's life has been extended till the end of 1989. The other is the National VIII Plan, its public sector outlay and its proposals

Weather and Prices

September was a month when the South West monsoon continued in the state. Towards the second half of the month, the Northern part of the state, including Madras received continuing and sometimes heavy rains. This is needed to help raise the falling ground water level. The southern part of the state continued to receive good rains benefitting farmers, the drinking water supplies and the hydel reservoirs. For example for the 24 hours ended 8.30 a.m. of September 3, Usilampati in Madurai district recorded 11 cm, Mettupalayam in Coimbatore district 10 cm, Erode 9 cm, Gobichettipalayam 7 cm, Manaparai, Periyarkulam and Kodaikanal 5 cm each. The heavy rains particularly in the Nilgiris where the hydel reservoirs are

located have been beneficial in increasing the hydel potential of the state for the coming season. As reported in the last issue, Mettur was opened for irrigation on August 20. The Mettur level on September 25 was 72.25 feet, with inflow at 10.822 cusecs and discharge at 13,000 cusecs. On prices, CSO's monthly abstract for June 1989 reports that the index number of consumer prices for industrial workers after remaining stagnant at 843 for the previous 3 months fell by 5 points to 838 in March, the index number of consumer prices for agriculture labourers rose by 10 points to 695 in April and the index number of consumer prices for non manual workers for April remained stationary at Tiruchirappalli and Madurai at 143, rose by 1 point each to 139 in Salem, to 141 in Coimbatore and to 146 in Madras.

Power

The power situation in the state was normal in September. By mid September the hydel storage was the equivalent of 1580 MU compared to last year's 1337 MU. The government, with the agreement of the industrialists is maintaining the 20 per cent cut on HT units. This will be reviewed after the North East monsoon. The thermal stations except for Tuticorin, are not doing too well, as they work below capacity — Mettur 195 MW against its capacity of 630 MW, Neyveli at 360 MW against its double capacity, Ennore at 195 MW against 320 MW capacity and Kalpakkam at 150 MW against 320 MW capacity of the 2 units. Only Tuticorin at 400 MW was doing well.

The power situation in the country in September was near normal with the

cuts removed in Kerala, Delhi, Haryana and reduced in Karnataka and AP. In Karnataka the cut in September was 20 per cent. The government announced its decision to increase hydel capacity nearer the ideal norm of 40 hydel to 60 thermal in place of its current 30:70. This would help meet the power demand during peak hours. The resources crunch continuing into the VIII Plan will mean that instead of Rs.70,000 crores for creating 38,000 MW, hardly 28,000 MW is likely to be added. The Central Electricity Authority reports that on September 1989, only about 27,000 MW of schemes have been sanctioned by the Planning Commission. This resource shortage cannot and should not be met by inviting bilateral resources for setting up power plants. Under these programmes, power machinery has to be bought in the lending country, without any competitive bid and on top the Indian machinery unit, BHEL, suffers. Now that the government has decided not to use bilateral aid for power, the order book position of BHEL will improve, as it can supply the needed plants and machinery for 38,000 MW. From this point of view, the agreement with the Soviet Union for a loan of 900 million roubles to finance the 840 MW Bihar Plant and the 400 MW plant each for Karnataka and Kerala is a backward step. The part of the loan for contribution of transmission lines of the Vindhyachal project in the only part of the loan agreement which can be welcomed. The two union-state power projects—Nathpa Jhakri (Haryana) and Tehri (UP) — which is the first effort of a joint union—state power project have been seriously delayed and so the future of this joint sector power concept is not encouraging. There is a struggle over the appointment of the

Head of the Corporation in Haryana which is delaying its start. But the posts of directors for both corporations have been filled and infrastructural work proceeding well. The government's plan to use non conventional energy to supplement its rural electricity programme under which electricity has been provided to 4.2 lakh out of 5.76 lakh villages in the country is also facing problems of resources shortage. It reports that the two million biogas plants set up in the last 3 years has helped saved Rs. 148.5 crores of fire wood annually. Through solar energy, 35 million KW of electricity is being saved every year. It reports that 7123 solar steels, 96,000 solar cookers, 10880 rural street lighting systems using solar photo-voltaic technology have been set up. But these are well below the targets established in its 20 year perspective plan. The government reports total power generation in the country increased from 87.85 billion units in April-August 1988 to 97.11 billion units (a 10.5 per cent increase) in April-August 1989, when thermal general increased from 62.42 billion units to 68.76 billion units, hydel from 22.51 billion units to 26.73 billion units, while nuclear generation declined from 2.91 billion units to 1.61 billion units. The Plant Load Factor during this period was 53.5 per cent compared to previous year's 53.4 per cent. Calling attention to only Maharashtra and MP being self sufficient in power generation, the Union government called for Tamil Nadu, Kerala and AP to go in for coastal thermal stations for which assistance will be given for importing machinery. There is need to upgrade transmission lines. The Union is planning, it states, to lay 450 KV throughout the country to minimise power losses.

Transport and DA

Indian Airlines announced in early September daily airbus service between Madras and Hyderabad and also between Madras and Delhi in the mornings (as well as the evening service already in force). It has also revised the daily services between Madras and Bangalore. The Southern Railway reports that among the three main suburban railway lines from Madras, only the Gummidipoondi section has maintained its traffic during the past 3 years, whereas both the Trivellore and Tambaram systems have recorded declines. But it is on these latter lines that new works or improvements are being undertaken. The Tambaram line is being extended upto Chingleput along with doubling of that section. A third line is being built from Pattabiram to Trivellore. Planners have suggested that the Tamil Nadu Housing Board and real estate developers should be encouraged by the state government to launch housing projects on the Trivellore line, in view of the third line being built. That will increase the traffic on this line. Following the Union government's DA decision to be referred to later, the state government announced on September 27 the revised DA to its employees as from 1 July 1989 at 25-35 per cent of pay involving for the government treasury in 1989-90 Rs. 53.76 crores and in a full year Rs. 71.68 crores.

Effluent Control

The death of seven out of 8 buffaloes which drank the Ezhilar canal water in which a truck had deposited cycle parts containing cyanide and the subsequent death of one of the workers who was working on getting the corpses out of the canal has prodded the

Tamil Nadu Pollution Control Board to action. It has set up a task force under the chairmanship of the senior environmental engineer (inspection and monitoring) to monitor the deposit of cyanide bearing effluents. The task force is visiting all major units in and around Madras and will see to the enforcement of its directive that all the units using cyanide in their process should furnish details of the manner of its disposal. This will also enable the Board and its officers not only to monitor this dangerous effluence but give advice and technical guidance to units using cyanide in their production process.

National

Plan

The Eighth Plan Approach Paper described in the last 3 issues of the Bulletin (See Vol. XIX pp. 337, 338, 401 and the October issue) was endorsed at a full meeting of the Planning Commission on August 28. With its concentration on the rate of growth, ICOR and the public sector outlay of Rs. 345,000 crores, the paper does not face some crucial issues such as 1) the fiscal crisis involving a negative balance on current account over the last 5 years, 2) the certain and heavy reliance on borrowing to raise the VIII Plan resources of Rs. 345,000 crores for the public sector outlay, 3) the problem of the low agricultural trend growth rates, 4) the capacity of agriculture to absorb further the increasing labour force entrants having reached a ceiling, 5) the complex problems of the public sector enterprises, 6) more generally the question of the priorities in the industrial sector which the wage

goods model throws up, 7) the demand constraints faced by the low purchasing power in the hands of the majority of the people (those living in poverty), 8) the ICOR computations being based on the first 3 years of the VII Plan, 9) the stagnation in the savings ratio, and 10) the spectacular growth of consumer durables (colour TV, passenger cars, 5 star culture generally) which accounts for the high growth of the manufacturing sector, resulting in low or no employment growth — all these constraints are passed over and not faced by the Approach Paper. That document is based on an ICOR of 4.15 compared to 4.30 in VII Plan, a savings rate of 23.3 per cent GDP (compared to 21.1 per cent in the VII Plan), total investment of 24.9 per cent of GDP (compared to 23.1 per cent in VII Plan), net capital inflow of 1.6 per cent of GDP (compared to 2 per cent in VII Plan), a tax-GDP ratio of 18.9 per cent (against 17 per cent in the VII Plan) and public consumption 13.3 per cent of GDP (compared to 12.1 per cent in the VII Plan).

Prices and DA

Inflation in August was 1.5 per cent, with the whole sale price index standing at 165.9 per cent for the week ending August 26, (with the 1980-81 base). For the 12 month period it was 6.9 per cent. For the period April-August 1989 it was 6.1 per cent, on top of the increase of 7.5 per cent for the year 1988-89. The table below gives the comparative status :

Months	1989-90	Base 1980-81	1988-89
April	158.4		150.0
May	160.4		150.8
June	162.0		152.2
July	162.7		154.4
August	165.1		154.5
Average April-August	161.7		152.4

The consumer price index for industrial workers with the base of 1982 stood at 169.5 for the period April-July 1989. While all the major groups contribute to the rise in WPI, the main thrust came from manufactured products (whose weight in the new index has been raised to 57.04 per cent from 49.87 per cent) as it went up by 10 per cent in August. Within that group, sugar, khandasari went up by 24.7 per cent, beverages 11.9 per cent. The prices of commodities of daily consumption rose sharply by more than 2 per cent in August. This is confirmed by the Consumer Price Index which rose by 7.5 per cent in April-July over that period in the previous year. The 1987-88 CPI rose by 9.2 per cent, which may be explained by the drought that year, but that for 1988-89 rose by 9.1 per cent and that of the first four months of 1989-90 shows that 1989-90 also will have a similar rate. The last 2 years being good agriculture performance years, that this near double digit inflation is a cause for concern. The Union government announced one more DA from July 1, involving a revised DA of 19,22 & 29 per cent.

Stock Exchange

The secondary market though flooded by Rs. 3000 crores is in for a subdued

phase during the next 4 months — September — December 1989. There has been large scale disinvestment by investors with a view to increasing their ability to subscribe to the new issues. The quarterly meeting of the presidents of the stock exchange in August have set up a panel to examine the guidelines for the delivery of documents in the market, recommending the needed modifications, additions and alterations in them. For the 90s, stock market analysis predicts a bright future for takeover. Further, the volatile exchange rate markets have a positive effect on the stock market. Overseas banks began helping in relation to the Indian rupee to reduce losses arising from exchange rate volatility. It has also been suggested that there is need for a national securities market that should develop within a couple of year.

Economy

The Annual Report of the Reserve Bank of India for 1988-89 refers to the exceptionally good performance of the economy when the growth rate is 10 per cent (compared to the 3.6 per cent growth of 1987-88), due mainly to the record increase of near 23 per cent in agriculture and industrial production registering 8.8 per

cent against the previous year's 7.3 per cent. The report says on this basis, the VII Plan target of 5 per cent will be exceeded. But it also refers to the negative elements in the economy starting with the rapid growth of the revenue deficit which reached Rs. 8802 crores in 1988-89, compared to Rs. 1906 crores in 1984-85 and Rs. 206 crores in 1980-81, due to the government's dissaving. A large part of the government's current expenditure is financed by borrowing. The external debt at 31 March 1989 was Rs. 70 crores compared to Rs. 55,000 crores in March 1988, total interest payments were Rs. 17,000 crores which was 27.4 per cent of total revenue expenditures, and 44.3 per cent of total revenue. Further, the current account deficit has risen to 2.2 per cent of GDP over the last 4 years compared to VII Plan target of 1.6 per cent. Domestic savings rate is stagnant at 21 per cent due to current lags between the increase in real income and the rise in savings, the savings in public sector falling from 4.6 per cent of GDP in 1981-82 to 2.1 per cent in 1988-89, private savings rose by 2.3 per cent to 18.9 per cent. The inflation rate was high at 6.7 per cent particularly in goods of common consumption (seen in CPI recording 9 per cent) despite large foodgrains releases and imports of certain commodities. Because of the monetisation of the fiscal deficit, reserve money rose by 18.6 per cent a year and liquidity by 17 per cent per annum. Despite a good export performance at 27 per cent in Rupee terms and 15.5 per cent in \$ terms, imports grew faster at an annual average of 13 per cent, a 11 per cent in 1988-89 and caused a strain on the trade balance and balance of accounts. The World Bank's annual report also compliments India on its economic performance, the

excellent monsoon in 1988-89 leading to strong recovery from the drought and predicts that the 5 per cent target of VII Plan will be exceeded, "thus breaking free of the low growth syndrome of the post independence years". It however advocates a strategy of maintaining a tighter control of domestic demand and of continued industrial and trade reforms. The major challenge to the economy will be its difficult balance of payments and the continuing strain on its public finance. This advice needs to be tampered with the imperative of the reforms advocated to improve the balance of payments and improve the fiscal position of the government. Economists in the Institute of Economic Growth in a study point out that if poverty which is 37.4 per cent of the people in 1983-84 (according to the official data) is to be removed by 2000 AD, either the growth rate will have to increase by 14 per cent per annum between now and 2000, if the present distribution of assets and incomes is unchanged, or the investment in the poverty alleviation programme will have to be increased by 10 per cent every year during that period, which is double the present investment. A disturbing report on the current state of the economy is that there is a marked all round deceleration, with industrial growth down to 2.7 per cent in April-May 1989, with steel, fertilisers and railways traffic, recording negative growth, investment declining with capital good import approvals down by 60 per cent, foreign exchange reserves falling by Rs.1600 crores and the budget deficit growing. This is alarming and with the government concentrating on the election, this deterioration is not being attended to. An evaluative study by Dr. Vijay Paranjpay of INTACH

of the Sardar Sarovar and Narmada Sagar dams questions the wisdom of the Gujarat government and the planning commission in giving financial approval to them and concludes that they will be uneconomical and ecologically disastrous. It offers an alternative plan to meet the irrigation demands of the tribal districts, with practical investment options which will satisfy the needs of the drought affected areas. The study points out the errors in the original evaluation of the project by the government and World Bank which overlooked the loss of valuable archaeological monuments and problems of rehabilitation. The popular support for the project, it is pointed out, is due to the false belief that water will be available to the people in 5 years, when even in 20 years there will be no water from the Narmada.

Industry

On the one hand, government reports that industrial production has exceeded the Seventh Plan target of 8 per cent, the achievement being 9.6 per cent in April 1988 to January 1989. On the other CSO's quick index shows that the industrial index for the first two months, April and May 1989-90 slowed from 12.5 per cent in these months to 1986-87 and 10.5 per cent in 1987-88 to 2.7 per cent. The final index for these two months compiled by the finance ministry shows the growth for the 2 months at 1.5 per cent. The manufacturing sector's performance in the first 2 months recorded a negative growth rate of -1.5 per cent and -1.3 per cent in April and May. The decelerating industries are a) steel, b) phosphatic fertilisers, c) sugar, d) light trucks, e) motor cycles and mopeds, f) TV & TV components, g) jute textiles and tea. CMIE reports

that in June and July this negative trend continued in steel, fertilisers, sugar, some auto industries, tea, jute textiles and cement. The causes for this slow down are mystifying, because all else in the economy - agriculture, power etc. seem to be booming. RBI announces a modified definition of sick small industry as follows. "a small scale industrial unit should be considered sick, if it has at the end of any accounting year, accumulated losses equal to or exceeding 50 per cent of its peak net worth in the immediately preceding 5 accounting years". This also applies to the tiny or decentralized sick units. It is to be hoped that this will enable the banks to identify sickness at an early stage and help BIFR to restore them to health. Though a 98.9 per cent of the sick units are in the small sector, the outstanding bank credit in this sector is only 27 per cent. Therefore more attention is needed on the large units who are the problem of industrial sickness. The government decided in September to extend the broad banding scheme to the man made fibre industry for greater flexibility in production and better use of capacities. The production of the electronics sector for 1988-89 is expected to be Rs. 9300 crores (a growth of 35 per cent) against the target of Rs. 10,000 crores. The computer sector is likely to reach 47 per cent, while consumer electronics may fall to 42 per cent. NALCO reports a Rs. 1240 crores capacity expansion plant and has selected Engineers India Ltd. as consultants for this plan. The electrical goods industry reports that in 1988-89 its lamps and fans segments met with severe competition, while other sectors like transformers, motors, circuit breakers experience a booming phase. It states that profitability is

under pressure because of the steep rise in prices. The public sector Hindustan Petroleum Corporation states that it will expand and diversify its operation at a cost of Rs. 3200 crores during the Eighth Plan.

Public Sector

The public sector's dissaving rate is on the rise. This is serious because this will make the ambitious VIII Plan public sector outlay impossible of attainment. The rate of saving in the public sector in the 80s was negative at -0.2 per cent in 1980-81 and 2.9 per cent in 1987-88. This is despite the fact that the public sector accounts for an increasing share of the domestic product—19.8 per cent in 1986-87, at 27.2 per cent in 1987-88 and the continuous rise in administered prices applying to it. The 225 units employing 23 lakh employees carries a large and increasing pay roll. So the government is trying to switch from the government criteria for DA to industrial criteria. This has been challenged by the employees and the case is now before the supreme court, where the government has stated that, "the government cannot ignore the financial burden before taking a decision on the pay structure of the public sector units". SCOPE reports that its effect on improvement in public sector units has been limited because it is an advisory body. It has helped some sick public sector units through its recommendations and it is studying the role of government and non government directors on the boards of companies. It has a group to identify areas of research.

National Production Front

Steel

In view of the complaints from the users about poor quality, SAIL reports that it has arrested the trend of deterioration in quality standards of its steel products. It admits that the full needs of the customers are not met at present, but will be when the programme of modernisation of the plant is completed. In the meanwhile it has taken various measures to improve customers service. There is one rather puzzling issue and that is while it is understandable that ASSOCHAM, PHD Chamber etc. should press for importing steel and steel items, the support for this demand by SAIL does not make sense, as such imports will replace the demand for its products. Are the public sector steel plants being dominated by the big firms in the private sector? SAIL reports a record profit of Rs. 358.4 crores in 1988-89, an increase in production of crude steel by 1 million tonnes, productivity per worker up to 64 tonnes, capacity use at 81.4 per cent compared to the previous year's of 77 per cent and turnover increased by 32 per cent. But the ratio of net profit to sales is only 5 per cent compared to TISCO's 9 per cent and production has fallen in its first quarter of this year. With Rs. 711.6 crores spent on modernisation in 1988-89, the production has to be stepped up to meet the increasing steel demand. A World Bank study is critical of SAIL's management training programme which does not promote innovation and initiative and makes a number of recommendations to remedy this.

Crude

The cumulative production of oil in the VII Plan is estimated at 159,387 million tonnes, with ONGC producing 144,497 million tonnes (against its target of 143.64 million tonnes) and OIL 12.89 (against its target of 15.5 million tonnes later revised to 14.9 million tonnes). The increasing use of gas for fertilisers, power, petro-chemicals and domestic use at 58 million cubic metres during the VII Plan, with the terminal year production being 15 million cubic metres with 70 per cent of the gas produced being unused should be noted. The Planning Commission's subgroup on exploration and development recommends an increase in the price of crude and gas, as they are irreplaceable assets and so secondary recovery methods have to be resorted to from the early stages of production which justifies the price increase. Among the reasons justifying such price increase are: a) the essentiality of the use of enhanced oil recovery (EOR) techniques in older fields to maintain production which involves a higher cost, b) known sources of oil and gas are being exploited and exhausted resulting in the search for hydro-carbons in more difficult areas and deeper prospects, and c) the fact that marginal fields with low production are uneconomical to operate at current prices, though they can be economically viable at higher prices and give an economic rate of return. The government states that it has decided to implement the Bharat Petroleum Corporations central India refinery project as a joint venture with a suitable private firm. ONGC reports that 2 natural gas and oil fields have been discovered in Gotalu and Manhar Tibba in Rajasthan on which Rs. 160.40

crores are being invested. Its exploration in Tamil Nadu is referred to in the Tamil Nadu Section.

Coal

All the subsidiaries of Coal India report a record increase in production and attendance. BCL report attendance at 1,21,544 persons against a normal of 1,17,897 and production at 73,650 lakh tonnes against the daily average of 63.63 lakh tonnes. CIL reports production of 69,145 lakh tonnes (against daily average of 64.83 lakh tonnes). NCL reports production of 62.2 lakh tonnes (against its daily normal of 57 lakh tonnes). WCL report production of 89.74 lakh tonnes (against the daily normal of 57.21 lakh tonnes). Wagon loading also maintained a rising rate, so that customer demands during the year were more fully met.

Non Ferrous

HZL reports that it will float Rs. 300 crores bonds to finance part of the Rs. 617 crores new integrated project for the development of 3000 tonnes per day of lead zinc mine, the 70,000 tonnes per annum of zinc and 35,000 tonnes per annum of lead. The massive project is to be financed through equity of Rs. 190 crores, Rs. 127 crores internal resources and Rs. 300 crores bonds. When the project is completed in May 1991, it will meet 80 per cent of the country's demand for zinc and 63 per cent of its demand for lead. Alcobox metals reports that it is setting up a plant to manufacture 5000 tonnes per annum of zinc ingots in Rajasthan.

Oil seeds and sugar

Oil seeds in 1988-89 recorded a bumper production estimated over 17 million tonnes—which however did not bring prices down. But because of the decline in the stock of palmolein, particularly in the PDS, the Government has decided to import 1 lakh

tonnes of edible oil. Here STC by purchasing the oils from Indonesia (60,000 tonnes), Czechoslovakia (12,000 tonnes), Malaysia (24,000 tonnes) and Netherlands (6000 tonnes) has been able to save about \$ 1 million on these imports. On the sugar front, there is a real mess. The table below sets forth the data:

	1987-88	1988-89	1989-90 (estimated)
			in lakh tonnes)
1. Opening Stock on Oct. 1	26.53	24.31	11.65
2. Production during season (Oct. to Sept.)	91.10	87.50	100.00
3. Imports	0.71	—	2
4. Offtake :			
(a) Internal Consumption	93.85	100.00	107.00
(b) Exports	0.18	0.18	0.20
5. Closing stocks as on September 30 including imports.	24.31	11.63	8.43

1) Starting at the end, the open market price of sugar has shot up by 40 per cent in 3 months and reached Rs. 15 a kg. This skyrocketing of the price causes distress to consumers and also affects industrial consumers such as drugs and pharmaceuticals, soft drinks, food processing, biscuits and confectionary. 2) The output of 787.5 lakh tonnes in 1988-89 was only 3.6 lakh tonnes short of the record production in the previous year, but the crisis is due to the fact that the estimated production for the year was put at 100 lakh tonnes against which only 87.50 lakh tonnes was produced. The high

estimate's seemed to be justified because in the first 6 months October to February production was 59.69 lakh tonnes against 53.91 lakh tonnes in that period in 1987-88, but fell sharply by 9.38 lakh tonnes between March and September due to lower recovery in the North etc. 3) Meanwhile on the basis of the estimated higher output the Union government released large quantities of levy and free sale sugar (11 lakh tonnes of free sale sugar and 8.64 lakh tonnes of levy sugar for October-November and an additional release of 1 lakh tonnes for the festival season). On top, the government also announced

exports of 5 lakh tonnes which had to be retracted and in place imports of 2 lakh tonnes in September and even a possible 5 lakh tonnes had to be undertaken. 4) One element which caused the shortage, about which nothing official has been said, is the smuggling of sugar to Bangladesh, Nepal and Pakistan, which is estimated at 5-6 lakh tonnes, valued at Rs. 600 crores at Indian open market prices and Rs. 1000-1500 at prices in these countries. If this smuggling had been stopped, there would have been no serious shortage and flaring up of prices and certainly no imports. 5) The government has tried to meet this situation by calling a meeting of the sugar producers at which the industry has been asked for free sugar to be sold at Rs. 775 a quintal between September 15 and November 15 and the retail price of Rs. 8.50 to 9 a kg against the prevailing tender price of Rs. 10.40 to Rs. 10.70 a kg. One question which should be asked is whether this agreed domestic cut in prices means that the mills have been charging unreasonably high prices in recent weeks. 6) The major issue is for the current year 1989-90 which is about to start when the output should be 105 lakh tonnes to meet the established gross consumption of 107 lakh tonnes, spurred by increased rural incomes due to the bumper foodgrains crops in the last 2 years. If the output is only 96 lakh tonnes, as is likely, imports will have to be arranged. The domestic offtake has been rising steadily from 49.70 lakh tonnes in 1980-81 when the output was 51.57 lakh tonnes to the doubling of consumption in 1989-90, while output is much lower. Either sugar industry will have to be expanded or sugar consumption curtailed—particularly by the bulk con-

sumers and industries. As sugar is a water intensive crop in a situation of water scarcity, the reduction in consumption is the option which must be explored.

Textiles

ICMF reports that textiles production in 1988-89 was 13,282 million metres, an increase of 290 million metres over the previous year, with a declining mill sector (by 208 million metres from the previous year's 3027 million metres), a slight decline in handloom sector (by 42 million metres to 3466 million metres) and a big increase in the powerloom sector (by 550 million metres to 7007 million metres). Thus the share of the mill sector declined to 21.15 per cent, while handlooms was 26.10 per cent and power looms 52.75 per cent. The reason for a continuous decline of the mill sector (declining by 1391 million metres between 1980-81 and 1988-89) is a) the government freezing its loom capacity and encouraging the growth of the decentralized sector, b) its technological obsolescence, c) its growing sickness and d) the closure of a number of mills (number 142 by March 1989). In light of this ICMF's VIII Plan projection of producing 18900 million metres of cloth comprising 4200 million metres by the mill sector, 5250 million metres by the handloom sector and 9450 million metres by the power loom sector, may not be attained as far as the mill sector is concerned, unless the modernisation backlog involving an investment of over Rs. 3000 crores is cleared. Its one plus point is exports which was Rs. 707.50 crores in 1988-89, which can register a quantum jump if there is technology upgradation,

quality checks and a package of incentives. This may be the means of the mill sector meeting the competition from the power loom sector.

Cotton

Cotton has had a good year in 1988-89 (September to August) with production at 104 lakh bales (against the previous year's 90 lakh bales), increased mill consumption of 98 lakh bales, limited 3 lakh bales imports, even more limited exports of 1.5 lakh bales due to cumbersome export procedures and unrealistic MEP, a closing carryover of 19 to 20 lakh bales on August 31, 1989. So the new season 1989-90 starts with this good carry over which will meet the increasing demand of mills at 8.5 lakh bales a month till mid November, when the new crop will come to the market. Traders expect an output of 100 to 110 lakh bales which will be realised if there are moderate rains in October. In view of the decline in world supply of cotton to 80.5 million bales and the 25 per cent rise in world cotton prices, India should streamline its export procedures and export atleast 3 to 5 lakh bales to take advantage of this situation.

Agricultural Production

With the end of the south west monsoon, it is now possible to assess its spread which has been not as good as that of last year (29 out of 32 meteorological divisions had excess or normal rainfall, while in 1988-89 almost all divisions had good rains). Also there has been a break in the monsoon half way, the north and north west passed through some anxious weather

as they had no rains till the late winter spell, and there are some "pockets of misery" in Maharashtra, Andhra Pradesh, Arunachal Pradesh and Assam. On this basis, it is expected that the kharif crop will attain its target. There has been no serious incidence of disease. The pulses crops and the oil seeds crops are also doing well. The rabi strategy was finalised at a meeting on the last day of September. It aims at increasing the rabi output beyond the target of 77 million tonnes (8.4) million tonnes rice, 53.9 million tonnes wheat, 6.6 million tonnes coarse cereals and pulses 10.7 million tonnes). In 1988-89 rabi output was 74.84 million tonnes against the target of 74.07 million tonnes.

Foreign Trade

Exports in 1988-89 are estimated at Rs. 20,281 crores against a target of Rs. 18,795 crores. Exports in the first 4 months of 1989-90, April-July, increased by 39 per cent and imports by 21.2 per cent. On this basis the trade for the first 4 months declined by 17.7 per cent to Rs. 2154.85 crores compared to Rs. 2618.19 crores for that period in 1988-89. For 1989-90, the export target has been established at Rs. 28,025 crores. In terms of policy, in September i) exporters were asked to quote prices in US dollars while negotiating export contracts with all countries except the rupee payment countries in order to avoid loss in dollar exports as a result of fluctuations in rupee-exchange rate: ii) the office of the chief controller of imports and exports introduced a fast track scheme for disposal of applications of major exporters: iii) export policy amendments have been introduced for non basmati rice, peacock tail feather and psyllium

seed and powder: iv) the intermediate advance licencing scheme has been liberalised as a result of which the ultimate exporters, not being manufacturers of the goods but holding the status of export or trading houses can also avail of the facility of the intermediate scheme. Some changes were also made in the import policy for registered exporters and v) input-output norms under Appendix 13 F of the import policy were revised affecting petrochemicals and chemicals, fish and fish products, readymade garments and engineering products. On individual items, silk exports earned Rs. 330 crores in 1988-89 and in the first 4 months of 1989-90, Rs. 117 crores were exported (in July Rs. 31 crores were exported, being a 26 per cent increase). For 1989-90 a target of Rs. 1000 crores has been set for leather garments. In this, foreign investment and joint ventures can be of particular help. Exports of engineering goods, excluding electronics, software and prime steel amounted to

Rs. 330 crores in the first quarter, April-June, 1989-90 (growth of 27 per cent). The ministry of commerce reports that during the last 3 years, India's industrial exports has been at an annual 10 per cent. Foreign exchange earnings of 116 private sector companies have risen by 30 per cent from Rs. 895.5 crores in 1987-88 to Rs. 1163.9 crores in 1988-89. Exports earnings from merchandise was 84 per cent of the total. Foreign exchange expenditures at 1733.9 crores increased by 37.1 per cent in 1987-88. So net foreign exchange earnings are negative. The gap between earnings and outgo has fallen from Rs. 574.8 crores to Rs. 469.5 crores in 1988-89. Public sector companies have also a gap between their foreign exchange earnings and expenditures, which increased from Rs. 7662 crores in 1986-87 to Rs. 10,252 crores in 1987-88. The earnings went up by 7.9 per cent and their expenditure by 25 per cent. In fixing the 1989-90 export target, the commerce ministry has indicated the following thrust areas.

	Export targets in 1989-90 (Rs. crores)	Exports in 1989-90 (Rs. crores)	Anticipated 1989-90	rise in (%) share in total exports %
Chemicals & allied goods	3000	1338	124.2	4.7
Handicrafts	1300	782	66.2	4.6
Gems & Jewellery	6500	4291	51.4	23.2
Minerals & ore	1600	1069	49.7	5.7
Agriculture & allied products	2500	1790	41.2	8.9
Sports goods	60	43	39.5	0.2
Leather & products	2000	1465	36.75	7.1
Marine products	840	630	33.3	3.0
Engineering sector	3000	2258	32.9	10.7
Plantations	1125	855	31.5	4.0
Textiles	5500	4586	20.0	19.6

There is a parallel increase in imports.

Loans and Aid

In September in addition to the World Bank loan of \$200 million to IFCI to fund technology the government authorised it in raising by \$60 million as commercial loan from the international market. ADB made a grant of \$100,000 to assist the state government to prepare the second road project. The US Export-Import Bank has signed a \$25 million credit facility with the State Bank of India to assist import of capital goods and services from the USA. The government reports that it is examining 3 sets of proposals for reducing the level of its unutilised foreign aid, which has risen to over Rs. 30,000 crores. The proposals involve in a) winding up telecom projects caught up in controversy, b) closing a number of agricultural and irrigation schemes which face a serious time and cost overrun, or c) expedite implementation of several projects in the coal and power sectors. The World Bank in a recent assessment of the Indian economy within the framework of the IDA IX negotiations, states that capital shortage on reasonable terms may slow down India's growth and poverty alleviation programmes. It states "if the terms on which external capital is available to India continue to harden, the country would be forced to use increasing amounts of its domestic savings to service external debt at the expense of growth and poverty alleviation".

International

World-Bank-IMF Annual meeting

The meeting in September received the IMF director's report which forecasts

a slower rate of expansion in 1989 for the global economy at 3.1 per cent (against the 3.3 per cent growth in 1988) which will not, however, lead to a recession. It calls for watching inflation, which will not, however lead to an inflationary spiral. For 1990 it sees a global growth rate of 2.9 per cent. It denies the criticism that its adjustment programmes have had adverse impact on the poor countries. In the meeting, the dominant themes were the increase (doubling) of IMF quotas, the increase of the next round of IDA IX to \$14 billion from the current \$12.4 billion, and the ineffectiveness of the Third World debt reduction strategy. The World Bank's annual report called attention to severely indebted middle income countries which qualified neither for special concessions on debt relief nor for significant assistance under the Brady Plan. It expressed concern over excess spending on defence by developing countries to the extent of 20 per cent of their budgets. The IMF Managing Director asked for a 100 per cent increase in member quotas which would double its available lending authority of \$110 billion. US opposes this, as it would give Japan a leading position in the Fund. The group of 24, which is the developing countries' forum, voiced concern at the deteriorating debt situation and called on the industrial countries to accept the IMF request report to double the quotas. The interim committees of IMF, however, bowed to US pressure and opted for a conciliatory approach on this question. It urged the executive board to pursue the issue of quotas increase as a matter of high priority, but made no decision on the level of increase. Once more the Annual meeting of the Bank and the Fund have been completed without any decision on the only two issues which

was before them and which mattered — namely the increase of IMF quotas and the level of replenishment of IDA-IX. On world debt also there was no progress. Japan announced a contribution of \$300 million to the World Bank over 3 years to train people in developing countries to help their countries' development.

World Trade

GATT's annual report states that international trade may rise by 7 per cent in 1989, after last year's 8.5 per cent increase and (in contrast to UNCTAD's forecast to be referred to later), that the world may be entering a period of above average trade and production growth. Trading growth is outstripping the production growth by 2:1 due to a) technological innovations widening the scope of goods being traded internationally, b) the real cost of petroleum has dropped by one half since its 1980 peak, bringing high savings to households and enterprises, c) the share of manufactures had risen in world trade by one third since 1980 and is now 75 per cent of world merchandise trade, d) policies of deregulation and denationalisation, the cooperation of major central banks in preventing high inflation, reforms in USSR, China and East Europe. But the report warns on the following: a) external shocks, periodic over investment in key sectors, macro economic miscalculations and other disturbances will continue to affect both individual country and global economies: b) because business investment last year focussed more on machinery and equipment than on structures, it gave a particularly strong boost to trade in capital goods of the order of \$850 billions (20 per cent

over 1987, c) world trade volume in commercial services reached \$560 billion in 1988; d) the NICs in Asia and China are increasing their shares of world trade, ahead of Sweden, Switzerland and Australia. GATT is entering the final phase of the four years negotiations on world trade, the Uruguay round. A lot is at stake for the 42 year old GATT, which is the throes of a middle age crisis, having successfully pushed down the industrial world's tariffs to an average 5 per cent from 40 per cent in the immediate post war years. GATT is critical of discrimination curbs which postpone adjustments and reduce overall growth. It is now reaching for an expenditure mission to avoid a decline and so is moving on to services, ideas and investment which are outside its scope; and in addition a more assertive US, a more integrated European community and a more powerful Japan are inclined to thrash out their problems themselves, bypassing GATT. It will emerge from the current round of talk either significantly revitalised or clearly vestigial. It has also the Multi Fibre Arrangement which expires in 1991, and Intellectual Property Rights on its agenda. UNCTAD in its annual report states that the prospects for world trade in 1989 are not as bright as 1988 when it expanded by over 9 per cent, brought about by the widespread investment boom in both industrial and developing countries which strongly influenced international demand for capital goods. But with key economies shifting towards policies of greater demand restraint, some restraint in the growth in trade is underway. The exports of manufactures of industrialised countries rose fast in East Asia developing countries by 30 per cent in volume and exports

to other developing countries stopped falling. However due to the continued burden of debt servicing, import levels in many developing countries are depressed. Exports from developing countries increased by 13.3 percent in 1988, primary commodity exporters benefited from enhanced demand, but prices of these commodities have declined by 10 per cent. It states that Nepali devaluation has not helped and Bangladesh needs to be more flexible in implementing its policy packages. It states that the design and thrust of the Bank-Fund adjustment package suffer from several weaknesses: a) their concentration on short term external balance; b) little attention is given to the social affect of these programmes; c) there is a strong bias towards privatisation and the free market. It challenges the conventional wisdom that liberalisation of imports is necessary to improve export performance. Instead it sees a complex set of sometimes contradictory factors affecting third world exports. It states that most of the 32 countries studied in the report which introduced drastic trade liberalisation packages during the 80s were among those with the most sluggish export growth. While stressing the utmost importance of investment growth, it notes that investment in exports in many countries has become a high risk because of the instability in the real exchange rate. Currently depreciation and foreign exchanges scarcity (this sounds as if India is being described) have consequently been locked into a kind of vicious circle, the scarcity has led to depreciation, which in the context of drastic uncertainties has failed to induce higher export earnings. In turn, the continuing foreign exchange crisis has resulted in further currency depreciation.

High inflation has made real exchange rate stability difficult to attain and exchange rates instability has discouraged investment in tradeables. It sees EEC and US as being in a difficult and dangerous juncture, with the Uruguay round teetering on the US Trade Exports and Competitive Act. Much hopes is placed on Japan whose share of imports from developing countries in the total consumption of manufacturing goods rose sharply by one half in 1986-88. Despite the share of imports of manufactures from developing countries being only 2.7 per cent in Japan against 4.7 per cent in US and 4.2 per cent in EEC, Japan offers a fertile area for the exports of the developing countries in view of its large current account surplus.

World Debt and World Resource transfers

The World Bank report states that the debt of developing countries has further tightened at \$993 billion in 1989 compared to 893.9 billion in 1986. The IMF report refers to the loosening of the debt burden from \$998.4 billion in 1987 to 993.2 in 1988. The World Bank calls attention to the negative reverse flow of resources from developing countries having increased 5 fold between 1984 and 1988 as the table below shows: The trend in negative transfer (last column (7) which began in 1984 gathered momentum, so that in 1988 disbursements were \$ 82.3 billion, and total debt service was \$ 142.4 billion (comprising principal repayment of \$ 75.4 billion and interest payment of \$ 67 billion), resulting in a negative net transfer of over \$ 50 billion.

	Debt Disbursement & out standing (1)	Disbursement Total (2)	Principal Payments (3)	Interest Payments (4)	Net Flows Total debt 5 = (3-4)	6 = (2-3)	Net Transfers 7 = (2-5) - (6-5)
1984	686.7	91.6	48.6	53.2	101.8	43.0	— 10.2
1985	793.7	89.3	56.4	55.8	112.2	32.4	— 22.9
1986	873.9	87.7	61.5	54.9	116.5	26.2	— 28.7
1987	998.4	87.1	71.1	54.4	125.5	16.0	— 28.4
1988	993.2	92.3	75.4	67.0	142.4	16.9	— 50.1

Indo-Bangla Water and Trade Agreements

After the lapse of the 1985 memorandum of understanding on the sharing of dry season flow of the Ganges in November 1988, India and Bangladesh are negotiating a new water pact, removing the problems in the way. Similarly India and Bangladesh have agreed to extend their bilateral trade agreement for 3 years from October 1989. The agreement covers jute and sarees and lays the basis for agreement on export of newsprint and urea from Bangladesh.

NAM

The Non aligned summit met in Belgrade in September. It decided to strengthen and coordinate South-South cooperation and prepare a plan of action. It set up a 12 nation committee to follow up the decision. With the change in the international situation and the growing friendship between the leaders of the old two power blocks, the rationale and programme of action of the Non Aligned Movement needs to be rethought. At present it is a hotchpotch of over 150 countries which have no binding accord or criteria.

II. Agricultural Development in Tamil Nadu

Paddy and other crops

The farmers in Thajavur district are completing the limited kuruvai planting and operation that they have undertaken. Now most farmers are engaged in samba paddy cultivation. These activities also apply to other districts which have had wide and adequate rainfall. Only the Chengai Anna district faced a serious situation at the beginning of September. Farmers raised nurseries in 2000 hectares

but because of lack of irrigation have not transplanted the seedlings. Of the normal 1.92 lakh hectares which they bring under samba, only 1025 have been cultivated. Out of 3628 irrigation tanks in the district only one had a month's supply and 30 have 15-20 days supply, the rest being dry. The water table has fallen and farmers in Sri-perambathur, Cheyyar, Maduranthakam, Utteramerur and Chengalpattu face dry tanks. The sornavari crop that they

raised was also affected, as they were able to cover only 17,000 hectares instead the normal 28,000 hectares. Towards the end of September, after consulting paddy trade associations, rice merchants and rice mill owners, the state government announced that a) the paddy levy on traders is reduced from 50 per cent to 30 per cent and b) to facilitate the easy movement of paddy from the farmers to the mills, the food districts boundaries have been readjusted. Ramanathapuram, Pasumpon Thevar Thirumurugan and Kamarajar district are to form one district, Coimbatore and Periyar to form one district and Madurai and Dindigul — Quaide Millat district are to be combined in order to reduce the open market price of rice. These decisions are based on the understanding that the paddy — rice merchants association would ensure that the government got not less than 2 lakh tonnes of samba paddy and 50,000 tonnes of kuruvai paddy. This would be an improvement over the 60,000 tonnes collected from the 50 per cent levy in 1988 and 45,000 tonnes in 1989.

Research results

Research reports in September are from Annamalai University on means of controlling a major rice weed found in lowland rice regions, from AP agricultural university on techniques of controlling sheath rot in semi dwarf rice varieties, from the zoology research centre, Kerala on checking the shoot borer threat in ginger, from UAS Karnataka on use of mesta for paper making, from MP lab on growing rabi linseed in marginal lands, from TNAU centre, Vellore on countering the diamond leaf spot in banana from SZAAD, Karnataka on an improved production strategy for

onions, from the Vriddachalam Centre which developed the groundnut variety VR12 which assures high yield in drought, from the horticultural research centre, Bangalore on use of biological agents to control the heliothis pest, from Haripad, Kerala on fighting successfully the tungro virus transmitted by the green leaf hopper in the paddy lands of Kerala, from UAS, Dharwad on controlling the caterpillar which destroys sunflower, from ARS, Cuddapah on means of checking the stem borer and stem weevil which attack agathi, the betel vines support plant, from ARS, Bhavanisagar on using lady bird beetles as effective predator on crop pests, from the Regional ARS, Anapalli on how the zingspot disease can be arrested in Papayya, from TNAU's ARS, Paramakudi on means of controlling the silk cotton pest, from AP agricultural university, Jaghil on increasing the productivity of groundnuts through use of gypsum, from the oil technological research institute, Anantapur on growing safflower which is an important oil seed crop, from TNAU Coimbatore on the use of Triaccontamol to boost cotton yield, from the Regional ARS, Jaghal on how to counter iron chlorosis in sugarcane, from ARS, Kerala on how to fight "Azhagal" a cardamom disease, from Kerala Agricultural University on the programme of pest control in cashew, from the citrus improvement project, Tirupathi on means of preventing citrus disease in orange orchards, from ARS West Godavari on means of hastening the bud break in sweet orange, from Southern Regional Research Centre, Mannavathur on a programme of disease management in rabbits, from central institute for research on goats, UP on a vaccination schedule in goat farms, from TNAUs Department of Poultry on

means of minimising the losses from heat stroke chickens, from the college of animal sciences, Trichur on controlling parasitic disease in livestock, from TNAU on use of neem produce to check insect and pests, from college of veterinary sciences, Tirupathi on countering Rachitic syndrome in broiler chicken, from TNAU Centre, Erode on stopping mycotic infection in cows, and from central region on developing small farm reservoirs for rainfed tracts.

Plantation Crops

The Eighth Plan demands for plantation crops are challenging. For tea, an increase of 170 million kg is demanded making a total production of 876 million kg in the VIII Plan against the little over 700 million kg in the terminal year of VII Plan that is, tea is projected to grow at twice its present growth rate. Tea prices domestically are fairly stable at a moderately rising level and at the international level is not determined on the normal supply and demand position of the product, but by the few multinationals who demand a buyers, price from the producers and who increasingly go in for blending, demanded by the foreign consumers. Coffee production in the VIII Plan is projected at 2.2 lakh tonnes against the over 2 lakh tonnes peak production in the penultimate year and 1.4 lakh tonnes in the last year of the VII Plan. The problem here is the collapse of the international coffee agreement and the 40 per cent fall in international coffee prices which means that even if 1.6 lakh tonnes are exported the industry will make a loss. This gives point to the producers demand for an international sale quota and an increase in the minimum price

of coffee demands which will spill over into the VIII Plan. In rubber, the VIII Plan projects an increase of 1.6 lakh tonnes to 4 lakh tonnes. In the VII Plan, rubber production increased by less than 1 tonne and so the target is challenging and the wide gap between supply and demand for the current year (the demand is estimated at 3.12 lakh tonnes and the supply at 2.39 lakh tonnes is likely to further widen in the VIII Plan, when the question of import led rubber prices stability faces the challenge of rising world rubber prices. In spices, the targets for pepper (which is doing well in earning Rs. 200 crores on exports this year), and cardamom are also arbitrary and face problems for their realisation particularly in the case of cardamom which exported a meagre 787 tonnes in the penultimate year and an ever lower amount in the final year of the current plan. The general problem facing the plantation industry in the VIII Plan are: a) most plantation crops are area specific and so cannot be expanded beyond a certain point in response to demand: b) increasing improved productivity is the alternative: c) this requires cost effect techniques which demand the cooperation of its 25 lakh workforce: d) as far as markets are concerned, in tea the domestic market is cutting into the export market, to the point when in the case of tea the import tea is being talked about for the first time: in the case of coffee there is the problem of glutted world market: in spices there is the problem of the declining market for pepper which has led to the forming of the 4 nation International Pepper Community: e) in the case of rubber the relative merits of synthetic and natural rubber should move nearer a consensus in the Eighth Plan.

Tea

With regard to tea in the current year, production is expected to be at around last year's 700 million kg far away from the production target of 750 million kg, due mainly to the decline in the production in the South. With internal consumption going up by 15 to 17 million kg a year, the domestic requirement will be 490 million kg, leaving 205 million kg for exports. The export target is 250 million kg which will not be reached and to reach it or even 225 million kg, the question of importing tea for the first time in Indian history is being seriously debated. The producers are against it because it will depress their prices, the multinationals are pressing for it to increase and improve their blending processes, referred to earlier. For the moment, the government is negative on this matter. But the options facing the industry are: a) imports for blending for export or for domestic consumption; or b) asking major blenders to slow down their purchases for a few weeks so that prices may soften; or c) asking the USSR to slow down its buying (which is now 100 million kg and may

rise to 150 million kg) temporarily. These are hard options and none is likely to be accepted. Meanwhile one fall out is that at the auctions the quantity sold is about 10 per cent lower and prices 20 per cent higher. Tea companies are showing good profits and their shares are rising in the stock market. The tea production at this point is a difficult one both domestically and in terms of exports. The area under tea needs to be continuously increased. In 1988 the 700 million kg came from 4.25 lakh hectares, giving a yield of 1650 kg per hectare, so that more production can only come from more land being brought under tea without jeopardising the environment. There is one more problem which the northern tea plantations are facing and that is labour scarcity. This is the national result of the spread of education, so that the tradition of the son stepping into the plantation workers job of his father is now passing. In this situation there is no escape from mechanisation—using mechanical plucking aids and providing vocational training to labourers and their sons so that they could operate this kind of equipment.

III. Industrial Development in Tamil Nadu

Industrialisation in the State

The Tamil Nadu government announced in August a capital investment subsidy of 15 per cent subject to a maximum of Rs. 15 lakhs a unit, for small scale industries set up in backward taluks. The subsidy will also be available to the existing units which

take up substantial expansion or diversification subject to certain conditions. The government also announced a special state capital investment subsidy of 20 per cent up to a ceiling of Rs. 20 lakhs for the leather industry. The further details are: Electronics industry, auto ancillaries, drugs and pharmaceuticals, food processing industries

solar energy equipment, gold and diamond jewellery exclusively for export, jute processing industry in six select taluks, pollution control equipment, sports goods and accessories, cost effective building materials such as aluminium, PVC doors and windows and window frames will be eligible for the special subsidy of 20 per cent subject to a maximum of Rs. 15 lakhs. The incentive will also be available for the existing small scale industrial units undertaking substantial expansion or diversification. As part of a package of incentives, the government has decided that all new small scale industries be eligible for deferment of payment of sales tax for five years. The total benefit will be the actual sales tax payable for five years, or Rs. 10 lakhs for five years together, or 80 per cent of the capital invested for the units located at State Industries Promotion Corporation complex and growth centres, or 70 per cent of the capital invested in respect of the units located at other places. The units in towns with more than 3.1 lakh population (as per the 1981 census) and the city of Madras with a 15 km belt area and the Tiruchi, Coimbatore, Madurai and Salem urban agglomerations with an 8 km belt area will, however, not be eligible for the liberalised interest deferral scheme. The existing units which carry out expansion or diversification by increasing the production level by 25 per cent in quantity in the case of existing production and in the case of new products, an increase of 25 per cent over the best annual production achieved during the last three years will be eligible for "Interest-Free Sales Tax Deferral Scheme for Expansion. During the life time of any small unit, interest free sales tax deferral will be granted only for one substantial expan-

sion apart from that for the original project. Secondhand machinery will be excluded under this scheme. All small scale industrial units which continue HT/LT power are eligible for a subsidy of 15 per cent subject to a maximum of Rs. 5 lakhs on the purchase of new generator sets.

Salem

SAIL, at the end of September, approved the installation of hot rolling facilities at the Salem steel plant at a cost of Rs. 330 crores. They will be commissioned at the end of 1992. In view of the 96 per cent customs duty and spiralling exchange rates, imported hot rolled coils have become very costly. Further, there is an uncertain element in the supply of the coils. Thus the setting up of these facilities at the Salem plant which has been forced on it, moves the plant in the integrated, plant direction, which was the original project. The next stage is downward integration in steel making and the ultimate stage is iron making, which will make the plant an integrated steel plant. This last stage can use the cauvery gas and the ore from Kudramukh. When this is done, the state foundries will no longer face periodic shortage of pig iron that they now face (see for example Vol. XVIII pp. 265, 491, 592, Vol. XIX pp. 292, 353).

ONGC

ONGC reports striking oil at Adiyakkamangalam near Thiruvavur town. Rs. 3200 metre deep well produces oil at 600 barrels per day and one lakh cubic metre of gas per day. This makes 5 points in the cauvery

basin where major hydro carbon strikes have been made — the other being Kovilkalappal, Narimanam, Nannilam and Bhuvanagiri. The cauvery basin which has been projected as a major oil bearing region by ONGC is now, after upgradation to category I on par with other basins, Cambay, upper Assam, Krishna Godavari and Bombay offshore. The oil production target by the end of the year is 0.2 million tonnes, rising to 2 million per annum by 1994-95, when free and associated gas production will be 2.03 million cubic metres per day. ONGC also reports that drilling operations in offshore palar basin between oil rich Krishna-Godavari and cauvery basins are to be started by Chevron Amaco of the US. The basin comprises 10,000 sq km offshore and 3,500 sq km onshore. The basin is now category IV, which is a category of basins with indeterminate prospect and will soon be upgraded category III which is basin with petroleum for regenerating hydro carbons.

Hindustan Teleprinters

The Hindustan Teleprinters (HTL) is to launch new products for data communication and office automation to meet the needs of the Department of Telematics and other customers and the production of electronic teleprinters during the VIII Plan. Some R&D on this is underway along with marketing studies. HTL is planning to produce software packages which could be exported and sold to other manufacturers.

TIDCO & SIPCOT

A special category, 11 per cent investment by TIDCO in joint ventures has been established by the government.

A joint sector tapioca based industries, USHTA-te-Biotech industries has been established in the SIPCOT complex at Cuddalore at a cost of Rs. 20 crores. Also a pesticide plant will start functioning from March 1991 under TIDCO at the Cuddalore SIPCOT complex.

Manali Petro Chemicals and South India Viscose

Manali Petro Chemicals which is the country's first propylene glycol and polycols plant, with an investment of Rs. 101 crores will go onstream in early 1990. It has collaboration with Technip of France and Arco of the US. The basic raw materials will be supplied by the neighbouring Madras Refineries and SPIC. The capacity of the plant is 6250 tonnes per day for propylene glycol and 6000 tonnes per day for polycols. The projected turnover in the first 3 years is Rs. 40 crores, Rs. 45 crores and Rs. 55 crores. South India Viscose reports an unsold stock of 6000 tonnes of rayon pulp worth Rs. 5.5 crores which is awaiting union government clearance for export now for several months. Its product is in demand in Taiwan, South Korea and Indonesia and this delay is frustrating. The company is also undertaking a large agro forestry project producing 2 million seedlings of hybrid varieties of rayon wood with NABARD's financial help.

Textiles

On textiles, three developments in September should be noted. The first is a matter of regret. The state government has decided to take over the management of six mills which had long remained closed. This takeover of the

management is only a prelude to nationalisation. Why mills made sick by private management should be taken over by the state and add to its loss making group is not clear. Now the decision has been sent to the Union government for clearance. The Union government is committed to arresting the policy of taking over sick units. This is now a test for it. The take over is a decision following from trade union and political pressure. But there are other ways safeguarding the employment of the workers. Sell the mills and use the money for starting new projects in which the workers can be redeployed, after training, if necessary. The second development is the report that for the first time in 12 years, the power looms in the state and in south are experiencing a demand recession. The power looms in the south meet the export demand for garments. Now in the absence of new designs and the resistance to a price rise in garments caused by the rising prices of yarn and dyes and chemicals, export orders are falling off and the sector faces a recession. There is a tendency for the power looms to blame the mills for this on the grounds that they have captured the business with their designs, have absorbed the high yarn price by the large size of the orders they receive and have access to bank credit. This time it is the powerlooms who complain of unfair competition from the mills, unlike the complaints of the mills upto now about the unfair powerloom competition. The power looms will have to adjust to this situation. Third, the state government has doubled the allocation of hank yarn from 500 bales to 1000 bales from the state's cooperative spinning mills to handlooms to slash the yarn price.

Leather

As noted earlier, because of the booming leather garments export at Rs. 250 crores in 1988-89 (from Rs. 16 crores in 1984-85), the trade and government agreed to reach an export target in leather garment of Rs. 1000 crores by the end of the VIII Plan. This involves developing marketing strategies for US, FRG, Japan and UK who are main consumers of leather garments. In consultation with the Council for Leather Exports, the government is working out the leather strategy for the VIII Plan and one element in it is that the export of semi-processed leather is to be phased out totally. This will complete the final stage of India's transformation from an exporter of semi-processed leather mainly to an exporter of value added items.

Sugar and edible oils

The government is streamlining the sale of levy sugar to ensure its equitable distribution. As it has 22,000 tonnes against its requirement of 31,000 tonnes, it is now distributing it at the rate of 500 grams per adult a month on a first come first served basis which will result in many going without sugar. From October 1, there will be a ceiling of 2 kg a month, with families with 1 adult getting 50 grams, those with 2 adults 1 kg, 3 adults 1.5 kg, and 4 adult and more 2 kg at Rs. 5.25 a kg. Also cardholders will get a 5 kg card through cooperative super markets at Rs. 7.50 a kg. Further, in view of shortage of edible oil and the rising price of groundnut oil, the government has asked the Union to make available to it adequate quantity of palmolein (13,000 tonnes) against the allotment of 1150 tonnes or permit it to import it for distribution through PDS.

Sericulture

32,000 hectares are at present under mulberry, to which an estimated 12,000 hectares are to be added during the VIII Plan. The cocoon production will increase from the present 8000 tonnes to 16,000 tonnes at the end of the Plan and silk production will increase from 671 tonnes to 1500 tonnes. The state has a good silk weaving structure at Kancheepuram, Arni and Kumbakonam. But commercial production of mulberry silk is a recent phenomenon. The major handicaps of the state are: i) inadequate seed cocoon production, ii) short fall in production and supply of commercial seed and iii) lack of adequate reeling seed capacity. To achieve a target of doubling, mulberry silk production in the VIII Plan, the infrastructural needs are 11 seed farms, nine P22/PL grain ages, 100 chowkie rearing centres,

15 cocoon markets and 82 technical service centres.

Private Sector reports

The annual report of EID Parry for the year ended 30 June 1989 shows a turnover increase of 11 per cent, fertiliser production at Ennore increasing by 24 per cent, the development of inhouse technique for tissue culture of cane, the completion of the modernisation of its sugar plant and the introduction of a crop insurance scheme for all farmers. It also reports that because of the drought, the quantity of cane crushed declined, though sugar recovery improved due to improved varieties and cane farming techniques. It reports operating profits before tax of Rs. 832 lakhs (+62 per cent) and profits after tax of Rs. 550 lakhs (+92 per cent). This is a good record, for a company which was ailing a few years back.

* * * * *

IV. Education, Science & Health

Educational reforms

At the university level, UGC has identified 10 universities — Andhra, Osmania, Srivenkateswara, Annamalai, Madurai Kamaraj, Gandhigram, Pondicherry, Kerala, Vishwa Vidyalaya and Bharathidasan for introduction of courses in future studies. At the state level, the falling rate of passes in university examinations continues to be discussed and is a cause for concern. In one Bharathidasan university college there were zero passes and in others including those affiliated to Madras University the percentage of passes was below 11 even in postgraduate courses of

Tamil, Mathematics, and Economics. Girls generally do better. The dismal results have led universities to develop crisis plans for tightening admissions to colleges and the setting up cut off marks for admission to certain courses. The academic council of Madras University has asked for stringent action against affiliated colleges collecting capitation fees. The commercialisation of education was discussed and the setting up of a vigilance committee to monitor the colleges was suggested. A Madras University syndicate committee has indicted 7 employees of the Presidency college for tampering with examinations on the basis of

confession of 6 students of having paid them to cheat at the April 1989 examination. Disciplinary action is being taken against those involved.

Technical education

IITs announced that in the joint entrance examination, Indian languages would be allowed to be used. The new pattern will have a screening paper and to start with the question papers will be in English and Hindi, and the answers could be in any of the Indian languages. This further use of the teaching medium will have to go alongside of the development of texts and language facility in the various subject disciplines. In the state a number of decisions were made on new technical universities. The Tamil Nadu Veterinary and Animal Science university which is the first in the country was inaugurated on September 20. It offers three post graduates diploma courses in veterinary practice, disease investigation and animal production, with emphasis on farm oriented specialisation and self employment. The university will also do collaborative research on a turnkey basis for industries. The state government announced that a technical university spreading technical education for women, called Periyar Maniyammai Technical university for Women is to be established shortly. A 20 year perspective plan has been drawn up by the Dr. MGR Medical University on the basis of which UGC assistance is requested. The Tamil Nadu Agricultural College is to start a college of Horticulture at Periakulam where a vegetable and now horticultural research station are functioning. Details are now available about the ill-equipped self financing engineering college surveyed in the Kulandaiswamy Report. Besides the 3

disciplined by the Madras University, are Adhimayans college of engineering, Sathyabhama engineering college, Dr. MGR Engineering college, the others being the VLB Janaki Ammal college of engineering, Coimbatore, the Periyar Maniammai college of Technology for women, all of whom lack basic infrastructure. The Adhiyaman college is housed in an unsafe building of 2000 sq ft against the norm of 6000 sq ft in pucca building. The laboratories are in rented ramshackle illit and ill-ventilated building. The committee recommends that the students already admitted should be distributed to other colleges. Dr. MGR college is in a rented building, with no work on a permanent site. At Shanmuga Engineering college there are 43 staff members against the required 72, a library of 1700 sq ft against the required 10,000 sq ft and 4400 books against the required 10,000. There are electric and electronic labs and so on for all the other colleges. The panel appointed by the High Court to study the 4 colleges facing disaffiliation has recommended that 3 of them can conduct classes for certain courses for 1989-90 with existing facilities but the fourth, the Adhiyaman college has an unsatisfactory infrastructure. It is to be regretted that the judiciary is getting itself involved in judging academic standards and infrastructure for which it has no competence. An other disturbing development which the Indian Council for Dental Research has highlighted is the mushroom growth of dental colleges in the state. Here what is needed is the strict application of the Tamil Nadu Medical University stipulation concerning the opening of new dental colleges.

Research

In relation to the Rs. 35 crores Giant Metrowave Radio Telescope (GMAT) being set up near Pune, training and manpower development have been identified as the most important but possibly the frustrating part of the project. The review committee on ICAR states that the estimated rate of return from investments in agricultural research in India are high and so it is to be regretted that these investments are declining from 20 per cent of total research expenditure in 1958-59 to 12 per cent in 1988. It has recommended that ICAR should pay more attention to the economic analysis of its programmes and projects. This recommendation should help in determining its future priorities. The decline in its share of expenditure which is normal in an industrialising country need not be a constraint, as one of the greatest practical success of Indian research, the green revolution, happened when its funds were declining. This means that the direction of research is more important than funding. This is also true of the role of irrigation in the pre-green revolution period.

when the contribution to growth of the gross sown area declined to 72 per cent, with fertilisers accounting for 5 per cent, HYV seeds for 5 per cent and irrigation for 18 per cent. Now it is clear that there are limits to area to be brought under irrigation and there is a rising cost to the green revolution technology. Hence there is need for a new technology which depends less on irrigation and is also financially viable. This is what the committee has in mind in saying that ICAR should pay more attention to the economic aspects of its programme. ICAR reports that it is going for a detailed classification of soil resource of the country to study the strength and weaknesses of the areas under cultivation and make agricultural growth strategy more area specific than the lumpy 15 agro-climatic zones involved. Scientists at Hyderabad Central Biological Control Scheme report success in the control of weeds and pests affecting the major crops of paddy, pulses and cotton through biological means. The ministry of Science & Technology reports that it is drafting a programme to double R&D funds in the VIII Plan.

V. Employment and Labour Relations

The Union government reports that Bihar and Tamil Nadu are in the forefront of states in the use of the Jawahar Rozgar Yojana (JRY). Of the Rs. 134 crores allocated to Tamil Nadu, 70 per cent given as the first instalment has been used up. The Union government announced at the end of September

that it is releasing the second instalment of JRY to the panchayats. In Maharashtra JRY is a pale replica compared to the very effective Employment Guarantee scheme in the state whose annual budget is Rs. 246 crores whereas JRY provides only Rs. 70 crores plus 20 per cent as the state share. In

Tamil Nadu, Tiruchi is far ahead in JRY or Jawahar Velai Vaippu Thittam (JVVT) as it is called as well as in IRDP, with a success of 84.4 per cent. Even as the Union and states are quarrelling over the guidelines to be followed, Tiruchi district with a non political administration has executed scheme based on economic viability — 3 LG group houses in 157 villages at a cost of Rs. 4.95 crores, 286 women including 86 SC benefited under IRDP in Pulivanam, 62 farmers in Kulathupalayam have completed community irrigation project. Under TRYSEM Rs. 30.12 lakhs have been used for training 1085 village youths (289 in TV and radio mechanics, 225 in mat weaving, 90 in wiring and 80 in motor winding, Rs. 30 lakhs is being used for social forestry and so on. A negative element reported is the rising number of educated unemployed. The 38th round of NSS (January-June 1989) reported that the number of unemployed was 3.7 million. The Seventh Plan document on the basis of 32nd round NSS states that in 1983, 4.7 million were the educated unemployed (3.5 million matriculates and 1.2 million graduates and above). The 840 employment exchanges report that in June 1988 of the total 29.4 million registered for jobs, 16.7 million

were educated (56.8 per cent, compared to 50 per cent in 1982 and 53 per cent in 1985). Matriculates were 9.7 million, higher secondary completers were 4.2 million and graduates and post graduates 12.8 million. While the employment situation for the educated remains static in the 80s, the proportion of graduates and post graduates declined from 18.2 per cent in 1982 to 16.8 per cent in 1985 to 17 per cent in 1987 and 1988. Unemployment among higher secondary completers was stagnant at 25-26 per cent in the 80s. For matriculates the job situation deteriorated by 5.6 million in 1982 (57 per cent) to 8.11 million in 1985 (57.5 per cent) and 9.7 million (58 per cent) in 1988. Even if we assume that 50 per cent of the registered unemployed are students and those who are employed as a Karnataka Sample Survey showed — 10.8 per cent students and 43.6 per cent employed — the pool of educated unemployed is still distressingly large at 7 million in 1985 when NSS reports 3.7 million. Out of 48 million educated in 1985 the 7 million unemployed are a large sector. In this regard, the country's large, over 60 per cent illiteracy rate is keeping the number of educated unemployed down.

VI. Other Items

World Literacy Day

September 8 was celebrated all over the world and in all the major centres in India as the world literacy day. In Paris at the celebration, the massive

nature of the problem of illiteracy facing the developing countries, particularly the top 10 with more than 10 million illiterates each and the need to devise a strategy to meet this massive challenge, and the importance of each

October Development Seminar

Recent trends in industrialisation in Tamil Nadu

by

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This paper, which aims simply to raise some issues which planning for industrialisation in Tamil Nadu must contrast, is in two parts. Part I looks at the history of investment, value-added and output growth from the early 1960s to the end of the 6th Plan period. Part II attempts to survey the situation as it appeared in the mid 1980s. There are no formal conclusions, but comments are appended to the discussion on the data.

Table 1 shows the growth in net State Domestic Product (SDP) contributed by the manufacturing sector in the nine major states and in India as a whole. As can be seen, Tamil Nadu was third after Maharashtra and West Bengal in 1970-71. However, at *constant prices*, by 1984-85 it had been

overtaken by Uttar Pradesh, with Gujarat very closely behind. In fact, at *current prices*, as Table 2 shows, Tamil Nadu was fifth in the country by 1984-85. One point that requires examination in this context, then, is whether this difference in ranking is due to greater efficiency in manufacturing in Tamil Nadu, leading to less than average price increases by manufacturers. If, on the other hand, it is due to greater competitive pressures which do not allow for equivalent price rises, then the resulting squeeze on profit margins may have consequences for future industrial growth in the State.

Returning to Table 1, it can be seen that Tamil Nadu's declining position dates from the Sixth Plan period, from 1980-81 to 1984-85. Unlike all the other major states, with the exception of West Bengal, manufacturing's

contribution to SDP increased by a very nominal amount (Rs. 30 crores at constant prices) over this period. This is reflected in the overall growth rate over the Fourth, Fifth and Sixth Plan periods (1970-71 to 1984-85), during which Tamil Nadu's annual growth rate was the lowest of any of the major States, again with the exception of West Bengal. (final column of Table 1).

In another sense, of course, Tamil Nadu remains a highly industrialised State. According to Table 2 (column 3) manufacturing contributes 22.4 per cent to SDP, which is the highest of any State after Maharashtra. But here, again, it may be noted that Gujarat is very close behind, at 21.6 per cent. Table 2 also provides an index of the importance of the manufacturing sector to the livelihood of the people as a whole. Taking per capita SDP, Tamil Nadu which was fourth in 1970-71 remained in the same position in 1984-85 (at constant prices). Here what is significant is that Karnataka has overtaken Tamil Nadu, displacing West Bengal to fifth position. Again, Tamil Nadu's growth in real per capita SDP is the lowest of all the States, barring West Bengal. Also of significance, in terms of looking ahead to the Eighth Plan, is the fact that while per capita SDP in Tamil Nadu in 1984-85 remained well above the all India average, the *growth rate* between 1970-71 and 1984-85 was markedly below the all India average. This, incidentally, included three cases of *negative* growth rate in Orissa, Rajasthan and, nominally, in West Bengal.

Some confirmation of Tamil Nadu's continuing importance to India's industrial economy is provided by Table 3, which is based on the Annual Survey of Industries (ASI).

The data refer to the registered manufacturing sector i.e. to those factories which are monitored by the 1948 Factories Act. Data for four consecutive years in (Table 3) shows that in terms of share of all India value added, total capital invested and number of employees, Tamil Nadu remains generally in a second position to Maharashtra. Significant here is the position in respect to value added. As pointed out earlier, while the State remained in second position when measured in terms of manufacturing SDP at *constant prices*, it had fallen to fifth position in 1984-85 when measurement was at *current prices*. If, now Tamil Nadu retains its position in terms of value added, these results probably indicate that new industries whose output prices are rising faster than those that dominate the industrial scene in Tamil Nadu, are coming up in other States. It may be noted that in Uttar Pradesh and Gujarat, which have shown startling growth rates in the 1980s, the Food Processing industry and the Petrochemical industries, respectively, are important. Here, again, is an issue that industrial planning will need to consider.

It may also be noted from Table 3, that the proportion of all employees in Tamil Nadu (about 10-11 per cent) corresponds fairly closely to the proportion of value added (also 10-11 per cent). This would indicate that labour productivity in the State is at about the all India average. In contrast, Maharashtra is well ahead, Gujarat also above average, while Uttar Pradesh and West Bengal are below.

Some confirmation of these observation is provided by Table 4 which gives data relating to 1985-86. Particularly

important are the ratios of fixed capital to value added (column 5) and emoluments to value added (column 8). The first provides a rough indication of "Capital Productivity" including within it, of course, capacity utilisation. As can be seen Tamil Nadu comes third after Maharashtra and, significantly, Karnataka and is well below the all-India average. The Karnataka instance is significant because of the considerable concentration of large Public Sector Units involved in heavy engineering. The performance of this State would imply that the high ratios for Madhya Pradesh, Bihar and Uttar Pradesh cannot be due to the presence of a heavy industrial base alone. Conversely, the generally good figure for Tamil Nadu is not likely to be based solely on its "light" industrial base.

Column 8 provides further evidence for reasonable labour productivity in Tamil Nadu. The ratio is an index of labour productivity which is better than the all-India average although behind Maharashtra and Gujarat in this respect.

If, then, productivity in Tamil Nadu is generally at a reasonable level, then industrial performance can also be taken to be reasonable. In that case its decline in performance over time may be due to a failure to diversify and to enter new industries where value added may be expected to increase rapidly in the future.

Table 5 provides a broad indication of the major industries in Tamil Nadu. Not surprisingly, machinery and machine tools, transport equipment (light engineering); rubber, plastic, petroleum and coal products and chemicals and chemical products (Chemicals and Petrochemicals); and cotton textiles account for 55.4 per cent of value added in 1985-86, the

last year for which data are available. These industries form the base of the industrial structure of Tamil Nadu, together with the leather industry which, though undertaken on a Small Scale generally, is a major export earner. The importance of these industries in Tamil Nadu may be construed by Table 6 which gives data, again for 1985-86, for the State's role in the Indian industrial economy.

As these industries have provided the base to Tamil Nadu's industrial growth since independence, Table 7 provides some data for their growth over the period from the beginning of the Third Plan, to the beginning of the 6th Plan. As has been mentioned before, the sluggishness of industrial growth seems to stem from the early 1980s and it may be useful to pose the problem as one of reasonable success upto this period followed by a failure to diversify, both *within* these broad industry groups and *away* from them.

From Table 7, there would seem to be very little uniformity of growth rates over the two decades under consideration. For instance, the highest growth rate of 14 per cent compounded in 1970-80 is in Tobacco and Beverages (22) in which there was actually a substantial *decline* of 8.3 per cent during the previous decade. Conversely, transport equipment (38) which grew at 16.7 per cent in the first decade, virtually stagnated (0.7 per cent compound growth) during 1970-80. In fact, in terms of *growth rate*, performance has been disappointing during 1970-80 in all industries except in Chemicals and Chemical Products (31), where the growth rate more than doubled. Although these growth rates must necessarily be related to the pre-existing base which had probably been

laid earlier in the case of transport equipment than in other "modern" industries, stagnation in any industry is certainly a matter of concern.

On the other hand, in terms of modernisation of the industrial structure as a whole there had been substantial progress. Taking the traditional industries (groups 20-29 and 32) on the one hand, and the modern (groups 30-31, 33-37) on the other, the following results are obtained. In 1960, the traditional group accounted for 68.5 per cent of value added, and the modern for 25.8 per cent. In 1970, the corresponding proportions were 42.6 per cent and 45.8 per cent. By 1980, the traditional sector rose marginally to 44.7 per cent and the modern, more substantially, to 54.6 per cent. The marginal industry group (38) has been ignored for this exercise.

The question of importance, however, is that by the mid 1970s, the modern industrial sector was itself divided between the electronics, petrochemicals and advanced engineering fields on the one hand, and the other older industries on the other. Table 7 does not allow detailed examination of these trends but it is ominous that both industry group 30 (whose full title would include petrochemicals) and 36 (which includes electronics) did not show the advance in growth rates expected of new industrial opportunities. This brings the discussion to the second, and the operationally important part, of this paper.

In 1960, transport of the Techno-Economic Survey of Madras brought out by the National Council of Applied Economic Research (NCAER) emphasized the significance of large scale industry in the following words:

"The components of the non-agricultural sector — large and small-scale industry, trade and commerce, construction and provision of services — are closely inter-related. In this complex of dynamic relationships, large-scale industry plays a crucial role. Not only does it add to employment and income directly, it gives an impetus to other sectors for expansion. The derived effects of an expansion of large-scale industry on employment and income are thus as important as the direct effects and more than offset the initial heavy investment relative to increased employment. Viewed against this background, large-scale industries assume pivotal importance in the continuing process of economic growth".

Although Tamil Nadu has long been known for its Small Scale Sector, both traditional as exemplified by handlooms, and modern Small Scale Units in the engineering industries, there would be little disagreement with the views of the NCAER. Small enterprises cannot be the basis for industrial growth and, for this reason, the rest of the paper will be specifically concerned with the large scale industrial sector.

Table 8 provides a benchmark of the situation as at the end of the Sixth Plan. As has been mentioned earlier, Tamil Nadu was not badly placed at the time. In terms of Private Sector sales performance, it stood fourth after Maharashtra, Gujarat and West Bengal. In the public sector it lay second, after Maharashtra. In aggregate terms, it lay third, this time following Maharashtra and West Bengal. Of course, opinion may vary on whether aggregate sales, and that at one point of time, is the best way to rank industrial performance. However, the picture is not noticeably different to that presented by

other sets of data, and as a classification of size in terms of overall economic performance, sales are a reasonable index. So again, as a Snapshot View, the situation in 1985 seemed to be reasonable in Tamil Nadu as compared to all India.

The problems begin when a view of the dynamics of the situation is taken. Perhaps one way to begin is to consider the employment situation. While it is readily conceded that it is not the sole purpose of industry to provide employment, it is equally true that any comprehensive view of the industrialisation process must include an increasing share of industrial employment in overall employment. As Table 9 shows, quite the reverse is happening in Tamil Nadu. While aggregate employment has steadily grown from 18.65 lakhs in 1979-80 to 21.67 lakhs in 1986-87, manufacturing accounts for only 0.59 lakhs between these end points. The peak figure for manufacturing employment occurs, in fact, in 1984-85, after which there has been a decline in the succeeding years. These are activities subject to cyclical variations but no statistical exercises are necessary to show that it is the tertiary sector (transport, storage, communications and services) which have shown steady increases which balance the stagnation, or even absolute, decline in other sectors. The simple point to be made here is that manufacturing employment is not showing any signs of a rate of growth by which it would begin to dominate the structure of employment. Particularly when it is recalled that these figures refer to the organised and relatively large scale enterprises, the abnormal growth of services employment is a matter of concern. Clearly the problem

is that of the direction and rate of industrial investment, and it is to these issues that Tables 10, 11 and 12 refer.

Table 10 provides information on the projects under implementation as in December 1985. It provides further evidence that as far as the probable dynamics of the industrial economy of Tamil Nadu are concerned, the picture is depressing. While in the case of Private Sector projects, Tamil Nadu has the lowest position after West Bengal, in the aggregate it is at the bottom of the list. It would be difficult to show that West Bengal is more favourably placed than Tamil Nadu as far as location decisions of public sector projects are concerned for the central decision making authorities. West Bengal's position (the highest in any State after Andhra Pradesh) does show some signs of changes in the future. This is not so in Tamil Nadu. The 75 projects under implementation account for a mere 3.3 per cent of the national figure.

Table 11 shows the distribution of the investment across the districts of Tamil Nadu. Not surprisingly, the Madras-Ranipet-Manali and the Tuticorin areas account for almost 66 per cent of the total investment. Although Private Sector investments are more evenly distributed than public sector projects, as Table 12 will show, this is not of much significance as far as industrial modernisation is concerned.

Table 12 shows the industrial areas in which projects are under implementation in the districts of Tamil Nadu. Quite apart from the geographic concentration, it is significant that such investment as is underway in Coimbatore, Madurai, North Arcot, let alone the districts which are

traditionally backward, is largely in the traditional industries of cotton textiles, sugar, and non-metallic mineral products. Diversification of the industrial structure is confined to the belts mentioned earlier, and to Dharmapuri owing to the location of the Hosur estate near Bangalore and, to a certain extent, to Tiruchirapalli, probably due to the BHEL complex. Otherwise the situation shows little signs of any movement either regionally or in terms of technologies. Table 12, in fact, shows precisely the situation that planning for the 8th Five Year Plan must tackle. There are no large scale projects in the leather industries, cotton textiles and automobile industries account for not more than 12 per cent of the investment, petrochemicals and electronics are miniscule.

A single public sector fertiliser project accounts for almost 23 per cent of aggregate investment in the State and 79 per cent of the investment in Madras. Although it has not been possible to obtain upto date information on a comparable basis for these projects, and by 1989 the situation may have changed, the gestation period of such large projects is such as to make a major change in the scenario unlikely.

Generally, the situation in Tamil Nadu is mixed. There may be no grounds for serious worry but there is certainly great scope for effective policy intervention. It may be hoped that the Eighth Plan period will see long desired changes to this end.

TABLE 1
Net State Domestic Product: Manufacturing Sector : 1970-71 to 1984-85
(At constant 1970-71 prices)
(Rs. lakhs)

Major States	Average annual rate of growth (%)			
	1970-71	1974-75	1980-81	1984-85
Andhra Pradesh	22,135	27,044	36,559	45,822
Bihar	22,177	24,393	34,414	47,073
Gujarat	34,939	43,973	56,989	76,404
Karnataka	28,588	32,361	53,395	62,603
Madhya Pradesh	17,880	22,130	31,460	41,470
Maharashtra	1,02,777	1,15,718	1,75,265	2,03,481
Tamil Nadu	45,871	40,448	74,060	77,377
Uttar Pradesh	37,925	37,376	62,058	91,789
West Bengal	55,587	56,786	67,051	67,764
All-India	4,61,900	5,47,000	6,92,300	8,67,300
			4.13	4.72
				4.60

Note : All India data are taken from the CSO's *National Accounts Statistics* (various issues) and the State-wise data are taken from the CSO's *Estimates of State Domestic Product* (various issues). However, the sums of the State-wise data do not add up to the All-India totals.

Source : Table 9.5 in Economic Intelligence Service Basic Statistics Relating to the Indian Economy, Volume 2: States (Centre for Monitoring the Indian Economy, Bombay : 1988)

TABLE 2
Manufacturing Sector : Share in Net State Domestic Product and its Real Per Capita Growth between : 1970-71 and 1984-85

State domestic product (SDP) in manufacturing sector 1984-85 (Current prices) (Rs. crores)	SDP's share (%) in		Real per capita State domestic product in manufacturing sector		Annual rate of increase (%) between 1970-71 to 1984-85
	Net national product in manufacturing	State's net domestic product	1970-71 (Rupees)	1984-85 (Rupees)	
Major States					
5,387	19.3	24.6	204	304	2.89
2,993	10.7	14.2	43	80	4.32
2,740	9.8	18.8	125	117	-0.50
2,394	8.6	21.6	131	210	3.45
2,383	8.5	22.4	111	152	2.26
1,488	5.3	17.8	98	158	3.49
1,403	5.0	13.4	39	63	3.44
1,347	4.8	14.0	43	74	4.02
1,204	4.3	10.5	51	81	3.36
27,960	100.0	15.9	84.26	118.73	2.48

Source : Table 9.6 from reference to Table 1.

TABLE 3

Share of major States in Selected Industrial Characteristics

State	Year	Characteristics									
		Value Added					Productive Capital				
		1982-83	1983-84	1984-85	1985-86	1982-83	1983-84	1984-85	1985-86	1982-83	1983-84
Maharashtra		21.6	21.8	22.8	25.9	16.0	16.7	15.7	19.1	16.1	16.1
Tamil Nadu		10.1	9.0	11.3	10.3	7.2	7.5	11.5	9.7	10.2	10.4
Gujarat		9.1	11.6	10.2	9.2	9.3	10.2	9.2	8.8	9.5	9.9
West Bengal		9.8	8.1	8.8	8.4	7.8	7.3	7.2	7.3	11.8	11.4
Uttar Pradesh		9.0	6.0	6.6	5.9	11.2	10.3	10.3	9.7	10.2	9.3
Madhya Pradesh		5.7	5.1	5.1	5.9	7.8	7.8	7.9	7.9	4.5	9.3
Andhra Pradesh		6.1	6.5	6.9	5.4	5.3	5.8	5.4	5.4	9.5	4.6
Bihar		6.7	7.8	5.5	5.4	10.1	9.3	8.4	7.9	4.7	4.6
Karnataka		4.9	5.6	5.0	5.0	4.2	4.3	3.8	3.8	4.9	5.0
Total for 9 States		83.0	81.8	82.1	81.5	78.9	79.1	79.3	79.5	81.4	80.6
All India		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source : Annual Survey of Industries, Summary Results for the Factory Sector, Various Issues.

TABLE 4

Structural Ratios and Technical Coefficients by Major States
1985-86

(Arranged in descending order of Net Value added)

State	FC per emplo- yee (Rs)	NVA per emplo- yee (Rs)	Wages per worker (Rs)	Ratio of			
				FC to NVA	FC to GOP	NVA to GOP	Eml to NVA
1	2	3	4	5	6	7	8
Maharashtra	78263	50189	17275	1.56	0.35	0.22	0.42
Tamil Nadu	60202	28049	10666	2.15	0.40	0.18	0.46
Gujarat	79767	32328	10886	2.47	0.39	0.16	0.42
West Bengal	58137	24174	14721	2.40	0.49	0.20	0.68
Uttar Pradesh	87579	20301	10828	4.31	0.68	0.16	0.63
Madhya Pradesh	157992	39471	12732	4.00	0.95	0.24	0.37
Andhra Pradesh	54710	19111	7533	2.86	0.49	0.17	0.53
Bihar	153919	36458	17040	4.22	0.81	0.19	0.53
Karnataka	60887	31147	12881	1.95	0.48	0.24	0.49
Total for 9 states	79459	31939	12725	2.49	0.49	0.20	0.48
All India	80419	31140	12187	2.58	0.50	0.19	0.48

FC : stands for fixed Capital

GOP : Stands for Gross output

NVA : stands for Net value added

Eml : stands for emoluments

Source : Annual Survey of Industries, *Summary Results for the Factory Sector*
1985-86 (Central Statistical Organisation, 1989)

TABLE 5

Share of Seven Major Industries in Gross Output and Value Added

State and Industry	Gross output Rs. lakhs)	Value added
Tamil Nadu	1297331	240158
All Industries	(100.0)	(100.0)
1. Rubber, plastic,	184417	13484
	(14.2)	(5.6)
2. Cotton textiles	167033	31079
	(12.8)	(12.9)
3. Chemicals & Chemical Products	152966	28392
	(11.8)	(11.8)
4. Food products	135635	18398
	(10.5)	(7.7)
5. Machinery & machine tools	130307	34328
	(10.0)	(14.3)
6. Transport equipment	108992	25952
	(8.4)	(10.8)
7. Electricity	85600	30290
	(6.8)	(12.6)
Total (1 to 7)	964950	181923
	(74.4)	(75.8)

Note : Figures in brackets indicate percentages

Source : As for Table 4.

TABLE 6

Share of Three Important States in the Gross Output and Value Added of each Major Industry Group

Sl. No.	Industry Group & State	Gross output (Rs. lakhs)	Value added
20-21	(Food products)	1502851	177643
		(100.0)	(100.0)
	Maharashtra	268840	28983
		(17.9)	(16.3)
	Uttar Pradesh	164757	23521
		(11.0)	(13.2)
	Andhra Pradesh	152086	14638
		(10.1)	(8.2)
	Total	585683	67142
		(39.0)	(37.8)
23	(Cotton textiles)	747457	146195
		(100.0)	(100.0)
	Tamil Nadu	167033	31079
		(22.3)	(22.3)
	Gujarat	161627	30825
		(21.6)	(21.1)
	Maharashtra	142903	34782
		(19.1)	(23.8)
	Total	471563	96686
		(63.1)	(66.1)

Note : Figures in brackets indicate percentages.

Table 6 (contd)

Industry group and state	Gross output (Rs. lakhs)	Value added (Rs. lakhs)
29 Leather, leather products etc)	99352 (100.0)	13224 (100.1)
Tamil Nadu	47809 (48.1)	5461 (41.3)
West Benga	13118 (13.2)	2763 (20.9)
Uttar Pradesh	12806 (12.9)	1498 (11.3)
Total	73733 (74.2)	9722 (73.5)
30 (Rubber, plastic, petroleum and coal products)	1493579 (100.0)	185881 (100.0)
Maharashtra	424483 (28.4)	93398 (50.2)
Tamil Nadu	184417 (12.3)	13484 (7.3)
Gujarat	176064 (11.8)	10707 (5.8)
Total	784964 (52.6)	117589 (63.3)
31 (Chemicals & chemical products)	1601241 (100.0)	290097 (100.0)
Maharashtra	443843 (27.7)	90387 (31.2)
Gujarat	359090 (22.4)	71712 (24.7)
Tamil Nadu	152966 (9.6)	28392 (9.8)
Total	955899 (59.7)	190491 (65.7)

Table 6 (contd ...)

Industry group and state	Gross output (Rs. lakhs)	Value added (Rs. lakhs)
35 (Machinery, machine & tools parts)	689066 (100.0)	186269 (100.0)
Maharashtra	179154 (26.0)	45989 (24.7)
Tamil Nadu	130307 (18.9)	34328 (18.4)
Gujarat	64305 (9.3)	15313 (8.2)
Total	373766 (54.2)	95630 (51.3)
37 (Transport equipment & parts)	636496 (100.0)	152262 (100.0)
Maharashtra	200429 (31.5)	53168 (34.9)
Tamil Nadu	108992 (17.1)	25952 (17.0)
Bihar	62370 (9.8)	14842 (9.7)
Total	371791 (58.4)	93962 (61.7)

Note : Figures in brackets indicate percentages.

TABLE 7
Value Added by Broad Industry Groups Rs. lakhs at 1970-71 prices

Industry Code		1960	1970	1980	Compound Growth % 1970 over 1960	Compound Growth % 1980 over 1970
20-21	Food Products	2029 (16.1)	2184 (7.8)	2968 (7.2)	0.7	3.1
22	Tobacco & Beverages	262 (2.1)	109 (0.39)	406 (1.0)	(-) 8.3	14.0
23,24,26	Textile Products	4896 (39.1)	6574 (23.3)	10813 (26.3)	3.0	5.1
27	Wood & Wood Products	80 (0.6)	115 (0.4)	121 (0.3)	3.7	0.5
28	Paper, Paper Board & Printing	494 (3.9)	1332 (4.7)	1863 (4.5)	10.4	3.4
29	Leather & Leather Products	296 (2.4)	658 (2.3)	716 (1.7)	8.3	0.8
30	Rubber & Rubber Products	301 (2.4)	1109 (3.9)	2174 (5.3)	13.9	7.0
31	Chemical & Chemical	899 (7.2)	1660 (5.9)	5576 (13.6)	6.3	12.9
32	Non-Metallic Mineral	532 (4.3)	1039 (3.7)	1528 (3.7)	6.9	3.9

contd.....

Table 7 (Contd.....)

Industry Code		1960	1970	1980	Compound Growth % 1970 over 1960	Compound Growth % 1980 over 1970
33	Basic Metal & Alloy Industries	352 (2.8)	1515 (5.4)	2158 (5.2)	15.7	3.6
34	Metal Products except Machinery	146 (1.2)	527 (1.9)	1171 (2.8)	13.6	8.3
35	Machinery except Electrical Machinery	451 (3.6)	3010 (10.7)	4492 (10.9)	20.9	4.1
36	Electrical Machinery	204 (1.6)	934 (3.3)	2422 (5.9)	16.4	10.0
37	Transport Equipment	879 (7.0)	4153 (14.7)	4471 (10.9)	16.7	0.7
38	Others	690 (5.5)	3258 (11.6)	259 (0.6)		
	Total	12511 (100.00)	28177 (100.00)	41138 (100.00)		

Note : Figures in brackets indicate percentage to total.

Source : M.N. Sivasubramanian, "Changes in the Industrial Structure of Tamil Nadu 1960-80" Madras Institute of Development Studies, *Bulletin*, Madras Development Seminar Series, Vol. XVI, No. 7.

TABLE 8

**State-Wise Picture of Large Scale Industrial Activity
Summary Data**

Major Manufacturing Units in Operation (Running Units)

	Private Sector			Public Sector			Public & Private Sector		
	No. of units	Sales crores	(Rs. % to total)	No. of units	Sales crores	(Rs. % to total)	No. of units	Sales crores	(Rs. % total)
I. Major States									
Andhra Pradesh	98	1,721	4.6	37	1,299	8.4	135	3,020	5.7
Bihar	53	2,021	5.3	18	1,157	7.5	71	3,178	6.0
Gujarat	222	4,146	11.0	15	491	3.2	237	4,637	8.7
Karnataka	421	1,598	4.2	31	1,395	9.0	155	2,993	5.6
Madhya Pradesh	57	1,038	2.7	18	627	4.1	75	1,665	3.1
Maharashtra	608	11,812	31.3	59	4,108	26.6	667	15,920	29.9
Tamil Nadu	250	3,375	8.9	26	1,622	10.5	276	4,997	9.4
Uttar Pradesh	125	2,229	5.9	44	797	5.2	169	3,026	5.7
West Bengal	229	4,251	11.2	43	1,384	9.0	272	5,635	10.6
Total for all States	2,175	37,768	100.0	362	15,427	100.0	2,537	53,195	100.0

Source : Economic Intelligence Services : A State-wise Picture of Large Industrial Activity (CMIE, 1985).

TABLE 9

**Public and Private Sector Employment by Industrial Classification
(As on 31st March)**

Industry Group 1	(Number '000)								
	1980 2	1981 3	1982 4	1983 5	1984 6	1985 7	1986 8	1987 9	
1. Agriculture, Hunting, Forestry Fishing etc.	94.9	94.5	95.3	94.0	94.8	96.8	97.1	95.5	
2. Mining and Quarrying	31.0	32.2	33.4	34.6	34.7	35.0	35.0	36.0	
3. Manufacturing	499.5	524.1	554.2	568.1	548.6	570.0	565.3	558.4	
4. Construction	60.6	61.3	59.8	57.8	57.6	58.4	55.3	55.7	
5. Electricity, Gas, Water and Sanitary Services, etc.	84.7	79.4	80.3	80.2	80.4	79.2	74.1	73.1	
6. Trade and Commerce									
a) Wholesale and Retail Trade and Restaurants and Hotels	74.2	79.0	74.7	76.1	80.0	79.2	74.7	75.0	
7. Transport, Storage and Communications	229.7	224.8	252.8	250.4	258.5	264.7	277.5	289.9	
8. Services	791.1	308.2	817.9	876.3	933.2	941.4	961.5	983.2	
a) Finance, Insurance, Real Estate & Business Services	100.3	102.4	107.2	117.8	120.7	124.0	125.5	126.2	
b) Community, Social and Personal services	690.8	705.8	710.7	758.5	812.5	817.4	836.0	857.0	
	1865.7	1903.5	1968.5	2037.5	2087.8	2124.8	2140.5	2166.8	

Source : Tables 9.2 to 9.4 of Tamil Nadu Economic Appraisal 1987-88.

Note : For definition of terms and limitations of data see Madras Institute of Development Studies, *Tamilnadu Economy* (Oxford & IBH, New Delhi : 1988)

TABLE 10

**State-Wise Picture of Large Scale Industrial Activity
Summary Data**

**Major Manufacturing Projects under
Implementation (Erection)**

	Private Sector			Public Sector			Public & Private		
	No. of units	Investment (Rs. crs)	% of total	No. of units	Investment (Rs. crs)	% to total	No. of units	Investment (Rs. crs)	% to total
Major States									
Andhra Pradesh	74	2730	10.1	45	6271	17.2	119	9001	14.2
Bihar	24	1096	4.0	26	3274	9.0	50	4370	6.9
Gujarat	98	4092	15.1	24	1748	4.8	122	5840	9.2
Karnataka	39	1136	4.2	28	2867	7.9	67	4003	6.3
Madhya Pradesh	48	1976	7.3	19	2988	8.2	67	4964	7.8
Maharashtra	154	3973	14.7	45	2812	7.7	199	6785	10.7
Tamil Nadu	55	1086	4.0	20	1019	2.8	75	2105	3.3
Uttar Pradesh	108	5957	22.0	41	2614	7.3	149	8611	13.6
West Bengal	36	500	1.8	32	4773	13.1	68	5273	1.3
Total for all States & Union Territories	838	27065	100.0	403	36471	100.0	1241	63513	100.0

Sources : Economic Intelligence Services : A State-wise Picture of Large Industrial Activity (CMIE, 1985)

Projects Under Erection in Tamil Nadu

District	Number of Projects under erection as on December '85	Capital outlay in Rs. Crores Public Sector	Private Sector	Total	% of State Total
Chengalpattu	13	174.00	179.33	353.33	16.79
Coimbatore	7	32.60	68.00	100.60	4.78
Dharmapuri	8	75.00	71.10	146.10	6.94
Kanniya Kumari	Nil	—	—	—	—
Madras	7	515.00	87.90	602.90	28.64
Madurai	6	32.00	35.14	67.14	3.19
Nilgiri	Nil	—	—	—	—
North Arcot	7	53.35	50.10	103.45	4.91
Periyar	1	—	10.00	10.00	0.43
Pudukottai	4	—	50.60	50.60	2.40
Ramanathapuram	2	5.20	5.26	10.46	0.50
Salem	2	7.65	10.51	18.16	0.86
South Arcot	2	—	23.85	23.85	1.13
Thanjavur	Nil	—	—	—	—
Tiruchirapalli	4	99.60	36.78	136.38	6.48
Tirunelveli	5	25.00	395.10	420.10	19.96
Location not known	7	—	61.90	61.90	2.94
	75	1019.40	1085.57	2104.97	100.00

Source : Economic Intelligence Services : A State-wise Picture of Large Industrial Activity (CMIE, 1985)

TABLE 12

Industry-wise Projected Investment (in Rs. Crores) as on December 1985

Industry Group	Chengal- pattu	Coimba- tore	Dharma- puri	Madras	Madurai	North Arcot	Peri- yar	Pudu- kottai	Rama- natha- puram	Salem	Arcot	Tiruchi- rapalli	Trunel- veli	Loca- tion	Indus- try Total	% of Industry Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
201	40.00		6.00												40.00	1.90
206			6.00		8.00		10.00								24.00	1.14
231		76.60	7.30		27.14			7.50							118.54	5.63
247	60.00	24.40											5.10		89.10	4.23
280												NA		NA	NA	"
290						NA									NA	"
302					NA										NA	"
304	60.00														60.00	2.85
305													25.00		25.00	1.19
309			11.42												11.42	0.54
310	154.83					23.10	-		10.51				390.00	6.00	584.44	27.76
311			475.00												475.00	22.57
313											15.00				15.00	0.71
318						53.35									53.35	2.53
324					32.00				5.26			36.78	NA		74.04	3.52

Table 12 contd. . . .

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
328												9.20			9.20	0.44
331	19.50						20.00								39.50	1.88
332				7.00											7.00	0.33
339									5.20	7.65					12.85	0.61
354	5.00		25.38	11.10								70.00			86.10	4.09
356				NA											25.38	1.21
360										8.85					8.85	0.42
362							6.00								6.00	0.29
364			70.00	25.00									5.40		100.40	4.77
365			5.00												5.00	0.24
370				40.00											40.00	1.90
372											20.40				20.40	0.97
374	14.00		21.00	44.80			17.10							10.50	107.40	5.10
375					27.00										27.00	1.28
382														40.00	40.00	1.90
District Total	353.33	100.60	146.10	602.90	67.14	108.45	10.00	50.60	10.46	18.16	23.85	136.38	420.10	61.90	2104.97	100.00
District Percentage	16.79	4.78	6.94	22.64	3.19	4.91	0.48	2.40	0.50	0.86	1.13	6.48	19.96	2.64	100.0	-

Note : Projects with an outlay of Rs. 5 crores and above have been considered.

Source : Computed from data given in reference to Table 8.

National Industrial Classification (NIC-70)
Codes and Descriptions — An Extract

Industry Code Sub-Group	Description of Industry
201	Manufacture of dairy products
206	Manufacture and refining of sugar (vacum pan sugar factories)
231	Cotton spinning, weaving, shrinking, sanforizing, mercerising and finishing of cotton textiles in mills
232	Printing, dyeing and bleaching of cotton textiles
247	Spinning, weaving and finishing of other textiles, synthetic fibres, rayons, nylons etc.
248	Printing, dyeing and bleaching of synthetic textiles
280	Manufacture of pulp, paper and paper board (including newsprint)
290	Tanning, curing, finishing, embossing, and japanning of leather
291	Manufacture of footwear (excluding repair) except vulcanized or moulded rubber or plastic footwear
292	Manufacture of wearing apparel like coats, gloves, etc. of leather and substitutes of leather
293	Manufacture of leather consumer goods (other than apparel and footwear)
302	Manufacture of rubber products not elsewhere classified (except house furnishing)
304	Petroleum refineries
305	Manufacture of products of petroleum not elsewhere classified
310	Manufacture of basic and industrial, organic and inorganic chemicals and gases like acetalene, oxygen, nitrogen etc.
311	Manufacture of fertilizers and pesticides
312	Manufacture of paints, varnishes and lacquers etc.
313	Manufacture of drugs and medicines
316	Manufacture of turpentine, synthetic resins, plastic materials and synthetic fibres like nylon, terylene except glass

Industry Code Sub-Group	Description of Industry
318	Manufacture of explosives, ammunition and fireworks
319	Manufacture of chemical products not elsewhere classified (including photo-chemicals, sensitised films and paper)
324	Manufacture of cements, lime and plaster
328	Manufacture of asbestos cement and other cement products
331	Foundries for casting and forging iron and steel
332	Manufacture of ferro-alloys
339	Other non-ferrous metal industries
352	Manufacture of prime movers, boilers and steam generating plants such as diesel engines and parts
353	Industrial machinery for food and textile industries
354	Industrial machinery for other than food and textile industries
356	Manufacture, alteration and repair of general items of non-electrical machinery, components, equipment and accessories not elsewhere classified
360	Manufacture of electrical industrial machinery and apparatus and parts (such as electrical motors, generators, transformers, electromagnetic clutches and break etc.)
362	Manufacture of dry and wet batteries
364	Manufacture of radio and television transmitting and receiving sets including transistor-radio sets, sound reproducing and recording equipment including taperecorders, public address system, gramophone records and pre-recorded magnetic tapes, wire and wireless, telephone and telegraph equipment, signaling and detection equipment and apparatus, radar equipment and installations, parts and supplies specially used for electronic apparatus classified in this group
365	Manufacture and repair of radio-graphic x-ray apparatus and tubes and parts
366	Manufacture of electronic computers, control instruments and other equipment

Industry Code Sub-Group	Description of Industry
367	Manufacture of electronic components and accessories not elsewhere classified
369	Manufacture of electrical machinery, apparatus, appliances and supplies and parts not elsewhere classified
370	Ship building and repairing
372	Manufacture of railway wagons and coaches and parts
374	Manufacture of motor vehicles and parts
375	Manufacture of motor-cycles and scooters and parts
376	Manufacture of bicycles and cycle-rickshaws and parts
379	Manufacture of transport equipment and parts not elsewhere classified
382	Manufacture of watches and clocks.

'Instrumentalism' And Friedman's Methodology : A Brief Comment

S. Subramanian
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Lawrence Boland (1979) urges the view that Milton Friedman's proposed 'methodology of positive economics' (Friedman, 1953) ought to be seen primarily as advocating an 'instrumentalist' interpretation of theories. In particular, if a theory generates conclusions or predictions that are compatible with known facts, then such a theory is a useful instrument for a policy-oriented economist. As he puts it (Boland, 1979, pp. 508-509):

"So long as a theory does its intended job, there is no apparent need to argue in its favour (or in favour of any of its constituent parts.) For some policy-oriented economists, the intended job is the generation of true or successful predictions. In this case a theory's predictive success is always a sufficient argument in its favour. This view of the *role* of theories is called 'instrumentalism'. It says that theories are convenient and useful ways of (logically) generating what have turned out to be true (or successful) predictions or conclusions. Instrumentalism is the primary methodological point of view expressed in Friedman's essay.

...[I]f the object of building or choosing theories (or models of theories) is only to have a theory or model that provides true predictions or conclusions, a *priori* truth of the assumptions is not required *if* it is already known that the conclusions are true or acceptable by some conventionalist criterion. Thus theories do not have to be considered true statements about the nature of the world, but only convenient ways of systematically generating the already known 'true' conclusions."

In terms of this 'instrumentalist' defence of what Samuelson has called the 'F-twist', one presumes that for a 'policy-oriented economist' the truth of the conclusions generated by a theory is a sufficient argument in favour of the theory, precisely because such a theory then serves the purpose of initiating (rationalizable) policy interventions. But then an inescapable corollary to this proposition seems to be that one cannot any longer be indifferent to the realism or otherwise of the assumptions underlying a theory. The point is argued with the help of a simple example.

A widely-observed phenomenon in the context of Indian agriculture is that the rental share in crop-share tenancy arrangements displays a certain constancy at the value of one-half. Two alternative 'explanations' — which I shall call E_1 and E_2 — for this observed phenomenon are provided below.

E_1 : Output x is a random variable distributed with mean $\bar{x}$ and variance $v(x)$. The distribution is assumed to have the property that the mean and the variance coincide ($\bar{x} = v(x)$). The tenant is assumed to have a utility function defined over the mean and the variance of output: the utility function is assumed to be increasing in the mean and decreasing in the variance, and will be specialized to the form $u(\bar{x}, v(x)) = \bar{x} - v(x)$. If r is the rental share, the tenant's utility will be given by $u = (1-r)\bar{x} - (1-r)^2v(x) = \bar{x}(r-r^2)$ since $\bar{x} = v(x)$ by assumption. Assuming that the tenant is a utility-maximizer who has the power to determine the rental share, the choice of r which maximizes his utility (given by $\bar{x}(r-r^2)$) can easily be seen to be given by $r = 1/2$.

E_2 : Output x is assumed to be an increasing, strictly concave and indefinitely differentiable function of the amount of labour (L) inputted, and will, in fact, be taken to be represented by the specialized form $x(L) = L^{1/2}$. The tenant's opportunity cost of labour is w per unit of labour, and if r is the rental share, the tenant's surplus is given by $s = (1-r)x(L) - wL = (1-r)L^{1/2} - wL$. It is easily verified that the tenant's surplus-maximizing choice of L is given by $\bar{L} = ((1-r)/2w)^2$, so that the optimal level of output will be given by $x(\bar{L}) = (1-r)/2w$. The land-

lord's surplus is then, clearly, $r(1-r)/2w$; if the landlord is assumed to have the power of determining the rental share, and if he is credited with profit-maximizing behaviour, then clearly his surplus $r(1-r)/2w$ will be maximized through a choice of r equal to one-half.

Let us suppose now that E_1 is the 'true' explanation of the observed phenomenon of a rental share of one-half. Note, however, that E_2 'predicts' as well as E_1 . If now a policy-maker proceeds on the presumed 'truth' of E_2 and decides that profit-maximizing landlords can afford a squeeze in their unearned surpluses, he may be guided to legislate a statutory rental share of, say, one-fourth, with a view to offering tenants a 'better deal'. In terms of what is actually 'happening on the ground' however, the only effect of this policy will be to force tenants to a lower level of utility (at $r = 1/2$, the tenant's utility is $\bar{x}/4$, while at $r = 1/4$, the tenant's utility declines to $3\bar{x}/16$). Briefly, a static theory of profit-maximizing landlords (E_2) 'predicts' as well as a dynamic theory of utility-maximizing tenants (E_1). Rationalization, on the grounds of E_2 , of a policy-intervention intended to make certain agents better off, only succeeds in rendering them worse off (when E_1 is the 'true' explanation). In the face of this, how does one maintain — particularly if one is adopting an instrumentalist position — indifference to the realism or otherwise of the assumptions of a theory?

It can be objected that the example above achieves its ends simply by placing too restrictive an interpretation on the notion of 'prediction'. A theory must be construed to fail the 'predictive test' — it may be argued — if policies based on it generate outcomes that

were unintended, or are incompatible with other conclusions that may come to light after the policy has been implemented. In this sense, E_2 in the example discussed above must be deemed a failure. (But note also that the failure is a product of indifference to the realism or otherwise of the assumptions underlying the theory; and it is a moot point whether an economy can be expected to bear the costs of possibly repeated failures within such a heuristic approach.) However, by assigning a much broader scope to the notion of 'predictive success' one must strain the possibilities of coincidence in order to accommodate a multiplicity of theories (based on 'false' assumptions) which precisely replicate each other's true predictions. In the context of the example discussed earlier, if the set of 'known true conclusions' is restricted to the single observation that the rental share is one-half, then both E_1 and E_2 are eligible for being regarded as satisfactory theories; but if the set of 'known

true conclusions' is expanded to admit the observation that tenants do not favour a rental share of less than one-half, then E_2 drops out as an eligible theory. In other words, considerations of probability must dictate that when theories are whittled away, one by one, owing to failure of the 'predictive test' — when the scope of the latter is not just confined to a few 'immediate' implications — then the tendency *must* be toward a unique theory which is based on realistic assumptions.

To summarize: if the predictive test of a theory is a 'narrow' one, then a theory based on unrealistic assumptions might pass it — but at the cost of initiating policies that have unintended (and presumably undesirable) outcomes; if the predictive test is a 'broad' one, then the possibility that a theory based on unrealistic assumptions will survive it is weak. The share-cropping example discussed in this note highlights both aspects of the problem.

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- Boland, L. A. (1979). 'A Critique of Friedman's Critics', *Journal of Economic Literature*, Vol. XVII, 503-522.
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Publication abstracts*

R. N. Poduval : Agricultural growth and equity

Working Paper No. 84, June 1988, pp. 31

That rapid agricultural growth can be combined with an equitable distribution of the benefits of such growth is illustrated by the experience of two South East Asian countries, Taiwan and South Korea, referred to as Newly Industrialising Countries (NIC) which is sharply contrasted that of India. It is instructive to probe into this development in these two countries as they provide some object lessons to other developing countries.

In the first place, both Taiwan and South Korea resorted to sweeping land reforms during the early fifties which eliminated great disparities in asset ownership. Economic growth, particularly, agricultural growth, took place, therefore, on an improved distribution of income, Kuznet's hypothesis of inequality to accentuate in the early process of economic development did not take place in these two countries.

Second, agricultural policies pursued since independence from Japanese occupation in 1945 contributed significantly to distribution of the benefits of growth. The type of technology adopted in agriculture such as the adoption of high yielding varieties, greater use of fertilizers and irrigation which increased agricultural productivity was land-saving rather than labour-saving. Third, the promotion of decentralized medium and small industries in rural areas, particularly in Taiwan, contributed greatly to off-farm employment. Fourth, the early spread of education enabled a wide segment of population in Taiwan and South Korea (the literacy rate at present is above 90 per cent in both countries to participate in the rapidly expanding manufacturing sector since the mid sixties. In view of the paucity of natural resources, both countries had to industrialize; but the pattern of industrialization was labour — intensive and export-oriented.

The agricultural growth rate in Taiwan and South Korea between 1960 and 1970 was 5.1 and 4.4 per cent per annum respectively while the Gini

co-efficient of inequality of income distribution declined from 0.5 in early 1950s to 0.27 in 1976-78 in Taiwan and in South Korea from 0.34 in 1964 to 0.33 in 1970 but showing a slight rise to 0.38 in 1976-78. It has been said that Taiwan has the lowest Gini co-efficient of inequality in income-distribution among the developing countries.

Neither in respect of over-all growth nor in respect of agricultural growth does the Indian experience compare favourably with that of Taiwan and South Korea. The acceleration of agricultural growth in India, particularly that of food grains, took place only with the seed-fertilizer-irrigation technology from the mid-sixties. It has to be borne in mind that while India has a sub-continental economy, the economies of Taiwan and South Korea have been small. In a sub-continental economy such as that of India, there are wide variations in output growth as between regions (ranging from 6.1 per cent per annum in Punjab to 1.3 per cent per annum in Orissa between 1967-68 and 1984-85). Nor has the growth rate in India been a sustained one. There have been marked fluctuations in agricultural output from year to year around a rising trend. Moreover, unlike in Taiwan and South Korea, multiple cropping which contributes so much to labour-absorption, has not made any significant headway in India.

It is in respect of structural changes that the experience of India has been markedly different from that of Taiwan and South Korea. Unlike in Taiwan and South Korea, land ownership is unequally distributed in India due to ineffective enforcement of land ceilings and tenancy legislation. The concentration ratio of household land ownership which was

0.73 in 1961-62, had declined only 0.71 in 1982 (37th round of NSS). This may be compared to the very low co-efficient of inequality in income distribution in Taiwan and South Korea. It may be mentioned that the kind of agricultural development deemed feasible by Indian planners has been growth without radical institutional change. The distribution of the gains from development has, therefore, been unequal in India.

While there has been to some extent a "trickling down" of the benefits from the adoption of the new technology, it has not been significant as the agricultural growth rate has not been high enough nor sustained enough. Hence growth has had to be supplemented by special programmes to increase the ability of small and marginal farmers to benefit from improved technology. This applies equally to employment generation.

Nor has India the kind of skilled labour or the work ethic which is to be found in South Korea and Taiwan. India has to go a long way in catching up with these two countries in this respect.

V. Chandrasekara Naidu : Some Aspects of Agro-economic Transformation in Tamil Nadu — A case study of Enathimelpakkam Village

Working Paper No. 86, September 1988, pp. 158

Enathimelpakkam is a small revenue village located 50 kilometres north of Madras city in the Gummidipundi Taluk of Chingleput district, Tamilnadu. Compared to any other village in the taluk Enathimelpakkam received greater financial assistance from the State government both for its household beneficiary and area development programmes in

* Abstracts of the publications brought out in the Institute from June 1988 to October 1989

the early 80s. However, the state intervention in village development had largely benefited the groups of agricultural labourers (who are provided with pucca houses and livestock either free of cost or at subsidised prices) and bigger farmers (who are provided with low cost credit for the purchase of tractors and pumpsets) leaving behind all other groups such as small and marginal farmers, pure tenants and artisanal and services households.

The state intervention coupled with the availability of ground water had completely transformed its (village) traditional agriculture (cultivation of traditional varieties of paddy based on traditional techniques) into a modern agriculture (introduction of seed-water-fertilizer-technologies) based on pumpset irrigation and tractorisation. The modernisation of agriculture which pushed up the intensive cultivation of paddy and its yield rates had almost doubled the total agricultural production of the village between 1970-71 and 1985-86. The increased intensity of cropping while leading to the increased employment of casual agricultural labourers especially that of females also led to the declines in the employment of permanent farm servants, cowherds and artisans. Whereas the tractorisation had substituted the human and bullock labour employed in some of the important operations such as ploughing, transportation and threshing, the privatisation of irrigation through pumpsets has increased the hold of the owners (of pumpsets) on non-owners belonging especially to the small and marginal farmers and pure tenant groups in the village. Further, given the skewed distribution of land ownership in the village in favour of a few bigger farmers, the introduction of modern technologies in

agriculture only led to the increased concentration of incomes in a few hands. And the surplus incomes earned by a few were very much reinvested on further accumulation of agricultural assets and incomes rather than invested on any non-agricultural occupations which could have increased the employment opportunities for the poor in the village. Any how, the modernisation of agriculture which tied up many poor households to land for their maintenance had prevented them from making use of non-agricultural occupations available even outside the village. But the state intervention in individual households development had enabled many poor households to make better use of common property resources available not only in their own village but also in the neighbouring village.

The modernisation of agriculture not only pushed up the per acre costs of cultivation of paddy which is a major crop in the village but also pushed up (almost doubled) the rent charged per acre per year. Consequently, the net incomes earned from an acre of paddy cultivation especially by the small and marginal farmers and poor tenants had declined.

The increased employment opportunities provided by the modernised agriculture had largely benefited the migrant agricultural labourers rather than local or resident casual agricultural labourers. The increased demand for labour especially for some peak agricultural operations gave rise to small tenancies involving agricultural labourers rather than large tenancies involving pure tenants in the village. Consequently, there emerged the interlinkage of different markets which worked very much against the poor and in favour

of the rich. The generation of large marketable surpluses of paddy has enabled the big merchant capital to penetrate into the village economy and work against the poor peasants who depended on it (capital) to meet their increased costs of cultivation.

Despite modernisation of agriculture and state intervention the different types (absolute, abject, relative and intensive) levels of poverty prevailing among the population of the village 1985-86 were all higher compared to the similar figures available for rural Tamil Nadu for an earlier year of 1983. Thus, while the technical objective of increasing food production has been realised by the modernisation of agriculture the social objective of alleviating poverty remains to be achieved.

Malcolm S. Adiseshiah : Mid Year Review of the Economy 1988-89.

Working Paper No. 87, October 1988, pp. 180

The 1988-89 Review of the Economy forms the outline of the previous years. A brief summary of the 1988-89 prospects for the economy is attempted. The current year, 1988-89 will be, should be a year of rehabilitation of the agricultural sector, which declined —5.5 per cent, and the foodgrains production subsector by at least 12 percentage points in 1987-88, the drought year. In 1988-89 there will be a bounce back in agriculture and foodgrains production — as not a single one of the 15 meteorological districts has not had an over abundance of rainfall. In the euphoria that is caused by this bounty, and the bounce back of agriculture, it must not be forgotten

that 1988-89 should be a year of consolidation and repair — to consolidate and build into our plans — annual, five year and perspective — that drought is now the normal conditions facing our agriculture.

For industry, particularly the manufacturing sector, 1987-88 recorded a slow down from the 9 per cent growth in 1986-87 to 7.6 per cent. The effect of the drought particularly on manufacturing raw material and the rural demand for manufactures will be felt in 1988-89 and may result in some further slowing of its growth.

The infrastructural sector will display a mixed record. Because of the bounteous monsoon, the hydel reservoirs this year are full and hydel power generation will, after a 3 year gap, make an important contribution to meeting the power demands of agriculture and industry. Coal supplies will be adequate, except in the matter of coking coal. Transportation — both railways and road — will expand during the year. It is in regard to crude that the prospect is daunting: domestic production has hit a plateau of 32 million tonnes for the past two years, while domestic demand is increasing rapidly at over 42 million tonnes, involving a foreign exchange outgo in importing crude and petroleum products of Rs. 4500 crores to Rs. 5000 crores a year. There is need to cutback on crude consumption.

The price situation is not comfortable. 1987-88 recorded a 10.4 per cent rise in the wholesale prices index and from 8.2 to 14.8 per cent in the consumer price index. While a good agricultural harvest will improve the supply side on the price equation in 1988-89, the demand side represented by bank credit,

fuelled by the very large deficit in the 1988-89 budget and the increase in government's consumption expenditure will exert an upward pressure. However, if the liquidity of the economy is curbed, wholesale prices should not rise above 9 per cent and consumer prices at 8-9 per cent during 1988-89.

CSO has revised the national accounts and related data, using 1980-81 as the base year, and introducing some needed methodological changes. One disturbing result of this revision is that the country's net savings has fallen to 12-13 per cent of the Net Domestic Product. With large scale capital destruction involved in the 1988-89 floods, and the heavy consumption of capital pushed forward by 1987-88 drought, the net savings in 1988-89 will continue at this low level of 12-13 per cent of NDP. This is inadequate to finance the investment in agriculture and allied industries like irrigation and in power and manufacturing, so that in 1988-89 the resource crunch will continue and worsen.

Another area of concern in 1988-89 is the growing large trade imbalance which is now touching Rs. 10,000 crores, with the balance of payments showing a negative Rs. 6,000 crores. This along with the sharp fall in our foreign exchange reserves is going to force government to cut back on imports, including capital goods imports which have been surging over the last 2 years. Exports will be given further incentives and concessions, but its rate and volume of expansion will not be adequate to keep down the heavy deficits in trade and balance of payments.

On the basis of the bounce back in agriculture and the good performance in power and infrastructure generally, even with the slight tailing off of

industrial growth, the overall growth of the economy in 1988-89 will be 8-9 per cent. This is on the low 1987-88 base of 2.5 per cent, which if corrected will make the 1988-89 growth nearer 4 to 5 per cent.

What does all this mean to the three crucial problems of employment, poverty and inequality?.. 1988-89 ought to rehabilitate in employment to some extent the massive under-employment and unemployment caused by the drought in 1987-88. Similarly, the agriculture and beneficiary oriented programmes should in 1988-89 pull up the millions of families which were at or above the poverty line, and which plunged below it as a result of the drought. They should be given the assistance to be self-supporting and rise above the poverty levels. The inequality situation — both in rural areas (as recorded by RBI's All India Debt and investment survey 1980-81 and as reflected in the lack of land reforms) and in the urban industrial area as reflected in the movements of the stock exchange and capital market will unfortunately continue unchanged.

Paul P. Appasamy : Managing Pollution in the Waterways of Madras City — An initial Assessment.

Working Paper No. 88, March 1989, pp. 175

The rapid growth of Madras City has led to a gradual deterioration of the natural environment. Urban services have been unable to cope with the escalating demand, resulting in the pollution of air, land and water. In particular, the waterways of Madras have been grossly polluted by sewage, sullage, garbage and assorted urban

wastes rendering them unfit for any beneficial use. The pollution of the waterways has damaged the estuarine ecosystems, has endangered public health, and has made the waterways a liability rather than an asset. Reversing the damage caused by pollution will enhance the quality of life in Madras. The sources and extent of pollution, and the measures that can be taken to clean the waterways are the major topics discussed in the working paper.

The Working Paper has two major sections: Section A is an empirical enquiry into the problem of pollution of the waterways — the sources, levels, and the long-term ecological and health impact of pollution. Section B is an outline of planning methodology for the control of pollution, and an appraisal of the current efforts by the government to clean the waterways. The role of public interest groups in raising environmental awareness, and in stimulating governmental action is also discussed.

The major recommendation of the study is that the focus of management must be on controlling wastes from entering the waterways. All other management measures such as flood control, recreation, and navigation must be accorded a lower priority. Secondly, suggestions have been made regarding an appropriate institutional framework for controlling pollution of the waterways. Lastly, the importance of public participation in the planning process is highlighted. Voluntary agencies can play a "watch-dog" role, as well as enlisting the cooperation of the public in reducing pollution. Cleaning the waterways is expensive and complex, but there are significant benefits for current and future residents of Madras.

D. Jayaraj : Determinants of Rural Non-Agricultural Employment

Working Paper No. 90, June 1989, pp. 38

This paper "Determinants of Rural Non-agricultural Employment" is divided into the two sections. Section I analyses the impact of factors external to the rural economy that causes the growth of non-agricultural employment of male workers for Tamilnadu at taluk level. Of the factors external to the rural economy, urbanisation is thought to be the most important factor. Urbanisation has two types of impact on the rural non-agricultural employment namely (1) spread effect and (2) push effect. Spread effect implies that growth of urban centres leads to increase in demand for goods and services of rural origin and also leads to the growth of activities in the adjacent rural areas, auxiliary to the industrial activities in the urban centres. As urbanisation proceeds workers who get employed in urban centres may prefer to reside in the urban periphery or rural areas while pursuing employment in the urban centres due to congestion and bad living conditions in the urban centres and availability of better transportation facilities. The above mentioned effect is referred to as push effect. But with the available data, it is not possible to disentangle the effect of urbanisation into (1) spread and (2) push effects. Hence the total impact of urbanisation on non-agricultural employment is analysed.

We have fitted the function of the following form :

$$\log Y = a + b \log X + U_t$$

Where Y is the percentage of male workers in non-agricultural employment, X is the percentage of population in the urban areas, a is intercept, b is elasticity and U_t is random error term.

Further to study the impact of change in degree of urbanisation on change in non-agricultural employment, function of the following form has been fitted:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + U_t$$

Where Y is the percentage point change in non-agricultural employment between 1961 and 1981, X_1 is the percentage point change in degree of urbanisation between 1961 and 1981, X_2 is the degree of urbanisation in the base year 1961, X_3 is the level of non-agricultural employment in the base year, a is intercept and b_1 to b_3 are slope co-efficients.

We have grouped the taluks into 3 groups based on the degree of urbanisation in the base year and fitted the same function for the three groups of taluks separately, to study if there is any difference in the impact of change in urbanisation between groups.

• Section II analyses the impact of both external and internal factors that affect non-agricultural employment such as degree of urbanisation, degree of commercialisation of agriculture, level of output and distribution of income. Of these four variables the last three variables are internal to the rural economy. In analysing the impact of all factors, it has been identified that literacy also influences the growth of non-agricultural employment.

Further it has not been possible to get either data on distribution of income or the proxy for the distribution of income in the rural area.

Hence the following function has been fitted,

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + U_t$$

Where X_1 is degree of urbanisation, X_2 is percapita gross cropped area, X_3 is

the proportion of gross cropped area irrigated, X_4 is the Gini ratio of land holdings, X_5 is the percentage of area irrigated by wells to total irrigated area. Percapita gross cropped area and proportion of area irrigated are used as proxies for percapita output of rural population. While percentage of area irrigated by wells to total irrigated area and concentration of land holdings have been used as proxies for degree of commercialisation.

From the analysis, it has been identified that degree of urbanisation has significant positive impact on rural non-agricultural employment. Of the factors internal to the rural economy, those variables used to capture the impact of level of income (i. e. proxies for percapita output) turned out to be insignificant. Literacy has been found to have positive and significant impact on rural non-agricultural employment, which needs further probing.

D. Jayaraj : Rural Non-Farm Employment: An analysis of the Village level data for Tamil Nadu.

Working Paper No. 91, July 1989, pp. 34.

This paper "Rural Non-agricultural Employment: An Analysis of the Village Level Data for Tamilnadu" explores the impact on non-agricultural employment of male workers of (1) proximity of villages to urban centres of different sizes and functional classifications which could not be analysed satisfactorily in the earlier paper (working paper No. 90) (2) agrarian distress reflected by poor land-man ratio and poor irrigation (3) prosperity of cultivator households and agrarian transformation and (4) literacy is tested at the village level to see if the

results obtained at the taluk level in the earlier analysis holds good at the village level too or is it due to aggregation.

For this purpose 8 taluks of different agro-climatic regions based on the development of non-farm sector have been selected. All villages that belong to these 8 taluks are considered in our analysis. It has been identified that there are 890 villages, some of which are uninhabited or partially in-habited. These uninhabited and partially in-habited villages are omitted from the analysis. Thus 830 villages that are around of different towns have been considered as our sample. Data for the year 1981 have been collected for these different villages, from various 'District Census Hand books Part XIII A and Part XIII B of Tamil Nadu.

For identifying the significance of the impact of various factors on the level of non-agricultural employment across villages around different towns, function of the following form has been fitted

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7D + U$$

Where Y is percentage of male workers in non-agricultural employment to total male workers, X_1 is the distance from the villages to the nearest town, X_2 is level of literacy (defined as percentage males literate to total males), X_3 is gross cropped area per male cultivator used as proxy for level of income or output per cultivator households across villages, X_4 is gross cropped area per rural population (village population), X_5 is proportion of gross cropped area irrigated, X_6 is percentage of gross cropped area irrigated by wells to gross cropped area irrigated, D is dummy variable incorporated for identifying the impact of accessibility to villages and U is random error term. In this function X_3 and X_4

are proxied for prosperity of cultivator households and agrarian transformation and X_4 and X_5 are proxies for agrarian distress.

Stepwise regression technique has been adopted to estimate the hypothesised relationship. From the estimated functions it has been identified that proximity (ie) distance from the village to the nearest town has been found to be significant for the villages around six of the 9 selected towns. Agrarian distress captured by gross cropped area per rural population has been found to be significant for villages around 5 towns. In eight regression equation literacy has been found to be significant. Prosperity of cultivator households has been found to be significant in three equations.

Further, we have pooled the data and estimated the above function with dummies for towns of different sizes and functional classifications to which the selected villages are closer. And also polynomial function of second degree (quadratic) in certain variables has been fitted. The results indicate that both size of towns and functional classification of the towns to which the villages are closer has significant impact. Further the non-linear function yields better results. The implications of these results and area of further research are discussed in the paper.

Malcolm S. Adiseshiah : Mid year Review of the Economy 1989-90.

Working Paper No. 92, October 1989, pp. 127.

The mid year review of the economy 1989-90 followed a different format because of the criticism of the official

data for agriculture and industry. The review therefore concentrated on reviews of the policies and programmes.

Looking at 1988-89 and the perspectives for 1989-90, some plus and minus points are recorded in the mid year review for 1989-90.

On the positive side, both years have had recorded exceptionally bountiful south west monsoons, and as a result the economy in 1988-89 has registered an estimated 9 per cent rate of growth (which in part reflects the low growth level of 3.6 per cent in (1987-88), and the 1989-90 seems set to build on that to achieve a growth rate of 5 to 5.5 per cent. The high 1988-89 growth rate (the low base apart) is primarily due to the exceptionally high 18.8 per cent in the rate of agricultural growth, mainly traceable to the good monsoon and the growth rate of over 20 per cent of foodgrains production (at an estimated 172 million tonnes). For 1989-90 following the repeat of the good monsoon, the agricultural growth rate is forecast at 4 per cent and the foodgrains production predicted at 185 million tonnes, which would give a growth rate of 6-8 per cent for the latter.

The other positive feature of the 2 years is that with regard the development of industry. For 1988-89 the official index of industrial growth is 8.8 per cent, with manufacturing registering 8.9 per cent. For 1989-90, the growth rate of industry is forecast to rise further to 9 to 9.5 per cent, with manufactures growing at 9.3 per cent and electricity at a record 12.0 per cent.

Another plus point is that agricultural policy has at last begun to plan for drought. The two good monsoon years have not produced the usual euphoria

about the future. The irrigation advancement plant, the division of the agricultural economy into 15 agro climatic regions grouping together some 300 smaller sector regions, and the water sheds programme are the means of countering the worst affects of future droughts and also means of augmenting food and non food crops as a step of moving in the Eighth Plan to letting each local body do the agricultural planning, target setting and execution. This area specific approach to planning and execution applies to all sectors — agriculture and manufactures of the economy.

Among the cash crops, the record 1988-89 output of 17.8 million tonnes of oilseeds is forecast to be followed by a higher yield of 20 million tonnes in 1989-90, basically due to the good rains, but also due to the technology mission which readied the farmers and suppliers of inputs to turn the monsoon to good account. Now the country cannot only stop the costly edible oil imports in 1989-90, it is also emerging as a major exporter of oilseed cakes and other oil seed production.

The negative side of the two years 1988-89 and 1989-90 is equally disturbing. The most worrisome minus point is that all this increased activity in the economy, in agriculture, in industry has not sensibly made a dent on the problem of our mass poverty. The latest information set forth in the review shows that in 1988, 40 per cent of the people, that is over 320 million men, women and children, were living in poverty, with about half of them living in dire poverty. The most disturbing situation is in Central and East India comprising the states of Madhya Pradesh, Rajasthan, UP, Bihar, Orissa, West Bengal, and Assam where poverty levels are 40-50 per

cent of their populations, with a disturbing degree of stagnation or regression among the very poor.

Related to this is the indication that employment generation is slow, in both the organised and unorganised sector, with an actual fall in employment rates in the private sector.

This latter, along with the organised (Factory) sector generally which have recorded high rates of growth as referred to earlier is characterised by capital intensive, import guzzling technologies, with the most impressive growth being in the consumers goods and durable consumer goods sectors, which meets the fast growing demand of the upper middle classes for these goods. In other words, the industrial policy reforms termed liberalisation (both with regard to internal regulations and imports) are accompanied by high growth rates — which are not reflected in employment or any improvement in the levels of living of the poor.

Another pressure point in the last four years, which is forecast to widen and worsen is the deficit in foreign trade, and our export earnings not being able to service our mounting foreign debt, along with the deepening and widening of our negative balance of payments which for 1989-90 is forecast to be only slightly below the high —Rs. 7000 crores in 1988-89. The outflow from our foreign exchange reserves has reached a point, where the reserves in 1989-90 will cover hardly 3 months of imports.

One troubling feature of the good agricultural performance in 1989-90 and also that anticipated for 1989-90 is the very poor procurement by public

procurement agencies of foodgrains. Why foodgrains are being held back by traders, and farmers despite the record harvests for 2 years, and the rising procurement prices needs investigation and corrective action. For the buffer stock which is needed to meet the future year's drought, it is now as at June 30, 1989 down to 6 million tonnes of wheat and 3.4 million tonnes of rice, which ought to be a total 22 million tonnes for the buffer and operational stock purposes, according to agreed norms.

The price situation is equally disturbing. For 1989-90 the whole sale price index is forecast to rise to 9 per cent on top of the rise of 5 per cent already registered in 1988-89. The consumer price index is also anticipated to rise to 8 per cent in 1989-90 being one of the rare occasions when its rise is expected to be 1 percentage point lower than the rise in wholesale price index. This is on top of the consumer price index rise of 8.6 per cent in 1988-89. One disturbing feature of the inflationary situation is that the major price rises are recorded for 1988-89 and the first quarter of 1989-90 in the foodgrains and food articles group, impinging heavily on the poor. A major cause of the inflation, (as of the deficit balance of payments) is the continuing and heavy revenue deficit financing of the government, on which there seems to be no let up in the current year. Thus at this mid year point the minuses outweigh the pluses for 1989-90, particularly in a decelerating industrial growth rate, poor performance of infrastructure, declining foreign exchange reserves and a growing budget deficit.

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MADRAS INSTITUTE
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The Institute was founded by Dr. Malcolm S. Adiseshiah in 1971 and reconstituted in 1977 as National Research Institute within the framework of the Indian Council of Social Science Research, New Delhi.

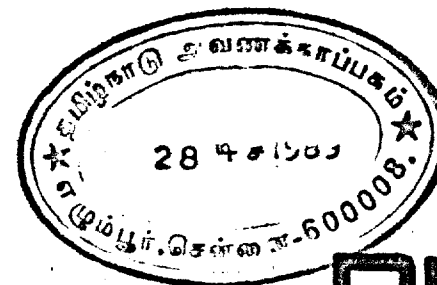
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Industrial Perspectives in Tamil Nadu — A Report

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EDITORIAL - SOME HIGHLIGHTS

I. General Economic Scene

State

VIII Plan

There was a meeting of the Planning Commission in mid October with the Chairman, the chief minister in the chair, when the report of the taskforce on power was reviewed in detail. It was agreed that the increasing deficit and subsidies from the state which are increasing to over Rs. 160 crores a year and with no decline in sight should be reversed. It was therefore agreed that the tariff for agriculture should be gradually raised to cover atleast the cost of the additional inputs of the Tamil Nadu Electricity Board, and that the tariff for industrial and domestic users should be raised. In addition there is to be a decision by the government on the proposal from the task force to levy on electricity tax as a kind of sales tax on the consumers as is done by a number of other states. Also the need for ensuring that the VIII Plan provides for 4 essentials —

a primary school in 1400 villages which do not have one within 1 km, the additional 500 odd sub centres and PHCs needed, the midday meal scheme as well as the supply of school uniforms and footwear for the children, and the provisions needed for the public distribution system. It was agreed that some additional resources raising measures like the levy of school fees on students from the well to do families should be undertaken.

Climate and Prices

The weather in October has been rather unusual. There were rains in central and southern parts of the state, but the northern part, particularly Madras, which badly needs rains, has had no rains of a monsoon character. In fact the metereologists had forecast two storms sweeping over the northern part of Tamil Nadu before October 20, but till near the end of the month, the weather which was warm (in fact on some days, the temperature neared the

40s the heart of summer months) and dry spell began to get some monsoonist showers. If the monsoon does not gather force in the last days of October and in all of November, Madras city will face a very serious drinking water problem as will be presently referred to. With regard to prices, CSO's monthly abstract for July reports that the index number of consumer prices for industrial workers recorded a decline by 5 points to 833 in April over the March index, the index number of consumer prices for agricultural labourers rose by 10 points in April compared to March at 695 (it will be noted that the rural inflation rate is always higher and in April sharply higher than the urban rate), and the index numbers of consumer prices for urban non manual employees show a remarkable stability in May at 1 point rose each in Madras to 147, in Coimbatore to 142, and in Salem to 140 and two point rise each in Madurai and in Tiruchirapalli to 145 each.

Power

The power situation in the state in October was normal. With the last unit of Ramagundam being synchronised in mid October, (about three months ahead of schedule) and like the current 22 per cent of power generation of 470 MW made available for Tamil Nadu, the additional 500 MW would similarly benefit Tamil Nadu. The Kalpakkam unit states that the two units of 235 MW each will soon be functioning at 75 per cent capacity, up from the current 50 per cent (90 - 95 MW). The long term Kalpakkam plan is to operate the 2 units at 75 per cent capacity for the next 6 months and with some modifications to be made in June 1990, the two reactors will work to full capacity.

The Indo-Soviet working group on nuclear power reports that arrangements are being made for the Soviet assisted nuclear power plant at Koodankulam (with two 1000 MW each) to become operational by December 1998. Neyveli Lignite Corporation and the government have agreed on the payment by the Corporation of royalty from 1976 at Rs. 2 to 3 crores per annum. Neyveli states that it will generate another 1050 MW in the VIII Plan in addition to the present 1250 MW, involving a total investment of Rs. 3400 crores, of which Rs. 500 crores will be generated internally. It awaits Union government clearance of this investment.

For the country as a whole, October marked an improvement in the power situation. In Andhra Pradesh the power cut on HT consumers has been lifted. Kerala has once more become a power surplus state, as its hydro electric reservoirs have reached 90 per cent capacity and has agreed to provide Karnataka with power on an exchange and loan basis: it will sell 200 MU to Tamil Nadu. While Andhra Pradesh will be exceeding its power target reaching 975 MW against the VII Plan target of 838 MW, through the advanced commissioning of units III and IV of the Vijayawada plant, Karnataka has had to increase its power cut on HT user by 5 per cent from November 7. The overall power position in the northern region during 1988-89 was good, as its shortage was less than 6 per cent, but the western region did even better with a lower shortage of around 2.5 per cent. NTPC has done very well in 1988-89 with a capacity of 7718 MW which is 12.9 per cent of total generation and a PLF of 68.4 per cent against the national average of 55 per cent, along with the pioneering of the launching of the 2 gas based turbine units based on

combined cycle technology. Its capacity is to go up by 11,150 MW in the VIII Plan. It faces some operational constraints due to low capacity coal, and a growing backlog of dues from the state power boards. But the most serious problem is that its important gas based projects are located in the north near Delhi and in Gujarat leaving the power starved south — Tamil Nadu and Karnataka, as well as Kerala and AP in most years — without any relief. This needs correction. One sound development in that 5 power project which were stated to be completed in the VIII Plan are being completed before the end of the current VII Plan which reduces the short fall to 645 MW. On the other hand, nuclear power generation received a set back during the first half of 1989 when it declined by 44 per cent compared to that period in the previous year. In April-September 1989 nuclear power generation was 1.93 billion units against 3.47 billion units in April-September 1988. Also its PLF came down from 64.2 per cent to 35.4 per cent. It is the good power generation by thermal and hydel plants which account for the increase of 11.6 per cent (117.34 bu) in the first half of the current financial year. Overall there are 2 directions of improvement. First, REC should be vested with the responsibility of operating small hydel projects, starting with the small, mini, micro hydel projects entrusted to it as a pilot project. This opens up a new source of supply. Second, there is the government announcement that it will be drawing 28 per cent of the country's energy requirement through non conventional sources. The government has been saying this for three years, but now it should act on it, not only to increase the country's energy supply but to correct the skewness of energy consumption. 20 per cent

of the population who live in urban areas consume 80 per cent of power and so the new sources — solar, wind, thermal, biomass are one means of correcting the imbalances. Also there is urgent need to put into operation the programme of energy conservation and cut back on wastage of energy by industry of 10 per cent of the generation which is the equivalent of Rs. 7800 crores. This would also be another means of correcting the rural urban skewness.

Water

The most serious event in October was the dropping of the water level in the Red Hills reservoir below its dead storage level, which means that all 3 of the city's drinking water reservoirs — Poondi, Sholavaram and Red Hills — have gone dry. In small pools, Red Hills has 273 million cubic feet (mcft) of water. Metro water is engaged round the clock in reaching all the pools by digging canal across the reservoirs bed so that even the last drop of water is pumped into the mains. A 50 per cent cut has been imposed in the water supply to industries and bulk consumers like ICF, Port Trust, Southern Railways, General Hospital etc. are requested to save water consumption. Also for the first time Metro water is trying the efficacy of a check dam system. Till now this was used in the irrigation system. The check dam project is part of the World Bank credit package of schemes for metro water, under which a chain of 5 check dams have been planned on the Kortalaiyar river bed at a cost of Rs. 6.75 crores. They will help recharge the Tamarapakkam and Flood Plains well fields fully. The 5 check dams are located at Valliyur,

Athango, Kavanoor, Almjavakkar, Janappan, Chathram and Jayannathapuram using also the Tamaraipakkam and Vallur anicuts. Other programmes to help the Madras city water supply include the Telugu Ganga project which will bring water to Madras by March 1993 and the project for directing the west flowing waters of Kerala for Tamil Nadu's drinking water and irrigation on which Kerala team of officials have held useful discussions with their counterparts in Tamil Nadu. Further under the Technology mission on drinking water, two desalination plants are being set up in state as part of the 20 plants scheme for the state. In all 9 plants are being set up at Ramanathapuram, and 9 in South Arcot at a cost of Rs. 2 crores. The Union government has also allotted 23 iron removal plants and 15 deflouridisation plants in state and also the installing of a solar photo voltaic pumping system. Meanwhile the dismantling of TEAM's desalination plant on Marine beach (see Vol XVIII pp 246 & 529) because the government has refused to renew its land is to be regretted, as it ends a potential source of water supply from the area to the city. TWAD has been directed to draw up detailed plans for the augmentation of water supply in partially covered habitations, of which there are more than 16,000. These habitations have been brought under potable water supply coverage, but in which there has not been adequate potable water for many reasons like failure of water source. Increase of water supply will be taken up in the second stage, after 64,000 habitations in the state are provided water. It is reported that there were 10,323 habitations uncovered at the start of the year. 7168 habitations are to be covered this year and the rest in the first 3 months (June 1990) of next year.

Effluent control

The cyanide poisoning of 8 buffaloes referred to in the last issue has woken up the government and its pollution control agencies. Environmental and consumer agencies are urging the government to establish strict control over a) toxic substances used by industries and b) their disposal. The Tamil Nadu Pollution Control Board is the agency which should act. In addition the government set up in 1981 a high power committee headed by Dr. Shantappa to go into the safety aspects of hazardous chemical industries. The committee should be revived and given specific terms of reference and a dead line for its report, and in the meanwhile the dumping of hazardous wastes should be carefully monitored.

Transportation

The southern railway announced the passenger amenities in the railway stations on the Madras - Tiruvellore section are being upgraded at a cost of Rs. 87 lakhs. These involve improvement to station building, extension of platforms shelters and construction of over bridges. PTC reports that it is reorganising its operations from October 1, which had to be reviewed and returned to the original schedule because of the reaction of the public. It also reports that it has increased its income without increasing its fares, in fact despite its reduction of the fare.

Welfare

The state is facing a problem in regard to its rice supply for its PDS, particularly as the union government has announced that the rice allotment will be cut by 50 per cent from mid November and

even more, that the allotment will be linked to the procurement of the state — which will make the total supply available even more limited. The government also announced that all those entitled to the free rice scheme of whom there were 80 lakh persons will also be given dhoties and saris as pledged in the government's election manifesto.

National

Plan

With announcement of general elections to the Lok Sabha during the third week of November, there is a pause in the preparation / formulation of the VIII Plan. Even the Approach Paper whose outline has been set forth in the last four issues of the Bulletin (see Vol XIX pp 337, 401, 463 and November issue), has not been finalised as it has not been considered and approved by the Cabinet for presentation to the National Development Council. This is as it should be as the newly elected government should have a chance of making it impress on the Plan, though the major outlines in terms of objectives, strategies and resources are in a sense fixed and what can be changed is the long term policies and their implications for the VIII Plan and the status of the Planning Commission, which has been devalued in recent times. Whatever be the plan as finally decided and its rate of growth, the disturbing elements are a) the need to increase the savings rate from 21 per cent of GDP to 27 per cent (an almost impossible task), b) the growing dissaving of the public sector whose net savings decline from -1.3 per cent of NDP in 1985-86 to -2.0

per cent in 1986-87 according to the RBI report on Currency and Finance for 1987-88), c) the proposed increase in total tax revenues for 17 per cent of GDP to 20 per cent, and d) an estimated investment-savings gap of Rs. 43,000 crores for the private sector during the VIII Plan, if it is to maintain a 11 per cent annual growth in industrial output and 15 per cent share of total investment, to help the economy achieve a 6 per cent growth, according to an Assocham estimate. The one positive feature is the still untapped potential of the capital market along with the possibility on economising in capital by fuller capacity use. The Annual Plan for 1989-90 which was once more released after half the Plan year has lapsed, emphasised the need to increase tax receipts, to restrain the unlimited growth of non plan expenditures, to execute monetary policies to reduce inflationary pressures, and develop a viable balance of payment for the year — all very good objectives, which are unlikely to be attained. The Plan gives high priority to agriculture and infrastructure and the maintaining of budgetary deficit at Rs. 8240 crores in 1989-90 compared to Rs. 7940 crores in 1988-89 — (note that the high level of deficit is taken as normal). The Plan forecasts that Seventh Plan is likely to end with an annual average of 5.4 per cent growth of GDP — well above the target of 5 per cent for the Plan. These statistical configurations do not help the basic problems of unemployment and poverty, nor of the immediate pressures of inflation and the serious balance of payment gap.

Prices

Inflation in September as measured by WPI on a point to point basis shows a rise of 1.8 points at 167.7 for the

week ending September 30. For the year, the inflation rate was 8.3 per cent. There is something rather peculiar in using the whole sale price index to measure the inflation rate. For one thing a year has to be taken (and not one month as is done in this Bulletin) to see the inflation trend. For instance while the September record shows a fall in the prices of non food articles like sunflower seed, groundnuts, raw cotton-food articles, and an even sharper decline in the index for food products, while the year's record shows rise in the prices of oil seeds, fodder, and non food articles. Further, these components of WPI do not reflect the real price situation, where despite the 10 per cent economic growth rate of 1988-89 and the over 5 per cent expected for this year, the foodgrains output of 172 million tonnes in 1988-89 and a record of 98 million tonnes for the current kharif, prices of rice and wheat are high and rising (not reflected in WPI) and even not easily available in the market; where despite a record and peak oil seeds crop, edible oil seeds are at unbelievable high levels; where pulses despite a record yield are having high prices; and where tea and sugar are also shooting up — all these are not reflected in the WPI. The WPI record for the quarter ending September 1989 shows a 3.7 per cent rise, while 150 out of 447 commodities constituting the basket record a rise. To control inflation, RBI's credit policy for the busy season announced in early October reduces the quantum of export refinance and directs banks not to exceed 60 per cent of non incremental non food credit deposit ratio, introduces some flexibility in interest rates on term loans and some changes in interest paid for short term deposits. This busy season credit policy announced by the RBI does not however

hide the fact that RBI has only a marginal role on monetary control, because the RBI is not able to control or influence the growing deficit financing of the government, including its budget deficit. In fact RBI credit to the government for the 22 weeks ending August 8 was a high Rs. 8266 crores compared to Rs. 6165 crores for that period in 1988-89 and Rs. 2864 crores in 1987-88.

Stock Exchange and Union loan

The Discount and Finance House of India (DFHI) is offering special buy back facility to financial institutions which invest regularly in 182 days Treasury Bills. The bills are for 3 to 14 days with the rate of interest to be fixed at the time of the sale of the bills. The RBI announced in October draft guidelines for the issue of commercial paper by companies on which it is consulting the banks. The amount permitted to be raised may be issued on a single date or parts on different dates subject to the conditions that the entire amount of the issue will mature on the same date. The banks have pointed out that in issues where the last of the permitted time frame is 15 days, the minimum period would effectively be 75 days and not 3 months as stipulated in the scheme. The union government announced in early October three loans aggregating Rs. 2200 crores which makes net market borrowings for this year Rs. 3129.77 crores. For the year, the budgeted net market borrowing is Rs. 7400.28 crores.

Economy

In relation to the savings — investment gap for the private corporate referred to earlier under prices, the agency

Assocham which made the computation suggested as a means of narrowing the gap a) the stepping up of generation of internal resources through depreciation and retained income, lower income tax rates, larger depreciation and withdrawal of section 115J. b) Also promotion of equity culture in semi urban and rural areas by creating intermediate credit instruments and stepping up term loans.

Industry

Continuing the above analysis, the paper points out that industries which are growing at over 10 per cent in the Seventh Plan and which will grow at the same rates in the VIII Plan are electronics, telecommunications, petrochemicals, polyester yarn, leather items, machine tools and food processing. 9 to 10 per cent growth industries are passenger cars, automotive tyres, electrical machinery, cement, steel, aluminium and chemical items. All this involves 78,000 MW energy (385 BU) which means an addition of 48,000 MW against which only 38,000 MW are envisaged as noted in Vol. XIX p 630. On the general industrial growth rate, the rate continues to be sluggish for the third month at 0.3 per cent in extension of the very poor record for April and May reported in the last issue. This means that CSO quick index for the first quarter shows a growth of 1.8 per cent against the 12.7 per cent recorded in the first quarter of 1988-89. Manufacturing has recorded negative growth rates for all 3 months at -1.14 per cent in April, -1.3 per cent in May and -2.0 per cent in June. The manufacturing growth for the first term is -0.6 per cent. The World Bank in its report to the Aid India Consortium attributes this to reduced agricultural expenditures. Electricity grew at 9.0 per cent and mining

at 10 per cent, which prevent the industrial growth turning negative. The industry ministry places the blame for this poor performance on the finance ministry which is responsible for import containment measures, hike in excise and high prices and holds that only if adequate foreign exchange is allocated will industry look up for the balance of the year. On the bright side, the Ministry of Programme Implementation reports that projects implementation has improved, that 151 large, 321 mega, major and medium project were on schedule, and only the remaining 170 delayed. Even these could make up for time lost and for this a good monitoring mechanism is recommended. The textiles ministry has asked more states to take up sericulture both to increase employment and silk exports. It is also reported that the caustic soda industry has taken off after a long period of glut and foreign dumping. Against a demand of 9.1 lakh tonnes, the industry will be producing 9.2 lakh tonnes in 1989. The government states that it will be spending Rs. 100 crores for the development of electronic industry in the country. It reports that it has increased the number of growth centres from 61 to 70 and has finalised the location of 39 centres in 14 states. The states that gain from this expansion are UP increasing its centre from 6 to 8, Assam will have 3, Bihar 6, Gujarat 3, MP 6, Maharashtra 5, Orissa 4 and Rajasthan 5. For the others, there are no increases.

Public Sector

There are two important policy issues brought to light in October on the public sector. First, the VIII Plan working group of the Planning Commission on the public sector enterprises has

recommended a selective approach to new investments in the public sector and withdrawal from activities which are not essential, without regard to profitability. On selectivity it recommends, application of 3 criteria, a) the activity is necessary from policy or strategy point of view, b) the draft on the government's budget will be minimal, and c) the internal rate of return is good. These have been repeated many times and it is to be hoped that the new government will incorporate this in the VIII Plan. The other development is the appointment of new Boards of Directors to nationalised banks. They like some other public sector undertakings have been functioning without Boards — that is non official, professional advice which accounts for their poor performance. The political tussles have been responsible for this 4-5 year delay in the appointment of the Boards. The Ministry of Industrial Development reports that 33 public sector undertakings recorded a growth of 23 per cent in August, producing Rs. 542.58 crores which was 93 per cent of their target. The units which equalled or exceeded their August target were: HEC (106 per cent), Maruti (117 per cent), Tungabhadra steel (101), HPF (226), NIDC (130). NTC reports that its losses in the first half of the current year have declined by Rs. 60 crores. Of 124 mills, 35 mills made net profit and 39 cash profit.

National Production Front

Steel

After last year's very good performance, in the 6 months April-September 1989-90 reported in the last issue of the Bulletin, there has been a sharp downturn in production by over 19 per

cent (29,65,000 tonnes) with the main downturn being registered in Bokaro because of labour trouble and uncertain power supply from DVC. There is a possibility of steel shortage in the current fiscal year. SAIL reports that the 6 year massive modernisation of its steel plants will reduce its cost of production by 20 per cent and improve quality. Steel production will be expanded from 10.9 million tonnes to 14 million tonnes by 1995 and 19 million tonnes by 2000 AD. It also reports that the production of exportable surplus steel will cross two millions by the end of the VIII Plan.

Crude

The government has set up an Organisation Development Group (ODG) to review the structure of ONGC and examine the feasibility of establishing subsidiaries in place of its present monolithic structure. This is because of its expanding activities. It is one of the units doing well, increasing crude production from 10.8 million tonnes in 1980-81 to 45.41 million tonnes of oil and oil equivalence of gas in 1989-90, contributing to the exchequer Rs. 3437 crores in 1989-90, it has surpassed the target and produced 15.6 million tonnes, along with a 101 per cent in drilling cycle speed targets. ONGC also reports that its international capital market loans will be Rs. 5000 crores at the end of 1989-90, which enables it to meet its foreign exchange needs and relieve the government to that extent of its balance of payments problem. Its outstanding currency loans are Rs. 3724 crores at 31 March 1989, which has now become Rs. 4244 crores, to which a further Rs. 700 crores will be added by the end of the year. It reports that it will produce an additional 194.43 million

tonnes in the VIII Plan which is 36 per cent more than the VII Plan target. Similarly 126.65 billion cubic metres of gas will be produced against 50.11 billion cubic metres during the VII Plan. This is an annual increase of 3 per cent. It states that it would work for a reserve accretion of 1340 million cubic metres during the VIII Plan.

Coal

Coal production is expected to be a record 209.50 million tonnes in 1989-90 compared to 194 million tonnes in the previous year, as both production and productivity are going up in the year. There has been an average annual growth of 12.5 per cent and by 1994-95 it is expected to go up to 310.31 million tonnes. Coal India reports an increase by 5.4 per cent (36 million tonnes) in the first 6 months of the current year. The energy ministry has drawn up a plan to add 50 billion tonnes of additional coal reserves to the proven category by 2000 AD. This will require 20.35 lakh metres of drilling in the VIII Plan and 19.65 lakh metres of drilling in the IX Plan. But the major part of the increased reserves will be in the inferior quality coal at 12.59 billion tonnes in the VIII Plan and 5.67 billion tonnes in the IX Plan.

Non ferrous

Aluminium production is expected to double from the present 2,75,000 tonnes to 5,50,000 tonnes by the end of the VIII Plan with the materialisation of additional capacities planned by the various primary producers. NALCO proposes to expand its product mix and produce billets, alloy ingots and alloy conductors to lend flexibility to its

marketing strategies according to its managing director. It is planning to implement 3 new schemes namely, production of 10,000 tonnes per annum of billets, 5000 tonnes per annum of ingots and 10,000 tonnes of alloy conductors financed from its own internal resources. It has plans to expand its capacity by 50 per cent and add to its downstream complex for making rolled products in 1990-91. During the first 6 months of 1989-90 it earned Rs. 152 crores in foreign exchange. Bharat Aluminium reports a 7 per cent growth in the second quarter July to September of 1989-90 producing 23545 tonnes of saleable aluminium and smelting, 5 per cent more of the hot metal at 23,710 tonnes. Hindustan Zinc reports, that the consumption of zinc in 1988-89 was 1.48 lakh tonnes and lead 78,000 tonnes. The working groups on non ferrous metals for the Eighth Plan has projected the demand, for zinc to grow at an annual rate of 5.5 per cent and lead at 7 per cent. To meet the growing demands, the company has started work on the Chanderoy Smelter and Rampa Agacha mining companies. This would increase the company's zinc capacity to 1.49 lakh tonnes and that of lead to 65,000 tonnes, which would save considerable foreign exchange. It increases lead zinc production to 15.80 lakh tonnes and lead zinc concentrate to 1.66 lakh tonnes earning a record pre tax profit of Rs. 34.04 crores against a sales turnover of Rs. 275 crores. MMTC reports that it is improving copper supply through a) issuing delivery orders upto 5 tonnes from the godowns, b) setting electronic weighing machine and c) purchasing of loading and unloading machines.

Sugar and cotton

The sugar mess referred to in the last issue continues. Though the first imports of 25,000 tonnes have arrived in last September, the delay in finalising the contract for their purchases has meant that sugar which could have been purchased at \$278 per tonne was finally bought at \$500-519. This means that the government will have to subsidise its sale through PDS at the rate of 50 paise per kg in order that it may sell at Rs. 9. The government announced in October that the statutory minimum price of sugar will be Rs. 22 per quintal for the October 1989-September 1990 sugar season (up from Rs. 20 in the previous season). Of course, though the statutory minimum price to be paid by factories has also been fixed at Rs. 23 per quintal, the actual price will be much higher on the basis of prices fixed by the various sugarcane producing states. On cotton, the first meeting of the Cotton Advisory Board for the coming cotton year 1989-90 on October 23 estimated the cotton crop at a record 115 lakh bales, with ICMF putting it at 110 lakh bales, CCI at 115 lakh bales and EICA and SICA at 115-129 lakh bales. It is good that CCI is involving itself in raising the growers productivity and improving the quality of their produce through seed development. This is needed because though India is the fourth largest cotton producer, its average yield at 230 kg per hectare is less than half of the world average. Further, the quality of some of the major varieties is deteriorating. In this connection CCI should cooperate with Indian Cotton Development and Research Association which works on the production of genetically pure seeds.

Agricultural Production

At the end of the south west monsoon on September 30, the total rainfall was seen to be 101.4 per cent of the normal, with 83 per cent of the meteorological subdivisions receiving normal or excess rainfall. In terms of live water storage in the major reservoirs, the position is held to be satisfactory. DST and the meteorological department note that this year the rainfall in none of the 35 meteorological subdivisions was "scanty", there were 6 subdivisions where it was 'deficient'. This holds out the hope of a high level of farm output for the second year in succession. The kharif food production this year in particular is bright and is expected to reach 98 million tonnes, despite certain deficient pockets (in Rajasthan, Delhi, South West UP and loss due to floods in some of the rice growing states like AP, Maharashtra, and Kerala). The rabi target has been fixed at 80 million tonnes, so that foodgrains production for the year might exceed last year's 172 million tonnes. The states have been asked to accord priority to the formulation of the credit plans for rabi (1989-90), right from the primary agricultural credit societies to the state cooperative banks, as against the non fulfilment of the credit target of 1988-89. This is specially needed to finance the National Oilseeds Development Project and the oilseeds production thrust projects. The government has evolved an integrated development plan for increased utilisation of agricultural produce by reducing post harvest losses, ensuring better returns to farmers, generating better employment and generating for consumers processed foods at affordable prices. The government announced procurement prices for a) paddy at Rs. 185 per quintal (up

from Rs. 125), b) coarse cereals from Rs. 155 to Rs. 165, c) kharif pulses from Rs. 4000 to Rs. 428 d) groundnuts from Rs. 475 to Rs. 500, e) and similar increase for soyabeans, sunflower seeds, cotton (earlier referred to) and jute.

Foreign Trade

The government reports that for the first 5 months, April to August 1989-90 export earnings increased by 38.1 per cent to Rs. 10,100.41 crores, imports grew by 18.5 per cent at Rs. 12,797.56 crores, reducing the trade deficit by 22.6 per cent (Rs. 787 crores) to Rs. 2697.15 crores. The government forecasts that exports for the current year may go up by 40 per cent compared to last year's 29 per cent. The Cabinet Committee is reported to have fixed a high export target for the VIII Plan, increasing it to 14 per cent per annum in real terms against the 12 per cent suggested in the Approach Paper. It also reports that the declining trend in import of capital goods has been arrested, with import approvals for July 1989 rising for the first time this year at Rs. 186.58 crores compared to Rs. 73.11 crores in July 1988 and Rs. 127.61 crores in June 1989. In an attempt to stave off a serious foreign exchange crisis (despite a slight improvement in October, the foreign exchange reserves are hardly adequate to cover 8 weeks imports) the government has asked all ministries to refrain from implementing import intensive projects. Under the flexibility clause, the government in a major policy change has allowed actual industrial users to utilise rep licenses and additional licenses issued to export and trading houses for the import of canalised and other items as well. A study by ICRIER shows that low foreign invest-

ment is the main cause for the unsatisfactory performance of the Indian Export Processing Zones (EPZ). Only 11 units of the 115 established at Kandla have attracted any foreign equity, and only 24 of 59 Santa Cruz units have any foreign participation. It is held that unless EPZ attracts foreign capital which can combine with surplus domestic resources and generate exports, the zones will be counterproductive. This is serious for not only is there tying up of the Indian economy with the world economy in EPZs but this dependence on foreign capital for their survival is ominous. The government reports a plan for setting up a Trade Centre for the strengthening the institutional frame work for export promotion and offer under one roof trade information and trade promotion services is under consideration. On individual items EEPC reports that during April-August 1989 engineering goods exports were Rs. 635 crores compared to the previous year's Rs. 480 crores for that period. CAPEXIL reports that exports of chemicals and allied products may reach Rs. 2000 crores during the current year, up by Rs. 744 crores over the previous year. Textile exports during the 5 months, April-August 1989 increased by 41.7 per cent to Rs. 2184.3 crores compared to Rs. 1540.9 crores in 1988 for the same period. MMTC reports that it will exceed its export target of Rs. 1300 crores during 1989-90. Agricultural exports are expected to reach Rs. 4500 crores during the current financial year, which is a 50 per cent increase over the last 3 years exports.

Aid and Loans

Under the World Bank's comprehensive industrial technology development project for India, the Canara Bank has been granted a line of credit of \$ 5.25

million. The World Bank has also agreed to raise the share of its aid in four projects — two agriculture expansion projects, one irrigation project and one social forestry scheme. SAIL and an international consortium have signed a 246 million deutsche mark Euro loan agreement for the modernisation of the Durgapur Steel plant. Japan's Export Import Bank is making a 12 billion yen loan to the Indian Petro Chemical Corporation. The Industrial Bank of India has launched the Japanese bond market with its first issue of 20 billion yen for meeting the foreign currency requirements of industrial companies in the country. The growth rate of non resident external deposits in Kerala is fast declining from 37 per cent growth in 1985 to 1.4 per cent in 1988-89, which is attributed to the end of the gulf boom. In 1988 NRE deposits were Rs. 844 crores out of Rs. 3479 crores total deposits. In 1987 it was Rs. 1359 crores out of Rs. 4816 crores and in 1988-89 it was Rs. 1562 crores out of Rs. 5067 crores.

International

World Economy

IMF forecasts that the next decade may be a difficult one but one which will offer great opportunities because of the liberalisation and structural reforms increasingly evident in industrial countries, in many developing countries and some socialist countries. These trends could produce temporarily great uncertainties and wide imbalances. This is also true of the Uruguay round where some break throughs may increase imbalances. Many of the developing countries that have not fallen into the debt trap and have embarked on major structural reforms will need balance of

payments financing the next five years but will have no access to financial markets. Also the major industrial countries face large external imbalances, the problems of the heavily indebted countries will become critical and the poor sub-Saharan economies will continue to face critical shortages. IMF prescribes greater structural adjustments for these countries as panacea.

World Trade

The final round of the Uruguayan negotiations are now on which will determine the shape of the world trading system in the nineties. There is some optimism that the negotiation are going well and will result or may help in reforming world trade. There is also the surge in world trade which GATT estimates at 7 per cent for this year, a little lower than last year's 8.5 per cent. There is growing awareness of the dangers of trade imbalances which coincides with personal saving ratios. As a result US and British external deficits are traced to the steady fall in the proportion of disposable incomes in each country. The most serious setback facing world trade is the US slide into multilateralism in its trade dealing. Though retaliation under Super 301 is not mandatory, Japan, India and Brazil are being threatened with it under its Omnibus Trade Act. It has been established (though not accepted by the US) that part of its Trade Act infringes GATT rules. The end of the Uruguay round is expected with some pessimism and fear by most developing countries.

World Debt

Two of the world's more pressing problems — Third World debt and the

deteriorating environment — have been linked through a new funding mechanism, known as 'Debt for Nature Swaps'. This programme passes through 3 stages: first organisations like the World Wild Life Fund reach agreement with the government, central banks, and environmental groups on administering the debt swaps programme and its funding: second, the organisation purchases a fixed amount of the debt on the discount market and exchange it for local currency, thereby reducing the debt: and finally the programme is implemented using the local currency obtained. The only problem is that these programmes are for small amounts of \$1 to \$5 million against the \$1,300,000 million world debt. In this connection a West German study shows that the oil exporting countries face a slower and lower rate of their debt reduction, than non oil producing developing countries who sell their industrial products to industrial countries and face fewer debt problems. This rather optimistic study

is based on somewhat slender and short time empirical evidence.

Common Wealth Summit

The heads of common wealth countries (Chogm) meeting in Malaysia in October 1) tightened the sanction against the apartheid ridden South Africa — with UK dissenting, 2) warned against the growing regionalisation of trade through establishment of trading blocs — with particular reference to Europe 1992 and the US-Canada trade blocks, 3) regretted the severe contraction of financial flows to developing countries, with negative net transfer of resources for several of them, 4) decried the protracted problem of heavy indebtedness and 5) stressed the importance of closer policy coordination between the countries. Chogm is a good meeting ground for the group of countries which were ex-British colonies, but their conclusions are no different than those reached by UN and NAM.

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II. Agricultural Development in Tamil Nadu

Paddy and other crops

With good south west monsoon in the state, particularly in the southern part, despite the late opening of Mettur, farmers were able to cultivate kuruva over a restricted 4 lakh acres. The paddy produced was good and the harvesting is near completion. Procurement has passed the 1 lakh tonnes mark, which indicates the success of the relaxation in the monopoly procurement policies. Now the samba paddy farming

is on and farmers in Thanjavur district and parts of Tirunelveli and Tiruchirapalli are glad to have the use of Mettur water and hope that it will last till the end of January when the samba harvest will start. The good north east monsoon over the central and southern parts of the state has helped the cultivation particularly of the rain fed crops. Millets are doing well and the farmers in dryland areas report a good response from cumbu, varagu and cholam. Also pulses are growing well, in some areas the

farmers are growing them jointly with paddy. Cotton is likely to be a bumper crop this year as farmers have used improved seeds distributed to them and have so far escaped any serious ravages from pests. Sugarcane is also doing well and the farmers desire to extend its cultivation in places as a substitute for paddy is rightly not being encouraged by the state, as it is a water guzzling crop and the state is in a position of just about meeting its water needs for paddy.

Research results

Research reports in October are from Madurai Agricultural college and Aduthurai Institute on the use of a parasite, platygaster sp., to control the attack of gall midge in paddy, from UAS station, Bidar on the means of countering the climbing out worm which is a devastating paddy pest, from TNAU on the use of the predatory beetle to control rice pests, from the Institute in Bhopal on a hand operated machine to act as a groundnut decorticator, from TNAU, Tiruchirapalli station on the development of new castor seeds — TMV4, TVM5 and SA2 which give good yields in a short time (105 to 135 days) under rainfed conditions, from ISR Lucknow on the development of short duration high yielding pigeon pea ICDL 151, from the Dharwad station on the growing of Abadhita-1 which is a pest (ball worms of various types) resistant cotton variety, from the agricultural station, Trivandrum on the means of controlling mealy bugs infestation in cocunuts, from ISR, Lucknow on nitrogen carriers such as coated fertilizers and large granules to increase fertilisation of sugarcane, from CTCR, Trivandrum in controlling mosaic virus, a crippling disease, in cassava, from

Bhavanisgar station on a high yielding drumstick seed which it has developed, from TNAU on means of controlling attack by stem borer on mangoes, and on the growing of custard apple in drought prone areas, from J Farm, Madras on the organic manuring as the means of ensuring bountiful returns from guava, from TNAU on the ideal feed for stall fed goats, from RAU Trichur on means of avoiding ammonia concentration in chicken houses, from the Madras Poultry research station on means of countering the stunting of broilers, from the Vemban research centre which has developed a allopathic strategy to control weeds, from Padappai institute on controlling fungal disease in cotton, and from the Indian Institute of Horticultural Research which reports on the genetic improvement of betelvine that it has developed.

Cauvery irrigation

It is time that cauvery irrigation was drastically reviewed because the pre 1974 status of the proportional water sharing will never again be realised. The dispute on this should be referred to a tribunal as the 2 governments will never come to a negotiated settlement. Expert advisers as well as an EEC team finding states that a) the scattered jurisdiction of the irrigation department engineers should be reduced at all levels for effective control of irrigation management: b) sluice gates should be provided in every branch channel to shut off water when not needed: c) lining channel sides and base with cement slabs should be taken up on a massive scale immediately: d) periodic clearance of jungle growth and silted rivers and branch channels should be undertaken: e) a chief technical examiner's office to inspect the work in progress should be set up directly

under the ministry: and f) a review of the functioning of the Irrigation Department of the PWD and the Directorate of Agriculture by an expert committee is needed to tone up the whole cauvery irrigation system.

Horticulture

The state has developed an integrated horticultural development plan for the Eighth Plan comprising: a) fourfold increase of the present 25.65 lakh tonnes of horticultural products, b) an increase in vegetable production from the current 31.65 lakh tonnes to 34.65 lakh tonnes and c) increasing similarly other horticultural crops like bananas, cashewnuts, vegetables, flower plants, mango, pomegranates, sapota, guava and other fruits with some 45,000 hectares of dryland. World Bank financial assistance of Rs. 19 crores will be available for this project which also includes developing 7700 hectares of orchards, a food processing scheme, the Vellore mango canning unit and the growing of the off season mangoes in Kanyakumari by the Marthandam Agro Co-operative society.

Coffee

The International Coffee Organisation (ICO) after a 2 week meeting in October in London failed to agree on renewing the quota system, mainly because Brazil the largest coffee producer, does not want quotas, wants to be free to sell its massive output anywhere including dumping in non quota countries. It opposed any resolution which attempt to revive the system. In this it was in fact indirectly supported by the largest coffee consumer, the US which insisted that any new agreement should include the West Asia and Eastern Block countries and all non quota countries in a system

of universal quotas, whatever that may mean. The result has been that coffee prices have fallen further, reaching the level of the 1920s. In this situation, India must expand its domestic consumption quickly, replacing tea by coffee so that the exports of the former can continue without any reduction and should reach bilateral agreements on coffee sales with west Asia, USSR and Europe which are its traditional buyers.

Pepper

1989-90 has been declared in India as the "Pepper year" as the output during the season November to October is estimated at 75,000 to 90,000 tonnes against 1988-89's 45,000 tonnes. It is highly priced at \$1.38 per pound compared to Indonesia's to \$1.10 and Brazil's 98 cents. India is the largest produce of pepper at 1.35 lakh tonnes which is double that of Indonesia, two and a half times that of Brazil and thrice that of Malaysia, being 30 per cent of the world's total. Again unlike the other countries, India has a large expanding internal market for pepper (consuming 20,000 tonnes while Indonesia contains 2000 tonnes, Malaysia 1000 tonnes and Brazil 8000 tonnes), and at a time when international pepper prices are falling by Rs. 50 per kg a month, India can afford to meet internal demand and push up international prices. The major buyers of Indian pepper are US, USSR (13,000 tonnes) and East and West Europe. With India's bumper crop, there is likely to be a global glut this year and so India needs to develop strategic marketing and support the International Pepper Community due to meet in November to prevent prices crashing and develop attractive prices.

III. Industrial Development in Tamil Nadu

ONGC

Crude output from the onland wells in the cauvery basin is to increase from the current 700 tonnes a day to 1000 tonnes a day to 1000 tonnes a day in March 1990. Production of oil and associated gas from PY 3-2 well in the cauvery offshore off Nagapattinam yielding 4000 barrels of oil and 1 lakh cubic metres of gas will start from the middle 1991. With the successful oil strike at Adiyakkamangalam, ONGC is aiming a ten fold increase in production from Cauvery during the VIII Plan. The target of oil production by the end of the current year is put at 0.2 million tonnes and will become 2 million tonnes per annum by the end of the VIII Plan. At that time, the free and associated gas production will be 2.03 million cubic metres per day. The cumulative production from the basin is 95,000 tonnes. Since 1985, 5 discoveries of oil and gas have been made at Kovilkalapal, Narimanam, Nannilam in Thanjavur district and Bhuvanagiri in South Arcot and in Porto Novo. ONGC plans to delineate the Adiyakkamangalam project with one more well and two locations, in addition to drilling at Narimanam and Thirukadu, 9 rigs have been deployed in the Cauvery basin which will be increased to 16 by 1994-95. The availability of gas could change the state's power scene. Already ONGC has commissioned 40,000 cubic metres of gas per day to be supplied to TNEB for generation of 5 MW by the first quarter of 1990-91. TNEB has also requested offshore gas to set up a 100 MW power plant at Cuddalore. From Narimanam a commitment of over

1 lakh cubic metres of gas per day have been made to 9 consumers and 14,000 cubic metres per day is already being supplied through the 18 km pipeline to industries in Nagapattinam. Also gas demand for 5 million cubic metres have been received from the fertilisers, glass, ceramic, textiles, cement and petro chemicals industries in the Bhuvanagiri area.

CECRI

ONGC is being helped by CECRI in checking corrosion in the oil wells and in the offshore area. ONGC reports that of the \$5 billion it has invested to produce 500,000 barrels a day from Bombay High, the loss from corrosion due to internal and external factors is high. While the Institute of Engineering and Ocean Technology, Bombay has dealt with the external corrosion, CECRI is to attend to the internal cause of corrosion of ONGC equipment. Corrosion in a gas pipeline or in handling crude is of a special nature, and it is to these that CECRI is bringing its expertise.

CIL

Coal India reports that it is working on a programme to give high quality coal on a priority basis to thermal power plants like those in Tamil Nadu, located furthest from the mines. The Coal India price at the pit head is Rs. 250 per tonne but by the time it reaches Ennore it is Rs. 887 per tonne because of the many transshipment points. This is one reason, CIL is opening 5 stock yards in the South at Madras, Coimbatore, Bangalore,

Hospet and Mangalore to meet the needs of small scale industries. On the basis of the experience of these 5 stock yards, CIL plans to open two more at Tiruchi and Cochin. The SS units in and around Madras city consume 8000 to 10,000 tonnes of coal every month and the opening of the Madras stockyard will prevent price fluctuations and benefit the producer.

MFL

Madras Fertilisers announces that it is investing Rs. 210 crores to restructure its 18 year old Mannali fertiliser complex to increase ammonia production from 750 tonnes to 1050 tonnes a day, urea production from 885 to 1400 tonnes per day, NPK from 50,000 to 75,000 a day. As this unit will be more energy efficient and not use naphtha, the cost will decline. Work is nearing completion on the Rs. 16 crore project to treat sewerage water for use in the plant to reduce its dependence on metro water. It has also sent to the Union government a Rs. 690 crore Cuddalore plant scheme to manufacture ammonia and urea using gas from the cauvery. Also a second Cuddalore plant costing Rs. 450 crores using imported rock phosphate has been formulated to produce ammonia nitro phosphate, and awaits Union clearance. These will meet the 60 per cent ammonia based fertiliser shortage and the 30 per cent phosphate fertiliser shortage that the 4 southern states will face in 1995.

MRF

MRF announces that it has reached agreement with the French Macheuil for its Rs. 15 crore aircraft tyre project.

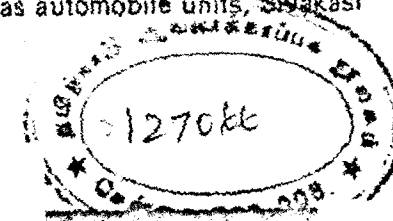
The project will be funded mainly by internal resources. The project is to be located near its Tiruvottiyur plant with the agreement of the State government as far as the law of acquisition is concerned. As Macheuil has taken over Uniroyal Goodrich, which is also USA, MRF's collaborator for other tyre projects. MRF will have the use of French technologies in other sectors as well.

MEPZ

MEPZ is now entering the second stage and to guide it on this a high power committee headed by AL Mudaliar is to work out its manufacturing and export strategy and to guide and advise the zone. In the second phase, the zone will be selective in its approach in allotting land and clearing projects. So far 111 units have been approved for the 100 acres, but only 61 of them have come up, 32 are exporting, earning Rs. 24 crores in 1988-89. This is a poor record, due to none of the large firms having entered the zone and the shortage of capital. Also the state government should interact here actively with the zone authorities. Its advisory committee has not met since 1989.

Small scale industries, and steel rerollers

The concentration of small scale industries in the state is in food products (12,289 units), metal products (10,407 units), chemicals and chemical products (1034 units), machinery and machine tools (10271 units) and paper and paper products and printing (7284 units). Coimbatore has a concentration of textile machinery units, North Arcot leather units, Madras automobile units, Sivakasi



match units. The industries have been given various incentives set forth in Vol. XIX pp. 296 and 416. Sickness is growing, a 1985 survey identified 15171 units as sick due to lack and delay in finance, incentives, delays etc. It has been suggested that a state level unit of the Board of Industrial and Financial Reconstruction should be set up to deal with sick units in the state. This is a sound suggestion and should be acted upon because sickness should be treated by those who know the local situations. The 50 steel rerolling mills in and around Madras report a major crisis due to non availability of raw materials like ingots, billets, slabs and blooms during the last few months. SAIL has not allotted steel to these mills since January 1989. It is pointed out that the conversion agency system has not helped the rerollers, under which SAIL gives steel to some units who convert them to finished products and hand them back to SAIL. This has favoured only a few firms and SAIL is accused of supplying off grade and commercial materials to the units. SAIL needs to rectify the anomalies in its distribution policy and meet the needs of the mills hopefully to avoid their cry for importing rerollables.

Sugar and Molasses

In October the government released a larger quantity of levy free sugar to be distributed at the concessional rate of Rs. 7.50 per kg, through TUCS and mini super markets. In addition, 3000 more tonnes are being allotted later at the end of October. Actually TUCS and others are selling sugar at Rs. 8.50. As noted earlier, the State government

has recommended the price for a tonne of sugarcane with 8.5 per cent recovery at Rs. 250 against the Rs. 200 fixed by the Union government for the 1989-90 crushing season. The average recovery in the state is above 8.5 per cent, and so a farmer may get Rs. 288 at the minimum and Rs. 341 at the maximum for a tonne of sugar. The State government is formulating a new policy on the production and utilisation of molasses and alcohol and their allotment for industrial use. This involves earmarking a major part of the molasses or alcohol for the industries, permitting new distilleries only in the cooperative sector, allowing the expansion of some distilleries and encouraging the growth of alcohol based industries. This is based on the surplus in molasses following from the expansion of the sugar mill, in the state and the focus on alcohol based industries and down stream products. 85 per cent of the molasses and alcohol produced in the state is being allotted for industrial use.

Leather

Tanneries in Dindigul — Quaid — E Milleth district will have a common effluent treatment plant. The plant costs Rs. 242.44 lakhs, 15 per cent of which is being contributed by the tanneries, 25 per cent by the State government, 20 per cent by the Union government and the balance 40 per cent as bank loans. The tanneries have contributed their share and have set up separate tanks for storing effluents to prevent them from polluting community and irrigation tanks.

IV. Education, Science & Health

Educational reforms

The Union government has formulated a scheme for the improvement of science education. For this a winter school was organised for higher secondary teachers in mathematics, physics, chemistry and biology in Madras. After training, selected +2 schools will receive Rs. 20,000 each for library and Rs. 20,000 for laboratory development under the scheme. The Union government has also sanctioned the setting up of a resource centre for each district in the state to improve science teaching and supervise the work of science teachers. The resource centre will be located in a college in each district. The government also announced the absorption of part time teachers working for full time in high and higher secondary schools as vocational teachers. The teachers who worked full time are to be absorbed and not those working part time. At the university level, the Senate of the Madras University has approved degree courses in environmental management, human resources development, visual communication and MSc in bio-technology. It has also adopted the code of professional ethics for university and college teachers framed by UGC. The State government has decided to release immediately the entire arrears payment to teachers of government and aided colleges and universities consequent on the revised UGC pay-scales. The arrears go back to January 1, 1986 as the revised scales went into effect on 1 February 1989. 50 per cent of the arrears will be disbursed in cash and 50 per cent credited to the Provident Fund Account of the teachers. The government has set up a committee of teachers representatives to review and

recommend the work load of teachers following precise UGC scales.

Literacy

Both the National Policy on Education 1986 and the International Literacy Year 1990 demand an early and vigorous effort to liquidate adult illiteracy, which is computed by the government as numbering 90 million in the age group 15-35. 30 million are to be made literate by the end of the VII Plan and 60 million by the end of the VIII Plan. For this all efforts by all educated persons — 14.8 lakh students in class IX and above, teachers, retired professors, ex-servicemen etc. are being pressed into a mass campaign. In addition a literacy mission to provide technologies for the programme, a Jatha to use committed literacy workers to go round villages and organise literacy programmes are being launched. There is no escape for this challenging effort.

Satellite

Both Doordarshan and the Indian Meteorological Department have been asked to switch to INSAT-IC, the spare satellite. This means that INSAT-IB which was launched on August 30, 1983 by the US space shuttle has completed its life. INSAT-IC was launched by the European Ariane rocket in July 1988 but has been partially disabled 2 months after the launch because of faulty power supply.

Science

Computer experts at IIT Madras report that they have successfully developed

for the first time in the country computer software for the local area net work. It is called the Open System Interconnection Network (OSINET) and is in use to network some departments. BHEL, Tiruchi R & D programme reports that it has devised an oil saver for coal fired boilers. It installed the direct ignition of pulverised coal (DPC) — system for the seventh unit of the Satpura thermal plant. The DPC system of BHEL's R & D programme reduces oil consumption during warm up and low load flame stabilisation of coal fired boilers by 95 per cent. This will result in an annual fuel oil saving of Rs. 400 crores. The World Resources Institute reports that clean burning solar hydrogen, that is hydrogen gas produced from water using electricity generated by the sun, is an environmentally safe alternative fuel to fossil fuels. Solar hydrogen has been discovered and began in experimental use. ICAR reports on a national scheme for hybrid production of various crops. This will result in superior hybrid stocks.

Health

The Director of Medical Education, Madras calls attention to the lack of statistical data on matters relating to health. This is a handicap in the evaluation of existing programmes of health and the adoption of measures to enhance their effectiveness. For instance there is no statistical data in connection with the implementation of the "Operation Polio" programme which deals with 120 cases a month. No data on the extent of the disability of patients at the admission stage and extent to which it had come down is available. Similarly though about 4 lakh sterilisation operations were being done a year, there is no data on the number of deaths connected with the operation and the reasons for them. A sub committee has been constituted to look into this matter and find out if the death were due to complications arising out of what was a 'simple operation' or due to other reasons. Here is a case where such statistical data can be used not only for evaluating the programme but also for adopting steps for making the programme more effective.

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V. Employment and Labour Relations

Employment in the country is in a bad way — despite the good certification of ILO in the 11 country survey. Its positive comments are relative to the poor performance in Thailand, Colombia, Hongkong and is based on not very reliable official statistics. What is known is i) the Prime minister's repeated statement that only 15 paise in every rupee earmarked for NREP and RLEGP

has reached the beneficiaries, ii) the non realisation of the VII Plan assumption that 16.5 million jobs will be created in 1985-90; iii) the annual rate of employment increase has been 2 per cent for a decade; iv) between 196 and 1981 total employment in the organised sector increased from 11 million to 26 million while the additions to the labour force were 175 million;

200 millions; v) most employment came from the service sectors as a result of the mammoth growth of government machinery from 3.7 million in 1961, to 8.6 million in 1988 in white collar jobs; and vi) the latest employment scheme announced by the government just before the announcement of parliamentary elections was the Nehru Rozgar Yojana as urban counterpart of JRY for generating a million jobs a year on an annual expenditure of Rs. 650 crores. This new programme is to be channelled to towns and city councils through DRDAs, with 80 per cent of funds coming from the Union and 20 per cent from the states. Its main components are: i) administered through town councils who will choose the project, identify the beneficiaries and organise labour cooperatives of the urban poor to execute the programme, ii) its three parts are a) first urban wage employment for towns ranging from 10,000 to 1,00,000 people, b) second, a scheme of generating employment through a special thrust on shelter and housing upgrading in all towns and cities with a population of more 100,000 (except Delhi, Bombay, Madras and Calcutta) and c) third, for urban micro enterprises for all settlements

as an urban counterpart of IRDP, iii) SC & ST are to be specially benefitted and 30 per cent of women looking for jobs given employment, iv) Rs. 81.25 crores earmarked for the first part which would cover smaller towns and municipalities, iv) each identified family will have access to Rs. 4000 from HUDCO including a subsidy of 25 per cent plus bank loan at 4 per cent interest, with special subsidy for SC & ST, v) Union will directly finance training schemes and infrastructure support for this second part and vi) the third part of urban micro enterprises is targeted at the urban poor living below the poverty line. The Union contribution under this component to the super metros will be Rs. 1 crore each for the loan and subsidy and Rs. 50 lakhs each for training and infrastructure. Some scheme like this is needed to tackle urban poverty. It should be launched after a year's preparation. The source of the Rs. 650 crores from the budget should be clearly identified by cutting out other low primary expenditures. The defeat of the 64th and 65th Constitutional Amendments gives the scheme a chance for reflection and more careful preparation, and takes it out of the election rhetoric, hopefully.

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VI. Other Items

Unesco

At the 18th session of the General Conference of the Unesco in October, the biennial report of the International Institute for Educational Planning was presented in 3 parts. First, the Sixth Medium Term Plan 1990-1995 drawing from the conclusions of the International

workshop organised on the Silver Jubilee of the Institute and Unesco's Third medium term plan. Second, the programme and budget proposed in the Unesco document 18C/5 for 1990-91 drawing on the first 2 years of the medium term plan. Third, the activities of the Institute during the current biennium 1988-89, revolving around its

training programme, research results and diffusions of its publications. There was general appreciation and endorsement of all 3 parts of the report.

Pondicherry Jatha

Pondicherry has established a plan to make its 70,000 adult illiterates, literates during the International Literacy Year. For this purpose they have developed a literacy jatha which is an adaptation of the Science Jatha referred to in vol XVIII p497. Under the literacy jatha (Kalvi Payanam) a band of some 12-15 committed persons visits every village which forms a committee to receive and welcome them and which later becomes the group to make every illiterate in the village literate. The jatha was launched on October 12 at Ettapakkam with the Minister of Education presiding. The important event in that inauguration was the song-drama which has been developed to propagate the literacy message. It was done by some 16 volunteers — students, teachers, banks and business workers etc. practised by them for 10 days, 18 hours a day, which really got the message across.

India International Centre

There was the usual monthly panel discussion on the balance of payment problem which concluded the three part discussion on India's International economic relations. The problem of the growing burden of the deficit in the balance of payments was vividly described but the way out was not clear — unless there was agreement to cut back on consumerism and on imports. There was also a meeting of the Standing Finance Committee at

that time which reviewed the agreement with ICRIER and RSI and agreed to their continuing for a further period of 2 years at a slightly enhanced rent. The committee also reviewed and revised the depreciation rates for the Institute's capital goods and approved the updated Golden Jubilee project of additional buildings of the Institute.

State Planning Commission

In addition to the meeting of the State Planning Commission dealt with at the start, there were 3 meetings to review the VIII Plan proposals on education, agriculture and allied subjects, environmental protection and employment and labour welfare. On the basis of these reviews the appropriate chapters are being drafted.

Rotary west

The rotary west which is celebrating its golden jubilee organised a series of lectures on the Tuesday of every month. One subject which was taken up on the last Tuesday of October was Competition in the private corporate sector in VIII Plan. The question of the preconditions for ensuring such competition and the results were discussed. The need for competition was clearly set forth and its limitation in regard to capital intensive infrastructure projects were also acknowledged. How competition will work under oligopolistic conditions which characterise major segments of the private sector was underlined. The main point made was that to ensure competition in the private corporate sector, a dynamic and expanding domestic market for their products must be assured. This necessary condition should be the aim of state policy.

AIR

AIR organised a discussion of urban poverty. A first point made was that urban poverty was part of the country in two ways: it showed in the low living levels of the mass of the people in terms of a total package comprising what is called the minimum needs: second, it is also a spill over from rural poverty due to the migration of the rural poor to urban areas in search of jobs. A basic cause of urban poverty is that there is limited scope for employment on a continuous and self sustaining basis for the mass of the people. This is aggravated by the absence of unions of the urban poor which makes possible, their being employed on a casual, part time basis, and paid very low wages. Finally the educational and health facilities for them are so limited and poor that they reinforce their poverty. What is needed for the development of employment generating small and medium industries which will employ them, are the unionisation of the men and women workers to fight for their rights.

First article

A second paper for the workshop on the Perspectives of Industrialisation of Tamil Nadu — Input output framework in the manufacturing sector by R. Hema appears as the first article. (A first paper was published in the last issue.)

Second article

A report summarising the proceedings of workshop, 'Perspectives of Industrialisation of Tamil Nadu' by Meenakshi

Thiagarajan, appears as the second article.

Special Section

The special section in this issue comprises selected articles prepared for the summer workshop on Management of renewable resources held at ISEC, Bangalore, from June 8 — 11, 1989. The articles are:

1. Environmental Impact of large scale storage based irrigation projects.

R. S. Deshpande,
Gokhale Institute of
Politics & Economics.

2. Characteristics and functioning of traditional Irrigation Systems.

S. Janakarajan
Research Associate
MIDS

3. The management of ground water and the problems of regulating its exploitation to ensure both sustainability and equity in rural and urban areas.

R. V. J. R. Krupanidhi
Scientist, Central
Ground water Board.

4. The legal principles and Institutional mechanisms for optimising water use in river basins.

A. Mohanakrishnan, Member,
Irrigation and Water Resources
Commission, Madras.

5. Ground water Management in hard rock areas.

L. P. Swaminathan &
P. Kandaswamy,
TNAU, Coimbatore.

MIDS News

Prof. V. Radhakrishnan, Professor of Mechanical Engineering at the Madras IIT, who coordinates the programme of Computer Aided Design and Manufacture gave a talk on the Social Implications of Automation in India at 3 p.m. on 22nd November.

Prof. R.C. Sekhar of Institute of Rural Management, Anand gave a seminar on "Contrasting trends in the Handloom Industry in Tamilnadu and Bengal during the past decade" at 3.30 p.m. on 30th November.

Dr. C.T. Kurien attended a Workshop on "Teaching of Economics in India" organised by the Indian Economic Association in Bangalore on 10th and

11th December and presented a Note there on the subject.

Dr. A. Vaidyanathan gave a lecture on "Health and Economic Development" for a workshop held at Ethiraj College for Women, Madras under the auspices of Dr. M.G.R. Medical University on 1st December.

Dr. A. Vaidyanathan attended the Golden Jubilee Conference of The Indian Society of Agricultural Economics, Bombay from 5th to 7th December and served as a discussant for the session on "Teaching and Research in Agricultural Economics".

November Development Seminar

An Input - Output Framework for the Manufacturing Sector in Tamil Nadu

R. Hema
Research Associate, MIDS

Among the nine major states in the country, Tamil Nadu remains a highly industrialised state as at the end of the Sixth Plan. The contribution of its manufacturing sector to State Domestic Product (SDP) was 22.4%, second highest after Maharashtra. In terms of the value added, capital invested and labour employed in the manufacturing sector also Tamil Nadu ranks quite high (second / third). However, if we look at the dynamics of the situation, the picture is quite grim. The growth rates in the value added by the manufacturing sector, in the labour employed in industries, in the per capita SDP (in real terms) have all shown marked declining trends since 1980. The new industrial projects under implementation during the Seventh Plan do not promise a significant improvement either. Industrialisation in Tamil Nadu seems to have reached a level of stagnation after 1980.

Is this because of a failure to diversify both within and away from the existing major industrial groups of the state? Is it for want of investments in new industries whose output prices at the national or international level have been rising fast? Is it because of input shortages (energy, raw materials etc.) that acted as bottlenecks? What are the industries to be promoted during the Eighth Plan and what would be the implications for growth in SDP, employment generation, foreign exchange earnings, fixed capital formation, input requirements etc.?

Finding the right answers to all these questions is quite involved. The inter-relationships among the different variables and industry groups concerned is quite complicated. For a balanced development we need accurate forecasts that are consistent with the short-run and

long-run options / programmes of each sector (ie. industry) and that are consistent intersectorally. This calls for market research efforts that are coordinated and designed to get such forecasts.

The input-output approach is a powerful tool that can be used for this purpose. This approach classifies and aggregates the innumerable market transactions into more or less homogeneous groups and shows the pattern of flow of goods and services among these groups or 'sectors'. It provides an accounting framework as well an analytical tool.

Input-Output approach — Theoretical framework.

The production units of the economy are classified into n sectors. Each sector processes the inputs derived from other industries using the primary factors of production and generates its output. The output of each sector is used to meet the intermediate demand of other industries and / or the final demand. These inter-industry transactions and the industry — final demand transactions are presented in a convenient tabular form as shown below :

TABLE 1
Input-Output Transactions Matrix

Inter-industry demand				Final demand	Total output
	1	2.....n	Total		
1	x_{11}	$x_{12} \dots x_{1n} \sum_j$	x_{1j}	f_1	x_1
2	x_{21}	$x_{22} \dots x_{2n} \sum_j$	x_{2j}	f_2	x_2
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
n	x_{n1}	$x_{n2} \dots x_{nn} \sum_j$	x_{nj}	f_n	x_n
Total	$\sum_j x_{j1}$	$\sum_j x_{j2}$	$\sum_j x_{jn}$		
Total Output	x_1	$x_2 \dots x_n$			

In table 1, x_{ij} represents the output of the i^{th} industry used to meet the demand of the j^{th} industry and f_i is the final demand for the i^{th} output. Thus the horizontal rows show how the output of each sector of the economy is distributed among the other sectors and final demand. The vertical columns show how each sector obtains its needed inputs of goods and services from the other sectors. Conceptually, these transactions could be presented either in physical terms or in value terms. In practice, however, the flows are given in value terms because of the difficulties involved in deriving a homogeneous unit of sectoral output.

The framework given above can be expanded to give the final column in terms of its components ie. private consumption, public consumption, gross fixed capital formation, net exports and change in stocks. At the bottom of the table additional rows could be introduced to show the net indirect taxes, gross value added and gross output. The contribution of different primary inputs to each producing sector and the distribution of income among factor shares could also be presented. (Refer Table. 2)

The approach outlined above thus gives a double-entry type of accounting framework where the output of each sector is accounted for as an input in some sector and/or by final consumption. This framework presents a static, ex-post picture of the sectoral linkages and the degree of interdependence. One could also easily get an idea of the shares of domestic consumption and exports, domestic production and imports in each sector; the shares in the national income of different primary factors of production; the direct

and indirect tax components in the gross output of each sector; the intensities of energy use in various sectors etc.

Input — Output Analysis — Analytical tool

Wassily Leontief demonstrated a methodology for converting this simple descriptive and accounting framework into a powerful analytical tool. The basic assumptions used to enable this transition were :

- each sector produces a homogeneous product,
- the production relations are linear homogeneous ie. they have constant returns to scale, and
- the technology is given ex-ante,

We have the total output produced in each sector equal to the sum of intermediate demand and final demand. Thus output of the i^{th} industry x_i is given by

$$x_i = \sum_{j=1}^n x_{ij} + f_i, \text{ for all } i = 1, 2, \dots, n$$

The ratio $a_{ij} = x_{ij} / x_i$ denotes the amount of the i^{th} input needed for producing one unit in the j^{th} industry. The inter-industry and final demand relationships could hence be expressed as

$$AX + F = X,$$

where $A = \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \dots & \dots & \dots \\ a_{n1} & \dots & a_{nn} \end{bmatrix}$ is an $n \times n$ matrix

of input-output coefficients, F is the $n \times 1$ vector of final demand and X is the $n \times 1$ output vector,

$$\text{Hence } X = (I - A)^{-1} F$$

TABLE 2
Input—Output Transactions Matrix
(Commodity x Industry)

Industry	Inter Industry Demand by Sectors				Final Demand			Gross output
Commodity	1	2	n	Total	Pri. Cons. Exp.	Pub. Cons. Exp.	Change Net in Ex-Stock porrits	

Similarly, if b_{ij} denotes the amount of the i^{th} primary input needed for unit production in the j^{th} sector then the vector of primary input requirements given by

$$BX = B(I - A)^{-1}F$$

This basic framework can be extended and exploited in order to find answers to a wide range of issues. A few examples are mentioned here.

a) Sectoral linkages

$$U_j = \frac{1}{n} \sum_{i=1}^n a_{ij}^* \quad \text{(back ward linkages)}$$

and

$$U_i = \frac{1}{n} \sum_{j=1}^n a_{ij}^* \quad \text{(forward linkages)}$$

where a_{ij}^* are elements of the $(I - A)^{-1}$ matrix which give the direct and indirect requirements of the i^{th} input needed for meeting one unit of the final demand for j^{th} output. Thus $\sum_{i=1}^n a_{ij}^*$ indicates

supplied by the i^{th} industry in order to meet a unit increase in the final demand for each product. Hence given the growth rates in the final demand for select outputs, the corresponding growth rates required in the related (linked) sectors can be worked out.

b) Simulation exercises

The input-output model could be made use of to carry out simulation exercises in order to assess the impact of exogenous changes like shift in technology, increased export or imports, energy rationing due to shortage, shift in the composition of final demand, changes in weather conditions, cropping pattern, etc. The direct and indirect effects on the different sectors of changes in tax rates, administered prices, wage policy etc. can also be assessed.

c) Extensions to the basic model

The basic model can also be extended to endogenise the final demand or some of its components, to allow for production lags to be built into the coefficient matrix, to incorporate the features of an indirect tax system by modifying the price equations, to endogenise some of the input-output coefficients etc.

Input-Output tables — Indian Context

At the national level the latest year for which the input-output transaction table is available is 1973-74. This was prepared by CSO and published in 1981.

The input-output table for 1982 is presently being prepared by CSO.

For Tamil Nadu the input-output transaction tables have been prepared for the agriculture, mining and manufacturing sectors (for the year 1981-82) by Prof. Sankar, Madras University. This was sponsored by the Planning and Development Department of the Govt. of Tamil Nadu. Separate transaction tables have been prepared for three categories in the organised manufacturing sector — the census, non-census, census and non-census (combined), categories of ASI and for two categories in the unorganised manufacturing sector — one comprising the units in the Directory of Manufacturing Establishments (DME) and the other comprising the Non-Directory Manufacturing Establishments (NDME) and the Own Account Enterprises (OAE).

The State economy has been classified into 55 major producing sectors — 40 in manufacturing, 9 in agriculture and one each for animal husbandry, fisheries, forestry, lignite petroleum and other mining, for the construction of these tables. Information had to be pooled from the Annual Survey of Industries (ASI) census and sample surveys for the organised manufacturing sector and National Sample Surveys (NSS) for the unorganised manufacturing sectors. For want of sufficient information the final demand vectors could not be constructed.

Data basis

In the transition from the theoretical model to the empirical formulation a lot of measurement problems are encountered. The required data basis for the non-manufacturing sector is not firm.

In the manufacturing sector also the information has to be pooled from different sources — the ASI sample and NSS surveys. The formats for the schedules in these surveys vary and it becomes difficult to match the data available from the different sources. In some cases gaps in the information and errors in measurement are observed.

Another area in which constraints are faced is regarding the unit used for expressing the transactions. The data sources available give intermediate inputs and final demand at purchasers' price while the sectoral output data are given in producers' price (particularly in the organised manufacturing sector). In order to express all the transactions in Producers' price (which would be desirable) complete information on the distributive margin, trade, transport and storage costs, taxes etc. would be needed. Detailed information on this price spread is crucial for a complete and meaningful analysis.

Another area where the data base is weak is regarding the inflows and outflows of many tradeable commodities and different types of financial assets. The state economies are relatively more open compared to the national economy and the state governments have only limited control over inter-state movements of goods, services and resources. The range of instruments available to the states for controlling economic activities is quite limited. However, if a proper data base is constructed to record the flows from and into the state, it would go a long way in improving the accuracy and reliability of the analysis.

Summary

The input-output approach provides a simple descriptive accounting framework that helps understand the structural features of an economy at a disaggregated level. As an analytical tool it helps understand the sectoral linkages and assess the impact of technological shifts, policy decisions etc. This framework can be fruitfully applied

for planning and policy making purposes provided it is suitably supported by sectoral studies relating to productivity, demand elasticities, employment and income generation and welfare analysis wherever necessary.

The quality and the reliability of the results of this analysis and hence its use value depends heavily on the accuracy of the data used and the specifying assumptions made.

Industrial Perspectives in Tamil Nadu — A Report*

The Workshop on Perspectives for Industrialisation in Tamil Nadu during the 8th Five Year Plan conducted recently by the Madras Institute of Development Studies (MIDS) was not in the usual run of gatherings of such nature. The difference arose mainly from the standing of the sponsor institution, as an independent academic body. No specific interest of any group was sought to be promoted or any particular view point explained. Rather, the aims were to bring together representatives of different interests, get them to speak freely and, from the interaction that followed, to gain a better understanding of the prevailing situation in the State's industrial sector and of the problems for the immediate future. It was an excellent idea to have held the Workshop over a week end — the whole of Saturday, September 23 and a part of Sunday — for it enabled the participation of many who would not have been able to spare the time during the working week.

The participation in the workshop was somewhat lop sided. There was

a fair number of administrators and civil servants, who are presently, or have been in the past, connected with the shaping and implementation of policies relating to industry, as also a good representation of the "lay" public, interested in the subject. One did wish that there was a stronger representation of industry. But generally this group, which responds readily to the invitations of associations representative of their interests, is inclined to consider academic exercises as a waste of time. The contribution of the industrialists who were present — and some were there throughout the proceedings — proved valuable and illustrated the importance of interaction with this group at the academic level.

There was no formal presentation of papers at the Workshop; about a dozen papers were circulated in advance. In each case, a discussant — who was not the author of the concerned paper — briefly reviewed the principal points raised, and discussions followed; in the course of this the authors also provided clarifications and amplifications.

The first part of the Workshop was chaired by M. Sivagnanam, Member, Tamilnadu Planning Commission. It was devoted to a general over-view of the industrial situation in Tamil Nadu. The basis for the discussion was provided by two papers analysing available data relating to organised industry in the State. The first (by Nasir Tyabji and Padmini Swaminathan of MIDS) made some inter-State comparisons which, for lack of data, necessarily stopped with 1985. The second (by the Director of Statistics, Government of Tamil Nadu) gave more recent information but which related only to Tamil Nadu. The main features of the situation, as summarised by the discussant (C. T. Kurien of MIDS) were as follows: The compulsions of industrialisation were greater in Tamil Nadu than elsewhere in the country as the rise in unemployment was more pronounced here than in any other State, barring Kerala. The position of industry in the State would appear satisfactory, if seen from a static view point as the State continued to be among the leaders, along with Maharashtra and Gujarat, in various industrial parameters. But if the recent trends are studied the position is far from satisfactory. The tempo of activity appears to have slackened considerably. For example, the State's share in major projects in progress throughout the country is a mere 3.3 per cent — the proportion being even lower if private sector projects alone are considered.

The presentation of this picture led to a discussion of possible explanations for the deceleration of the pace of industrial growth in the State. One important question that was raised was whether sufficient diversification was taking place, generally in industry as a whole as well as within broad industrial

groups such as chemicals, and whether enough effort was being put into keeping up with technological and other developments elsewhere. This brought up a theme, that recurred frequently throughout the proceedings of the Workshop — that of the failure of entrepreneurship in the State. Various assessments were made of this feature: of entrepreneurs being predominantly "inward looking"; of their inability to "Think Big" and adopt such modern commercial practice as resorting to public issues; of a certain cynicism — which was considered tantamount to a negation of the spirit of entrepreneurship itself. The other major constraint pointed out was in respect of infrastructure, particularly in the power sector, which again came in for searching analysis later in the deliberations.

The subsequent session of the Workshop on Saturday afternoon was chaired by A. Vaidyanathan, Director, MIDS. It took up for discussion the position of individual industries. The discussion was sometimes wide ranging, as for instance in the case of the leather industry. Two papers were prepared on this industry's position and prospects: one by the Industrial and Technical Consultancy of Tamil Nadu (ITCOT) and the other the Report of the State Planning Commission's Working Group for the Eighth Five Year Plan. A basic question raised was whether the industry was at all to be allowed a future, because of its inherent pollution hazards. This view point sought support in the fact that the industry was gradually migrating from the industrial countries to the less developed because of its inherent pollution problem and because of working conditions for the labour. At the other extreme was the view put forward by the industry's representatives, that the industry was addressing the pollution issue adequately, and, therefore, Governmental

* Summary of the Proceedings of the Workshop on Industrial Prospectives for Tamil Nadu during the 8th Five Year Plan Prepared by Dr. Meenakshi Tyagarajan held at the Institute between September 23 — 24th 1989.

pressure on this account should be eased. It was generally viewed that the industry, having export and employment potential, with a high proportion of women in its labour force, was deserving of special attention, incentives and support. It was pointed out in particular that adoption of pollution control measures was possible with some initial investment, for which special assistance was sought. Attention was also drawn to the deterioration in the quality of the raw materials, the raw hides and skins. Improvement in this direction would take time and in the long run, a link was necessary between the Animal Husbandry Department of the State Government and the industry. K. S. Rao of the Central Leather Research Institute was the discussant for this industry.

Discussion on the chemicals and petrochemicals industries group was also fairly detailed. There were 3 papers in this group — one by the Department of Evaluation and Applied Research and another by P. K. N. Panicker of the Chemical Industries Association. The third was a paper on a specific area within the group, on the salt based heavy chemical industry by the Vice Chairman and President of the Tuticorin Alkali Chemicals and Fertilizers. Although the State had an early start in inorganic chemicals, such investments as have been made have not sustained further growth and many opportunities have been lost. In the instance of the salt industry, the considerable scope offered by the long coast line and the existence of substantial demand for salt for industrial use as well as for consumption, locally and in the neighbouring States, has not resulted in much growth of salt industry.

The absence of "mother industries" — more specifically, a petro-chemical complex based on a naphta cracker plant — was underlined as a major handicap. The proposed aromatic complex was considered a poor substitute, although it could make a vast difference to an industry such as caustic soda. On the other hand, the idea was mooted that entrepreneurs should not consider the lack of a "mother industry" as a serious handicap but proceed to exploit the opportunities preferred by the large units coming up in neighbouring State, in particular in Andhra Pradesh and Karnataka. The reaction of the representatives of the industry to this suggestion was hesitant and lukewarm. They felt the implications of such a long reach were by no means clear yet, especially in regard to the basic requirement of quick, safe and economic transportation of the raw materials. The discussant for this session was R. Sethuraman of Tamilnadu Petro Products.

Two papers were presented relating to the electronics industry — one by ELOCT and the other by ITCOT. Here again the failure to exploit opportunities was underlined. Like leather, it was pointed out that this industry too offered considerable scope for employment, especially for women, and it had the additional advantages of being pollution-free and low on energy requirements. The discussant, R. V. Ramani of Metchem Silicon pointed out that scope for future growth of the industry lay not only in the manufacture of specific electronic items, but in the development of electronic grade materials required by the industry, which have a very high value added prospect, and also in the soft-ware area. The absence of effective institutional support to the industry in the State was regretted and

the industry's need for some special incentives stressed.

There was one paper on the light engineering industry (by the Confederation of Engineering Industry). Here too, it was pointed out that the State had been losing valuable ground in recent years with shrinkages in its share of the automobile ancillary and two wheeler industries. The necessity was stressed for a focussed thrust to promote ancillarisation for which some tax reliefs were considered essential. The discussant was T. S. Kannan.

The only paper on the textile industry (by M. Ramaswami, of Loyal Textile Industries) presented a radical view in respect of handlooms. It was argued that the available statistics grossly exaggerated the number of handlooms operating and that the support extended to the sector was proving a drag on the industry as a whole. Opinion was sharply divided on this point, and the employment provided by handlooms was highlighted as a good and sufficient reason for support to them. A regrettable feature of the situation was that the expansion taking place in power looms was of little benefit to weavers, as it was spearheaded by a merchant class.

Another paper presented at the Workshop did not deal with industry as such but related to a subject that could prove to be of importance in planning for industrial growth. This was a paper (by R. Hema of MIDS) on the application of the methodology of input-output analysis to the State manufacturing sector.

The concluding part of the Workshop was a plenary session, chaired by K. V. Ramanathan, former Secretary, Planning Commission, New Delhi. It

addressed itself to the general issues arising from the discussions in the previous sessions. It was initiated by M. S. Adiseshiah, Chairman, MIDS, and M. Sivagnanam.

An issue of importance raised frequently in the discussions was the power situation in the State. The serious nature of the deficiency of this infrastructure affects virtually every sector. While the Tamil Nadu power grid has a good mix — better than any of its neighbouring States, comprising hydel, thermal and nuclear power generation capacities — the scope for future expansion is very limited. All available sources of hydel energy has been tapped and the expansion based on Neyveli lignite has also reached its limit. Thermal generation based on coal would be uneconomic because of transportation costs. The use of imported coal would prove viable because of its high quality but the Central Government is opposed to such imports. The implications of this situation for industrial policy were delineated by some knowledgeable persons. An important point made was the need for the State Government to clarify its priorities in the industrial sector. Keeping in view the likely power demand from emerging industries, the State Government and the Planning Commission should indicate the priority it would accord to individual industries. A related point was the need to have a close and hard look at the structure of electricity tariff and the subsidy provided to agriculture. A more optimistic view was voiced in regard to potential for expansion of power generation capacity, with the exploitation of lignite in areas such as Jayamkondan and Srimushnam. The possibility of using natural gas for power generation was also mentioned and it was suggested that this might well be the best use to which this resource could be put.

Another area discussed was the role of technology. This related not only to the increase of productivity but in also such matters of immediate concern as the control of pollution and the introduction of energy-saving techniques in power-intensive industries like chemicals. It was felt that the attention given by the existing industries in the State to research and development was very inadequate and that unless there was some change in attitude, the necessary extent of diversification may not be possible.

The appropriate role of the State was another issue raised. A strongly felt view was that the State should keep away from areas where the private sector was already performing well. It should instead pay greater attention to infrastructural development. Attitudinal

changes were essential in both the private and public sectors. Entrepreneurs had to be far more market oriented. For their part, the protagonists of the private sector felt that the administration should adopt a more positive and helpful approach.

The numerous ideas that were discussed in the course of the sessions of the Workshop also included some possible lines of future academic research that would contribute to a better understanding of the dynamics of industry in the State. What changes were taking place in the non-household industrial sector? What sort of industrial units were coming up in the rural areas? Was sub-contracting growing? More information on these and related subjects would improve perception and aid policy makers.

Environmental Impact of Large Storage Based Irrigation Projects

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Much before the initial enthusiasm of the new technology in agriculture subsided, the problem of its social impact became more pertinent. Unlike the early seventies; when we discussed the direct influences of the seed-water-fertiliser technology; our priority shifted to gauging the social costs as against the benefits of the growth strategy. Irrigation had always been at the central stage both because of its biotic influence on the crop agriculture and the amount of investment involved in it. Given the large rainfed area and climatic fluctuations as its major limitation, irrigation would continue to dominate the sectoral plan for agriculture. Hence while working on the irrigation linked technological imperatives the advantageous qualities of the agro-eco-systems have to be protected as a long term strategy.

After independence large amount of public funds were invested in irrigation (both under major and medium types). The growth rate of area under major irrigation was 3.4 per cent per annum

and it was expected that every irrigated hectare would yield 4 to 5 tonnes of grains. But this expectation did not come true. It is now more or less established that the benefits in case of the major irrigation projects were heavily exaggerated whereas the social costs have always been undervalued. Among the social costs of an irrigation system, the water related environmental problems assume importance both due to the magnitude and the fact that water is the most important medium of compound exchange between land and environment. The problem involves not simply the externalities but also the sustainability of the systems for an overall development (Nadkarni, 1987). It was observed that as much irrigated land is going out of production every year in the world today, as is being brought under plough (Vora, 1982). By definition ecological problems are location specific and have to be analysed in the context under which they arise.

In the present paper we shall endeavour to analyse environmental problems in a command area of a major irrigation project in the limited perspective of agro-system of the region. For the purpose of our analyses we have chosen Krishna Raja Sagar major irrigation project in Karnataka which started functioning in the year 1930. In an irrigation project command the ecological changes take place over years. Hence an irrigation project completed recently would only indicate the process of change and this process would stabilise (even may be reversed) over years of experience. This consideration dictated our choice of a project which is six decade old. The present paper relies mainly on the impact studies completed recently (Deshpande & Iyyampillai, 1987 and Deshpande & Ramakrishna, 1988) at Institute for Social and Economic Change, Bangalore. Our sample was spread over 56 villages of which 50 were falling under the command area of the project and remaining six were rainfed villages from hinterlands chosen as control group. A sample of 1525 households was selected for detailed analysis. Quite a few difficulties were encountered while collecting information about environmental impact, the major difficulty was the comprehension of the environmental problem by the respondents due to the involvement of soil science terminologies.

The present paper is spread over three sections. The following section discusses the environmental impact of large storage based irrigation project under a system analytical framework. The third section deals with the case study of Krishna Raja Sagar (KRS) multipurpose irrigation project in Mysore district of Karnataka State. The remedial measures are discussed in the last section.

II

Any analysis of environmental impact involves both positive and negative aspects. A systematic impact assessment should follow both the approaches, however for a long time there was a tendency to concentrate mainly on the positive impacts relegating the social or environmental costs as negligible. In the recent past quite a few studies discussed the environmental cost of large irrigation projects (Golubev, 1978, ORG, 1980, Vora 1982, Brahme and Tetali 1986, Deshpande and Ramakrishna 1987, Paranjapye 1989). We have presented a systems approach diagram explaining the environmental costs of a large storage based irrigation project based on our field experience in KRS command area.

Basically there are four major sub-systems dividing the area under environmental changes of a large storage based irrigation project viz., (i) Catchment area (ii) Reservoir, (iii) Upper reaches of the canal system of command area (iv) Lower reaches of canal system. The last two sub-systems make a combined group as command area, however these are treated separately because of the differences in nature and intensity of problems. Further, we have not discussed here the environmental problems of hinterlands (rainfed area in the periphery of these regions) in order to sharpen the focus on environment of core areas.

The choice of location of large storage based dams is often dictated by topography of the region and especially where the river flows out on plains through a narrow neck in the spurs of a mountain chain. The reservoir is located in the basin falling before the neck of the mountain chain. There are

instances where the slopes in the catchment area have to be adjusted (involving large amount of land levelling work) in order to increase the storage of the reservoir. In such cases intervention with the topography leaves vast patches of top soil displaced. Submergence of the valley also results into displacement of people, abandoning of cultivated areas, deforestation on a large scale, displacement of wild life (at times even disappearance). Further the pressure on the bed rock and impounding of large quantity of water may result in the hydro-geological changes. Improper handling of the slopes of the mega-watershed and absence of proper land use treatments coupled with deforestation causes siltation of the reservoir at a faster rate than anticipated. On the positive side a proper land use treatment of catchment area would help in preserving flora and fauna in a suitable habitat. Fishery can be new vocation for a section of the society, which would induce immigration of fishermen community. There are quite a few instances where the dam sites are developed into excellent recreation centres.

For the purpose of our analysis we have divided the command area into two groups based on the canal situation. Though the environmental impacts both under upper reaches and lower reaches are more or less same, their nature and intensity differs widely. The environmental problems of command area (both of upper and lower reaches) can be grouped into three broad categories. First come the problems relating mechanical treatment of land (land shaping) and changes in land use. Land shaping involves displacement of the

top soil which brings up soil material from the sub-soil region and also causes a change in slopes. This has either a positive/negative influence on productivity.* Mechanical treatment of land is involved in establishing the network of the canal system. Both land shaping as well as establishment of canal network involves deforestation on a large scale in the command area. Moreover, unlike catchment area there is no alternative land available for afforestation on the same scale. This may also lead to certain micro-climatic changes. Higher level of prosperity due to irrigation gives a boost to construction activities. Infrastructure in the command area improves at a faster rate than that of hinterlands and this causes a sharp increase in the proportion of land under non-agricultural usage.

Another set of issues relate to the irrigated area or in other words cultivated lands. Improper water management coupled with applications of inorganic fertilisers and high water consuming crops lead to this set of problems. Among the water related problems water-logging assumes highest priority. Land is water logged if the groundwater table is less than 1.8 mtrs below the ground level. Crop growth in water logged area is affected due to three reasons. Firstly, the root zones of the crop get saturated and the roots do not get enough of oxygen resulting in accumulation of carbon dioxide. In the case of rice and sugarcane special air conducting tissues in the stems supply oxygen to the roots and hence these type of crops can survive. Secondly, certain micro-organisms thrive on the stagnant water in the water-logged area

* Positive when the top soil is already eroded, by bringing up productive subsoil and negative in case of shallow soils.

and not only disturb the micro-agro-eco-system of the soil but also consume Nitrogen which in turn denitrates the soil. Thirdly, soil salinity goes on increasing due to leaching of salts. According to a rough estimate nearly six million hectares of irrigated area is water-logged in the country and even more than this is affected due to salinity and alkalinity (Agrawal et al, 1982).

Changes in the chemical composition of soil occurs both because of defective water-management practices and use of inorganic matter. The rising water table bring up the salts in the sub soil altering the chemical composition of the soil.

It is well known that the use of fertilisers is higher in the irrigated command areas. The methods of application are not scientific and hence many times fertilisers stay in the soil without being absorbed by the crops. Similar is the case with the application of pesticides. Furthermore, residuals of these chemical fertilisers/pesticides find their way in irrigation water thereby deteriorating the quality of water.

The changes in the chemical compositions of soil include changes in the composition of inorganic matter, changes in the soil structure, pH value of the soil and electrical conductivity.* Table 1 gives classification of salty soils.

TABLE 1

Chemical Soil Composition

Type of soil	pH Value	Exchangeable sodium percentage	Electrical conductivity (Millimhos/cm)
Saline	Less than 8.5	Less than 15%	More than 4
Alkaline	8.5 to 10	More than 15%	Less than 4
Saline-Alkaline	Around 8.5	More than 15%	More than 4

Source : Prasad and Malhotra (1985).

The chemical compositions of the soils shown above would make it unsuitable for crop cultivation. But then for each crop the tolerance limit of these chemical parameters are different. Moreover,

chemical amendments would help the soils to regain its fertility. Addition of gypsum salt in recommended doses would help to replace excessive sodium by calcium, which can be leached out

* Ayers and Westcot (1976) give a method of arriving at reduction in yield of major crops given the level of electrical conductivity.

providing proper drainages. Saline-alkaline and alkaline soils present a problem here, since sodium disperses the colloids in the soil to make it less permeable (Prasad and Malhotra, 1985). Hence the method of reclamation of the soil has to be suitably amended. But then the costs of reclamation per hectare of problem areas are quite high and surely out of reach for even the medium farmers.

III

Krishnarajasagar (KRS) is one of the oldest major irrigation projects of South India. By 1897 there were 12 small canal systems functioning on Kaveri with an aggregate canal length of 369 miles (B. Lewis Rice, 1897). The Ramasamudram channel together with the anicut were constructed by Chikka Deva Raja Vodeyar who came to the throne in 1672. During 1902 a power station was established at Shivasamudram and hence a reservoir on the Cauvery or one of its tributaries became urgent necessity.* Mr. M. H. Karve a former Superintending Engineer in Mysore State surveyed the sites for construction of a reservoir near Kannambadi eighth and tenth miles respectively to the West of Serirangapatna. Captain Bernard Daews, the Deputy Chief Engineer recommended the lower site. On 5th May 1911, the Government of Mysore received the report of the Chief Engineer and gave a final sanction by 12th October 1911. A masonry dam of 124 ft above the river bed and 6550 ft long was recommended with a reservoir capacity of 41.5 thousand mcf of water and 1700 ft length of waste weir. The canal system was to

irrigate 1.25 lakh acres of land (Hayavadana Rao, 1930).

The reservoir site was almost a natural basin and no heavy earth work was involved. This averted large scale deforestation in the catchment area. Total land submerged belonged to 44 villages in the vicinity of Mysore and covered an area of 10026 acres - 24 guntas. The displaced population were rehabilitated much before the completion of the dam. Eight new villages were formed to settle these population with an expenditure of Rs. 12,51,270 (Hayavadana Rao, 1930). The cultivators were given 10,359 acres of land in exchange of submerged area. Though the construction of the dam, reservoir and canal systems did not involve large scale deforestation, the process of commercialisation as a result of irrigation has definitely caused deforestation on the large parts. We may note this when we analyse the land use pattern of the command area. Geomorphological changes are not observed. History of the region does not record any extraordinary seismic changes due to the pressure on the reservoir bed.

Immediately after the availability of irrigation the cropped area expands horizontally bringing under it forest lands and hitherto uncultivated marginal lands. The land utilisation pattern of the selected villages shows the contrast between rainfed and irrigated villages. (Table 2).

Table 2 reveals a few interesting observations. As expected the proportions of forest lands, barren lands, cultivable wastes, pastures and grazing land and area under trees and grooves are higher

* The idea and initiative about the project has to be entirely attributed to the Foresight of Sir. M. Visweswariah.

TABLE 2

Land Utilisation Pattern in the Selected Irrigated and Rainfed Villages
(Percent to total geographical area)

Land use categories	Irrigated villages	Rainfed villages
1. Forests	0.57	4.62
2. Barren lands	4.54	24.19
3. Land put to non-agricultural uses	15.85	16.26
4. Cultivable wastes	2.05	8.77
5. Pastures and grazing land	3.95	6.59
6. Areas under trees and grooves	1.35	3.52
7. Current fallows	5.41	1.72
8. Other fallows	1.42	0.14
9. Net sown area	64.46	34.19

Source : Deshpande R. S. and Iyyampillai S. (1986).

in the irrigated villages as compared to rainfed villages. This indicates that these areas have come under cultivation or put to non-agricultural uses. Culturable area in the irrigated villages is much higher compared to rainfed villages. Similar is the case about current fallows and other fallows.

Large scale deforestation and elimination of area under tree crops has taken place in the command area. Further that the marginal lands are being brought under cultivation, which would naturally bring down the average productivity of command area. Pastures and other grazing land which were a common feature of Mysore villages have also been disappearing and not being replaced under the land use. The major

sore point however, is the higher proportion of fallow lands. These lands are the usually rendered unfit for cultivation by the farmers and cannot be classified under any other land use category. Though the problem is not very acute it may assume higher proportions in the coming years.

Water logging is one of the main problems being faced by the command area of KRS. The project for land reclamation prepared by the Department of Agriculture, Government of Karnataka gives an idea of the problem areas falling under irrigation projects of Karnataka (Puttanaik, 1979). According to this source around 4 thousand hectares were falling under the category of problem areas (Saline, alkaline or

water-logged) under KRS. These can be called as gross underestimates due to various factors. The soil survey unit of CADA of KRS have estimated 5.06 per cent of the surveyed area underestimates due to various factors. The soil survey unit of CADA of KRS command as problematic (CADA, 1985). Of this almost more than half is water-logged with water table less than 2 mtrs bgl. The problem is more acute in Pandavpura and Mandya taluka of the command area.

Cropping pattern dominated by high water consuming crops seems to be the main reason of the problems of command area. As is well known, the water requirement changes over crops. Hence, the intensity of application of water depends upon the cropping pattern adopted in the irrigated area. We have presented in Table 3 the cropping pattern of the irrigated villages juxtaposing it against the rainfed cropping pattern. The table also gives water requirement for the area given the cropping pattern for irrigated villages.

It may be read from the table that about 69 per cent of the gross cropped area falls under irrigated crops. Of this about 17 per cent (much above the recommended pattern) of area is under sugarcane. The production of sugar has increased from 5 thousand tonnes in 1933-34 to more than 3 lakh tonnes during 1983-84. The water required for its cultivation is however quite high. We have also presented some rough estimates of water for 100 acres of the indicated crop pattern. These data are just indicative, since water requirement has large variations across soil types, topography and the canal position. The total water require-

ment roughly ranges between 5 to 6 thousand acre-inches for 100 irrigated acres of which more than half is the basic necessity for sugarcane. It may be noted that we are discussing the normative requirements and hence the actual use of water will clearly show a disturbing picture. Because in the case of paddy and sugarcane it will be much higher than the norms presented here.

The point we would like to drive at is the callous use of irrigation water especially in the upper reaches of the canal system. This surely is the reason of agro-ecological imbalances caused in the command area. Certainly, what may be called as 'Resource Illiteracy' on the part of the farmers coupled with the administrative laxity are behind the origin of the agro-ecological problems. Farmer's perception is that the productivity increases directly with the amount of water used and hence there is unsuppressing tendency to use more water than required. Seepages from the unlined irrigation canals also add to such problems. The repairs of such lining and breaches should receive priority in the CADA's land development work. Use of plastics or resin based water proofing chemicals would help in cutting down the cost of such repairs. It was noted in our field visits that breaches and crevasses in the canal system was a common phenomena.

There is a clear evidence of increased use of water from the quantum of water released per hectare* presented in Table 4. During 1973-74 only 73 cft of water was released in the canal system for irrigating 1 hectare of area which increased to 143 cft during 1980-81 and thereafter dropped down to

* This is similar to Pasten index used in water management in Indonesia (see Prabowo, 1983).

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TABLE 3

Cropping Pattern in Selected Villages and Water Requirement
for Irrigated Villages
(Per cent to gross cropped area)

Sl. No.	Crops	Annual water requirement in acre-inches at canal head	Cropping Pattern		Water requirement in acre inches at canal head for Col. 5
(1)	(2)	(3)	Rainfed villages (4)	Irrigated villages (5)	(6)
1.	Paddy	41.6 to 62.4	6.31	47.78	1988 to 2981
2.	Jowar	7.8 to 15.6	1.65	1.14	9 to 18
3.	Bajra	7.8	0.21	0.04	0.3
4.	Ragi	7.8	31.34	10.33	81.0
5.	Pulses and other millets	11.7 to 15.6	42.84	12.68	148 to 198
6.	Sugarcane	176.8	0.57	16.98	3002
7.	Mulberry	7.8 to 15.6	8.85	4.22	33 to 66
8.	Misc. crops	7.8 to 15.6	8.23	4.83	38 to 75

Source : 1. Deshpande R. S. and S. Iyyampillai 1986

2. Govt. of Maharashtra 1986.

Notes : The water requirement ranges indicate the actual requirements under kharif and rabi seasons. Under stress condition water requirement increases. For Mulberry the requirement is assumed as that of millets.

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TABLE 4

Yearwise Release of Water Per Hectare of Irrigated
Area through the Canal System

(Cft/per hectare)

Year	Water released in the canal system per gross irrigated hectare
1973-74	73.13
1974-75	83.99
1975-76	97.16
1976-77	107.47
1977-78	103.10
1978-79	116.55
1979-80	114.65
1980-81	143.49
1981-82	141.22
1982-83	125.28
1983-84	114.77

Source : Based on the data supplied by EE office, KRS, Mysore.

114 cft. Given some allowance (let us say a progressive allowance over years) for losses due to seepages and evaporation or similar other losses during transit, it is clear that every irrigated hectare is getting much more water compared to 1973-74 level. This can also be verified from the area trends in paddy and sugarcane. It is unfortunate that provision of irrigation water is treated as the end of the problems of an agriculturist, but in reality many a times problems of acute sort begin here.

IV

In its strict sense water is a renewable resource and every year we get enough of water for the purpose of agricultural activities. But due to defective water management practices we enter the problems of eco-environmental stresses. Certain components of the eco-system like soil, forests, vegetation, flora and fauna are not quick replenishables. It requires years together to get a thinnest layer of fertile soil. Moreover, the costs

of replenishment are prohibitive in the background of the scarcity of investible resources and alternatives. Most of the measures suggested in the literature are more preventive in nature than curative. We shall discuss in the paragraphs below steps to overcome the ecological problems of the agro-eco-system of large irrigation projects. Our focus however, would be on problems of KRS command area.

The ecological imbalances in KRS irrigation system has not yet assumed alarming proportions. This can be attributed to the proper management of CAD activities in the Kauveri Basin project. We hasten to add that the problems however, cannot be neglected. It is necessary that a survey of the problem areas is carried out to locate category-wise areas affected. This would also give an idea of potential hazard prone areas. It is necessary that potential hazard prone areas are taken up on priority to avert the process of destruction. Lining of canals and repairs of the breaches and crevices should receive top priority. It is necessary that experiments be carried out on the use of resin based chemicals for extending protection for seepage losses.

Large areas are affected by soil degradation of all the three types. Chemical treatment of soil with gypsum will help in exchanging sodium with calcium. But in case of alkaline and saline-alkaline soils exchangeable sodium disperses the colloids in the soil to make it less permeable. These also can be tackled by proper leaching and drainage. But these amendments of the soil structure are quite costly and had to be carried out with precision. Hence the reclamation of degraded soils should form the second priority, whereas, first priority be given to curative measures.

Treatment of waterlogged areas is relatively simple but not necessarily less costly. Conjunctive use of ground and surface water should be promoted since pumping of ground-water would naturally check the rising water table. An effective lowering of water table can be achieved by open drains, buried clay (tile) or half porous concrete pipes. Shallow tubewells in the waterlogged area can be used to pump back the water in canal system so that water availability in the lower reaches also increases.

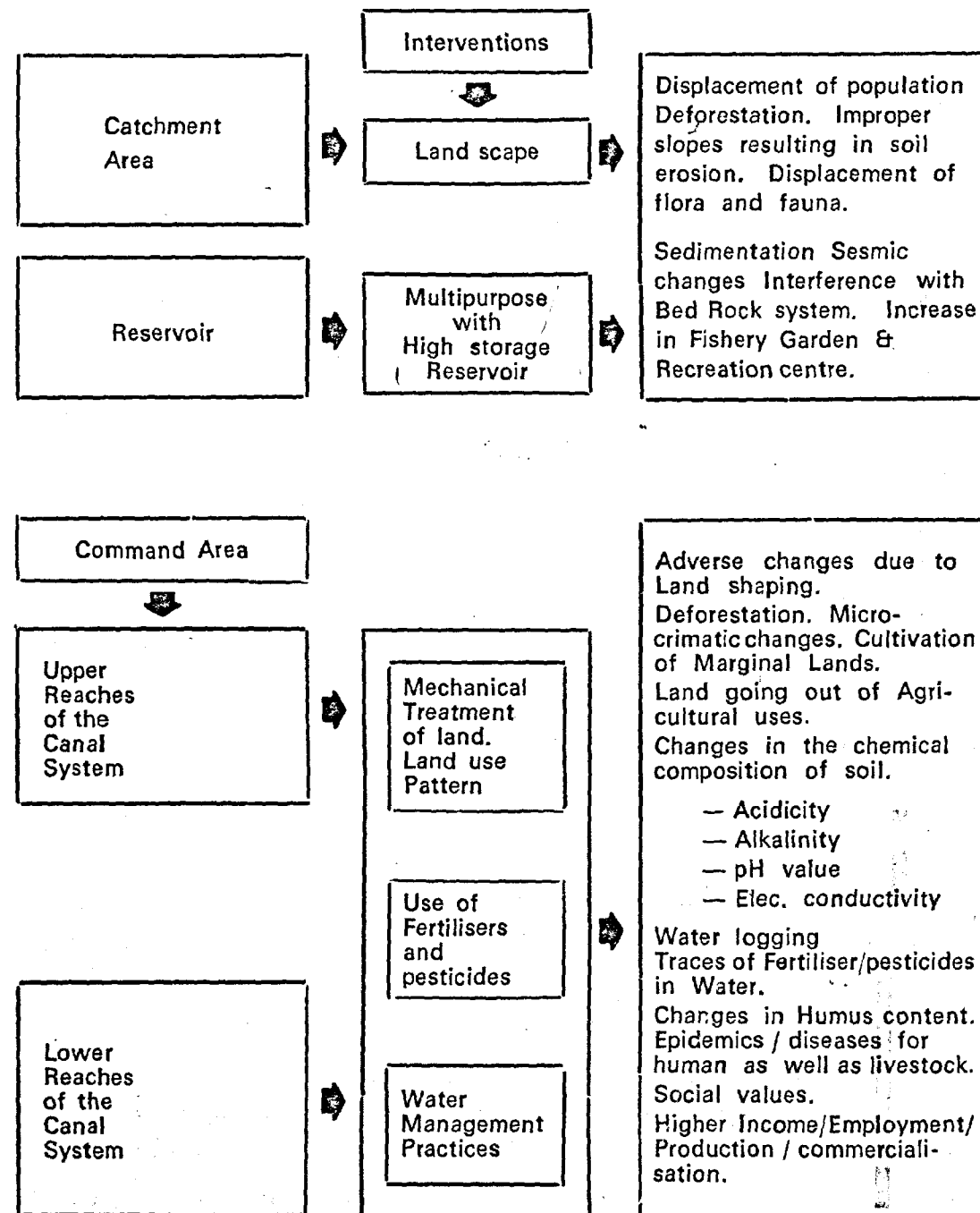
Bulk of the efforts of Command Area Development Authorities are concentrated on physical improvement of the command area where land reclamation and ecological problems do not get required priority. Construction of field and irrigation channels receive the major chunk of the expenditure and most of the time of the monthly monitoring meetings (MMR) is lost in gathering details of the targets and achievements. It is necessary that the Command Area authorities have a separate cell dealing with agro-ecological problems, with a Land Development Officer (ecology) incharge of it.

More than all this it is necessary to create an awareness of the problems for those who participate in the process. It is necessary to learn from experiences of community participation in irrigation management like "Pani Panchayat" experiment of Purandar taluka of Pune district in Maharashtra or similar experiment taking village as a unit of Ralegaon Siddhi (Maharashtra). The community involvement with institutional back up (like Manda Panchayats) would be helpful to achieve this in Karnataka.

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Figure 1 : Environmental Impact of Major Irrigation Project



Characteristics and Functioning of Traditional Irrigation Institutions

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The central objective of this paper is to understand the functioning or otherwise of traditional irrigation institutions (t.i.i.) and to examine the factors underlying this.

This note is based upon a field survey carried out in the selected tank irrigated areas fed by an age old system, viz., Palar Anicut System. This system supplies water to 317 tanks, irrigating an ayacut of 80,000 acres in North Arcot and Chengalpattu districts through four major channels. For our detailed survey, 15 tanks have been selected somewhat purposively to cover various reaches across main/branch channels as well as to capture various characteristics of tanks such as size, sources of supply, number of villages fed etc. The field survey was carried out at different phases during 1986-87.

The Concept of Traditional Irrigation Institutions and Organisational Structure

The t.i.i. are characterised by several social arrangements and responsibilities basically with a view to serve the members of a village society. The social responsibilities of such a t.i.i. are to maintain an irrigation system, its structures, to evolve and to adopt a common code for sharing water, to have a system of common irrigator for irrigating different parcels of land in different reaches of a command area etc. Basically, the evolution of principles for collective action of users of a particular system for maintenance and for sharing water may be called traditional irrigation institution.

However, the functioning of t.i.i. is basically a reflection of fundamental

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socio-economic aspects of a village society. The most crucial aspect that has direct bearing on the functioning of t.i.i. is the nature of control over productive resources like land and water. There are also several other physical factors such as size and location of a tank, sources of supply to a tank, availability of the free catchment area per acre of ayacut, etc. Many of these factors do not work in isolation and there exists a complex interaction among them.

Before examining the factors underlying the functioning or otherwise of t.i.i. it will be useful to discuss its major functions. The functions performed by a t.i.i. can be divided into two broad groups: They are: (i) maintenance work—the maintenance of inlet channel and the maintenance of main distributaries and field channels below a tank (ii) enforcing a system of water allocation or what is called enforcing a *murai* in the use of tank water. Besides these, the t.i.i. in some areas also involve in resolving disputes, repairing the sluices, surplus weirs and in strengthening the bunds etc., in particular during flood situation.

The organisational structure in a village society, for carrying out the responsibilities of a t.i.i., operates at two levels: One is at a more supervisory level as an enforcing authority and the other is more of a menial's nature involving hard labour. The first type is called '*Nattamaikar*' (a group of persons, almost representing the entire village) or '*Kavaimaniyam*' (generally one person). While the latter is a more specific irrigation functionary, concerned with organising maintenance work etc., the former besides carrying out the tasks of t.i.i. also have to organise village/temple festivals etc. Wherever, *Kavaimaniyam* exists, the *Nattamaikar* also

exists but where *Nattamaikar* assume responsibilities of a t.i.i., *Kavaimaniyam* does not exist. In general, the *Nattamaikar* and *Kavaimaniyam* are from upper castes who are also very often well to do farmers. Both these are honorary appointments except in one tank where the *Kavaimaniyam* is appointed and paid by the PWD (Kaliyur Tank). The posts of *Kavaimaniyam* and *Nattamai* used to be hereditary some three or four decades ago, but at present in most of the villages the selection is ceased to be on hereditary basis. One can attribute several reasons for the breakdown of selection of village head men on hereditary basis, but the most important reason is the extensive transfer of land from upper caste to lower caste people or the transfer of power from upper caste to lower caste.

The body of *Nattamai* or *Kavaimaniyam* is assisted by a group of irrigation workers called *Neerkattis* who are selected generally from among harijan households in rotation. The major responsibilities of *neerkattis* are to inspect the inlet channels during monsoon months when water flows and to bring to the notice of the *Nattamaikar* or *Kavaimaniyam* about any breaches or illegal tapping of water by upstream farmers, to watch the bunds and surplus weirs particularly during flood situation, to irrigate lands as per the directions of *Kavaimaniyam* or *Nattamai* and to protect the crop from cattle. The number of *neerkattis* vary from 1 to 8, depending upon the size of ayacut. The *neerkattis* are paid in kind every season (only when tank water is used. Full payments are made as per the convention; otherwise they are paid far less than the usual payments) by farmers of a concerned ayacut. If the tank water is used the payments range from 5 kgs of paddy per acre to 15 kgs per acre per

season (See Table-2). Usually the payments are made in the form of paddy stalk.

The most common method of functioning of *Nattamai* or *Kavaimaniyam* is to call for a meeting of ayacutdars as soon as a tank starts receiving supply through its feeder channel by having *neerkattis* announce the meeting by beat of the drum. In the meeting it will be decided when to start the maintenance work and contribution of labour by each ayacutdars. Usually one person per acre or in some cases one person per *kani* (1 Kani = 1.32 acres) will be the requirement. If a particular ayacutdar fails to contribute his labour then he should substitute with an hired labourer. If a farmer fails to do both then he will be fined. In fact some tanks (e.g. Pudukkottai tank, Kaliyur tank) the *Kavaimaniyam* maintains pucca records of extent of labour involved for maintenance work. Extent of labour involved very much depends upon the extent of maintenance work needed in any given year.

The method of functioning of a t.i.i. and the organisational structure is some what different in the case of one large tank which is a multi-village tank selected for the survey (Kaveripakkam tank). The Kaveripakkam tank has the storage capacity of 1474 mcf with a registered ayacut of 6278 acres and provides irrigation to 14 villages. This tank is at the head of Kaveripakkam main channel, the surplus from which irrigates an extent of about 10500 acres. The inlet channel of this tank (the bed width of which is 16 feet) is occasionally desilted and leweeded by the PWD and farmers never indulged in the collective effort or maintaining it for, it involves an co-ordinated effort of users of several villages which is not possible.

For the management and regulation of tank water, there is a body called Irrigation Board established long ago (the actual year of establishment is not known). The Board is constituted by an elected president, secretary and delegates representing various villages / sluices. The election is conducted in a more organised way by either a Revenue Divisional Officer or a Thasildar. Those who pay the wet assessment of Rs. 5/- and more are eligible to vote. First the delegate for all the 10 sluices representing 14 villages will be elected who in turn elect the office bearers of the Board, viz., President and Secretary. Although the elections should be held once in 5 years, no elections were held after 1969. At present, the same President, Secretary and delegates continue to serve the Board (except three delegates who passed away during this period). The Board is assisted by four *neerkattis* appointed and paid by the Government. The responsibilities of these *neerkattis* are to inspect the inlet channel, sluices, surplus weirs and bunds of the tank, to prevent illegal tapping from inlet channel and through the sluices, to prevent encroachment in the tank etc. Till 1980, they were selected on hereditary basis from among harijan households but after that it became open for everybody. At present, of the 4 *neerkattis*, three belong to the Scheduled caste and one belongs to Vanniar caste and their monthly remuneration is Rs. 295. Normally the sluices are opened and closed only by PWD laskars (after taking the advice from JE), but JE concerned can open or close the sluices only with the recommendation of the Board.

While the powers of the irrigation Board rests only upto the sluices, the body of *Nattamai*, which we

discussed earlier, takes care of the maintenance of main distributaries and field channels and water regulation below the sluices. Thus, in the bigger and multi village tanks the institutions function in a much more organised manner than in smaller and single village tanks.¹

Functioning of t. i. i. and Factors underlying it

Functioning of t. i. i. in the selected tanks can be seen from Table-1. The table shows that the t. i. i. functions at a varying degrees in the selected tanks; in some it is effective; in some it is less effective and in some others it is defunct. Out of 15 tanks, the institutions are effective in 7 tanks, it is less effective in 2, and in 6 it is defunct. In the seven tanks where the t. i. i. is effective, one can notice that the maintenance work of inlet channel, main distributaries and field channels is done quite periodically in the past 5 years, and also there is a well established system of water allocation called *murai*. Moreover, in 5 out of 7 tanks, where t. i. i. are effective, there is a specific irrigation functionary viz., *Kavalmaniyam*. In the case of two tanks where it is less effective the maintenance work is not done quite regularly at least in the past 5 years and moreover in both these villages, no system of water allocation was followed in the past 5 years. In the case of 6 other tanks, the t. i. i. is defunct and in all of them there was absolutely no maintenance work done in the past 5 years and in fact in 4 of them for

more than 15 years no maintenance work was done. In such villages, there is no system of water allocation and although *Nattamai* exists, it takes care of the temple and village festivals only. Quite surprisingly, in 14 out of 15 tanks, the irrigation workers exist (*neerkattis*) and receive full payments as per convention where t. i. i. is effective and receive much less than the conventional payment where it is defunct (See Table-2). In one case (Vembi tank), where even the *neerkattis* do not exist, farmers use the tank as a percolation pond and it was reported that since farmers do not make payments, the *neerkattis* refused to work for the past 5 years. The ayacutdars keep up the habit of maintaining *neerkattis* (although other institutional arrangements are defunct) mainly because they are involved in the beating of drums during festivals and death ceremonies and for other village menial work.

Nevertheless, in almost all the tanks we surveyed it was reported that the t. i. i. were in operation before 3 or 4 decades and were also reported to be very effective. In this context, it is interesting to probe into the factors underlying this varying degree of functioning of t. i. i.

Factors underlying the functioning of t. i. i.

1. Control over productive resources

(A) Water:

One of the most significant factors that has affected the functioning of the

t. i. i. is the emergence of wells in the tank ayacut. The spread of well irrigation in these districts (Chengalpattu and North Arcot) has been tremendous after the large scale rural electrification (during late 50s) and this process perhaps, became faster after the introduction of new technological package, which required more assured and controllable source of irrigation. In fact, in the past couple of decades, well has become an important source of irrigation even in the wet lands irrigated by tanks and spring channels. The underlying point is that hitherto the irrigation water was treated as a property of a village society, to which every individual user had responsibility in its maintenance; but after the emergence of well in the ayacut, the irrigation water became a private property - the private property for those who have access to resources to invest in wells and in water extracting mechanism. Thus, along with land, water also has become an important private productive resource. Hence those farmers who have access to ground water (which is private, more assured and controllable) lost interest in the tank water and its maintenance and so the collective efforts in the maintenance work and in enforcing *murai* is affected. (See Table-3)

The Table-3 gives information on the well density in the ayacut and percentage of all plots getting well irrigation (in 1985-86) as per our sample survey. We will notice that in all the six tanks where we found that the t. i. i. is defunct (See Table-1) viz., in Thakkolam, Perumbulipakkam, Poigainallur, Tirupukhuzhi, Vembi and Sirugattur, the well density is very high (i.e. well per acre) i.e. 0.18, 0.25, 0.16, 0.07, 0.28 & 0.33 respectively. In Tirupukhuzhi, although one finds only 0.07 well per acre, the percentage of area receiving well irrigation is found

to be 67.4%. For other tanks also it is considerably high and in three of them it is over 80%. In fact the case of Vembi is the most interesting one, where the sluices have been kept closed for the past 7 years and the tank solely serves as a percolation pond. (This is the only village where even *neerkattis* have stopped working since 1980). On the contrary while looking at the tanks where the t. i. i. is effective, the well density is found to be low and also percentage of area receiving well irrigation is insignificant. For instance in the four out of seven tanks where the t. i. i. is effective, viz., Peruvalayam, Karivedu, Pudupakkam and Paranthur, the well per acre works out to 0.04, 0.01, 0.02 and 0.01 and even the percentage of area receiving well irrigation works out to be very low. Only in three tanks (Velur, Agavalam and Kaliyur) where the t. i. i. is intact and effective but well per acre is also high (0.20, 0.14 and 0.21 respectively). This is probably due to physical factors such as that of an assured supply to the tank (Kaliyur) from other systems and the locations of a tank in the head of reach of a supply channel (like Velur is the head reach tank of Kalavai Channel). It may be interesting to note here that while in all other tanks where the t. i. i. is defunct and where the density of wells is very high, the supply from inlet channel is also stopped; whereas in the case of Velur and Kaliyur the supply to the tanks is not stopped completely.

(B) Control over land and land transfers:

The land transfers (from upper caste to lower caste people) have been taking place to a great extent in all the selected tank ayacuts with a few exception, and this has resulted in the

¹ There is another such big tank called Dusi-mamandur tank which we selected for the preliminary survey, the ayacut of which is 4118 acres and which provides irrigation to about 18 villages. Like that of Kaveripakkam tank, irrigation Board exists in this tank also and functions in a more organised manner.

breakdown of old power relations. In most of the selected tank ayacuts, before 4 or 5 decades, it was reported that a greater proportion of wet land was held by Brahmins and other high caste hindus like Mudaliars, Chettiyars, Naidus etc. But at present Naickers have emerged as one of the major land owners in the tank ayacut and in several places, harijans also have acquired land to a significant extent. Due to the changes in the caste-class relations, the t.i.i., which were hitherto managed effectively by the old landlords, broke down.

As a result of the land transfers, lot of caste factions have emerged which really stand in the way of effective functioning of t.i.i. In the case of Kaveripakkam tank for instance, in the head reach village of the deepest sluice, (Kaveripakkam) naickers have acquired lot of lands from Brahmins, Chettiyars and Mudaliars and in the tail end village of this sluice (Eralacheri) harijans and Pillai have bought land. Even when there is 5 months' water supply in the tank, it was reported that naickers of Kaveripakkam never let water to flow to the tail end village and this has resulted in several disputes. Within the head reach village also (Kaveripakkam) there are conflicting interests between mudaliars and naickers. This is very much reflected in the emergence of separate *nattamai* for naickers in the past 2 decades; and till then only mudaliar *nattamai* was taking all the decisions concerning the village. Such land transfers and caste factions are also seen in few other tanks such as Thakkolam, Perumbulipakkam, Poigainallur and Thiruppukuzhi. These are tanks where t.i.i. is defunct. On the whole, the land transfers resulting in fragmentation and caste factions within an ayacut do not provide conducive atmosphere for any collective effort.

(C) Absentee Ownership:

Yet another impact of land transfers is the emergence of absentee owners in the tank ayacut which affects also the functioning of t.i.i. For instance in Poigainallur, about 50% of the ayacut land is held by absentees (living in a neighbouring village but doing own cultivation) and in Sirungathur, about 70% of the land is held by farmers of a neighbouring village. Since *nattamai* or *Kavalmaniyam* of one village cannot exercise control over farmers of other village, collective effort relating to the tank ayacut becomes difficult.

(2) Physical Factors

(A) Location:

As per the conventional notion, the head reach tanks of each branch/main channel are always better placed in terms of availability of supply of water to the tank. This very much holds good as one can see from Table-1. The t.i.i. are effective in all the head reach tanks of main/branch channels (Peruvalayam, Karivedu, Pudupakkam and Velur). Again in the tail end tanks viz., Thakkolem (Kaveripakkam surplus channel) and Thiruppukuzhi (Govindavadi Channel), the t.i.i. are defunct. In the case of neervalar, which is tail end to Kambakkam channel, the institutions although not defunct, remains less effective. The case of Kaliyur (tail end of Kalavai channel) is unique. The supply from (Palar Anicut) Kalavai channel stopped more than 20 years ago, but this tank receives almost regular supply from two other sources. Hence the t.i.i. are still effective, although located at the tail end of a channel.

(B) Sources of supply to the tank:

Supply to a tank may be from two sources; one from PAS source and the other from non-PAS sources. Within the PAS source, it may be directly from the inlet channel; from the surpluses of upstream tanks or from both. The non-PAS sources are through spring channels or from other systems. The availability of water directly through an inlet channel is the most assured one; whereas the supply through the surpluses of upstream tanks is not assured to the same degree. For instance in most of the tanks where the t.i.i. are effective or less effective, the supply is directly through the inlet channel (e.g. Kaveripakkam, Peruvalayam, Agavalam, Karivedu, Pudupakkam and Velur). Similarly, in most of the tanks where the t.i.i. are defunct, the supply is through the surpluses of upstream tanks. There are two cases where although the supply through the PAS sources stopped for over a decade, the t.i.i. are effective basically because these ayacuts receive supply from non-PAS sources. For instance, it is more than a decade since water flowed through the Gafoor sluice (which is the most elevated sluice of Kaveripakkam tank). But still the t.i.i. are effective basically because this ayacut receives almost regular supply through a spring channel from Palar river. Again in the case of Kaliyur tank, the t.i.i. are effective even though water from PAS sources stopped more than 20 years ago. This is because, this tank receives supply from two other sources, viz., from Cheyyar spring channel and from Thandarai Anicut (constructed across Cheyyar river).

(C) Availability of free catchment area:

The extent of availability of free catchment area in a way assures supply

to a tank. That is, if the free catchment area is large enough for a particular tank then the users will have some guarantee of tapping atleast the rain water by way of desilting and dewatering the inlet channel. On the other hand if the free catchment area is relatively small, then the users may not get any such incentive to enter into a collective effort. The data shows that (See Table-4) atleast in four of the seven tanks where the t.i.i. are effective, the free catchment area per acre of ayacut is large (i.e., in Peruvalayam, Paranthur, Velur and Kaliyur) and in three of the six tanks where t.i.i. are defunct, it is seen to be relatively low (i.e. in Thakkolam, Poigainallur and Thiruppukuzhi).

However, as it has been said earlier, all these physical factors (such as location of a tank, sources of supply and availability of free catchment area to a tank etc.) lead us to the issue of availability and assured supply of water to a tank: If there is assured supply through an inlet channel then t.i.i. exists; otherwise it is ceased to exist.)

Conclusion

The detailed survey of tanks shows that there are complex set of factors which contribute for the existence or otherwise of the t.i.i. and these factors are very much inter-related. At the surface, the physical factors such as location, sources of supply, size of tanks, availability of free catchment areas etc. appear to have very close relations with the functioning of t.i.i. These physical factors only re-inforce the point that when there is assured and plentiful supply to a tank, the t.i.i. function well and otherwise not. However, this conventional notion is not always

true ; control over productive resources such as land and privatisation of water (ground water) appear to be the most crucial factors that affect the functioning of t. i. i.

However, one should not forget the fact that the t. i. i. is basically a reflection

of nature of control over productive resources. Hence even the so-called co-operation involved in these tasks is basically a reflection of the nature of power structure in a village society.

TABLE 1
Functioning of t. i. i.

Tank/Channel	Functioning of t. i. i.				Existence of irrigation functionaries			Degree of effectiveness of t. i. i.	
	inlet channel	main distri- butaries	(in the past 5 years) field channels	Preva- lence of murai	Kavai mani- yam	Nattamai	Neer- katti		
1. Kaveripakkam	X	✓	✓	X	X	✓	✓		Less effective
2. Peruvalayam	✓	✓	✓	✓	X	✓	✓		Effective
3. Agarvalam	✓	✓	✓	✓	✓	✓	✓		Effective
4. Takkolam	X	X	X	X	X	✓	✓		Defunct
5. Karivedu	✓	✓	✓	✓	X	✓	✓		Effective
6. Perumbuli	X	X	X	X	X	✓	✓		Defunct
7. Poigai	X	X	X	X	X	✓	✓		Defunct
8. T. Kuzhi	X	X	X	X	X	X	✓		Defunct
9. Puduppak	✓	✓	✓	✓	✓	✓	✓		Effective
10. Paranthur	✓	✓	✓	✓	✓	✓	✓		Effective
11. Neervalur	✓	✓	✓	X	X	✓	✓		Less effective
12. Velur	✓	✓	✓	✓	✓	✓	✓		Effective
13. Vembi	X	X	X	X	X	✓	X		Defunct
14. Sirungathur	X	X	X	X	X	✓	✓		Defunct
15. Kaliyur	✓	✓	✓	✓	✓	✓	✓		Effective

✓ refers to maintenance work done regularly in the past 5 years and the existence of irrigation functionaries

X refers to non-existence of maintenance work and irrigation functionaries.

Source : Survey

S. 90

TABLE 2

Number of Neerkattis and payments made per person
(in Kgs. of Paddy)

1 marakkal = 5 Kgs (Paddy)

No.	Tanks	No. of neer- kattis	Regd. ayacut (acres)	Payments per season per acre (in marakkals)	Payment per season for the (in Kg) ayacut	Payment per person in Kgs.
Tanks where t. i. i. is less effective						
1.	Peruvalayam	2	248	1 marakkal	1240	620
2.	Agavalam	2	445	3 marakkals	6675	3338
3.	Karivedu	1	370	2 marakkals	3700	3700
4.	Pudupakkam	5	836	3 marakkals	12540	2508
5.	Paranthur	6	779	2½ marakkals	9738	1623
6.	Velur	3	578	2 marakkals	5780	1927
7.	Kaliyur	6	530	3 marakkals	7950	1325
Tanks where t. i. i. is less effective						
1.	Kaveripakkam	NA	NA	NA	NA	NA
2.	Neervalur	7	795	1½ marakkals	5963	852
Tanks where t. i. i. is defunct						
1.	Thakkolam	2	518	1 marakkal	2590	1295
2.	Perumbuli	2	129	2 marakkals	1290	645
3.	Poigai	1	162	2 marakkals	1620	1620
4.	T. Kuzhi	2	476	2 marakkals	4760	2380
5.	Vembi	Nil	144	Nil	Nil	Nil
6.	Sirungathur	1	137	2 marakkals	1370	1370

Note : Data presented in this table is based upon the interviews held with the irrigation workers and this may not give an accurate picture.

Source : Survey.

S. 91

TABLE 3

Well density and % of area receiving well irrigations in the ayacut

Sl. No.	Tanks	Well per acre	% of area receiving well irrigation in the ayacut
Tanks where t. i. i. are effective			
1.	Peruvalayam	0.04	NA
2.	Agavalam	0.14	NA
3.	Karivedu	0.01	18.7
4.	Pudupakkam	0.02	30.8
5.	Paranthur	0.01	2.8
6.	Velur	0.20	70.8
7.	Kaliyur	0.21	27.5
Tanks where t. i. i. are less effective			
1.	KVP	0.26*	NA
2.	Neervalur	Nil	Nil
Tanks where t. i. i. are defunct			
1.	Thakkolam	0.18	97.2
2.	Perumbuli	0.25	72.2
3.	Poigai	0.16	41.3
4.	Tiruppukuzhi	0.07	67.4
5.	Vembi	0.28	89.9
6.	Sirungathur	0.33	83.8

* Worked out for the entire Kaveripakkam tank ayacut.

Source : Survey.

TABLE 4

Availability of free catchment area

Sl. No.	Tanks	Free catchment area (sq. miles)	Free catchment area per acre of ayacut (sq. miles)
Tanks where t. i. i. are effective			
1.	Peruvalayam	1.20	0.0052
2.	Agavalam	0.55	0.0012
3.	Karivedu	0.50	0.0007
4.	Pudupakkam	0.95	0.0014
5.	Paranthur	3.92	0.0050
6.	Velur	2.00	0.0035
7.	Kaliyur	3.80	0.0072
Tanks where t. i. i. are less effective			
8.	Kaveripakkam *	12.00	0.0019
9.	Neervalur	3.00	0.0038
Tanks where t. i. i. are defunct			
10.	Thakkolam	0.75	0.0014
11.	Perumbulipakkam	0.75	0.0058
12.	Poigainallur	0.15	0.0009
13.	Tiruppukuzhi	0.16	0.0003
14.	Vembi	0.75	0.0052
15.	Sirungathur	0.57	0.0040

* Computed on the total ayacut of Kaveripakkam Tank (6278 Ac)

Source : Survey.

The Management of Ground Water and The Problems of Regulating its Exploitation to Ensure Both Sustainability and Equity in Rural and Urban Areas

by

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INTRODUCTION

1.1. Water resource planning is essential to meet the growing demands of the increasing population, expanding urbanisation and advanced agricultural and industrial technologies. The resources of surface water alone are not adequate for the economic growth of the country and have to be supplemented largely from the resources of ground water reservoirs. Even in regions of abundant rainfall, shortages of water may develop because of the failure to pattern the development and management of the available water resources in a proper manner. Take for instance the State of Kerala in this connection. The State is a land of rivers and comparatively high rainfall is received during the south-west monsoon and preceding it. A critical examination of the problem points to the fact that the so called plentiful rainfall is not that dependable and

utilisation of surface water resources throughout the year is not possible in view of the cropping pattern adopted, the rugged nature of the terrain and meagre surface water flows in the dry weather period.

1.2. Development of ground water for irrigation has several advantages. In fact, the chief value of ground water as a source of irrigation lies in that it is so widely distributed. Apart from increasing irrigation potential, ground water development is also playing a crucial role in tiding over the deficiencies of irrigation supply in canal system at critical times and controlling hazards of water logging and salinisation in the canal commands.

1.3. The farmer's dependence on and confidence in ground water use has made its development essentially a people's programme. The entire ground water development programme of the

country is primarily sustained by the financial investments made by the farmers themselves either individually or through cooperative efforts from finance obtained as loans from institutional sources. These loans are recoverable and bear interest. Public sector outlay in the case of ground water schemes is limited to only such items as ground water surveys, public tubewells, services provided and grants and subsidies extended to the small farmers. Unlike major-medium irrigation projects which are more or less entirely dependent on public sector outlays, the programme of ground water development imposes very little burden on the public exchequer.

1.4. The above factors, coupled with an expanding programme of rural electrification and increasing mobilisation of institutional investment for irrigation works have not only led to a spectacular expansion in ground water development for irrigation in the recent years but shall continue to increase the growth of ground water use in the times to come.

2. Occurrence and Distribution of Ground Water Resources

2.1. Geological formations :

Ground water availability in a formation is largely governed by the state of cementation and compaction of the formation. Accordingly the geological formations encountered in the country may be broadly divided into three categories, namely, the unconsolidated, the semi-consolidated and the consolidated.

(i) Unconsolidated formations :

These include the alluvial plains built up by the Himalayan rivers, namely, the

Indus, the Ganga, the Brahmaputra and their tributaries; the inland valleys of the rivers Narmada, Tapti and Purna in Central India; the coastal and river alluvia of east and west coasts and plains of Gujarat; and the aeolian sand-tracts of Western Rajasthan. These formations are highly potential in ground water except in parts of the north-western arid and semi-arid zones not served by the surface water irrigation canals. Though they comprise about one-third of the total land area in the country, they account for about 50 to 60% of the total usable ground water resources. The lithology includes zones of sands, gravels, pebbles, etc., which not only store large quantities of ground water but are also favourable from the point of view of ground water abstraction.

(ii) Semi-consolidated formations :

These include the semi-consolidated sandstone formations of the Mesozoic and Tertiary periods, interspersed in different parts of the country, such as Lathi Series and Palana and Nagaur sandstones in Western Rajasthan, the Cuddalore sandstones and Rajahmundry sandstones in the east coast; the warkalai formations in Kerala and the Himatnagar sandstones and the sandstones of Bhuj and Katrol series in Gujarat and rocks of Gondwana super-group in Andhra Pradesh, Maharashtra, Bihar, Madhya Pradesh and Orissa.

These formations are next in importance from the point of view of ground water availability but hardly cover about 5% of the total land area. The lithology is generally favourable for ground water storage and abstraction.

(iii) Consolidated formations :

The major part of the country including almost the entire Indian Peninsula

consists of hard rocks. These comprise crystalline rocks; granites, gneisses, schists etc. of Archaean age, basaltic rocks of Upper Cretaceous to Oligocene age, and compact sedimentary formations of the Cuddapah and Vindhyan Super-groups and the equivalents which belong to the Pre-Cambrian age. Nearly 65% of the total land area is covered by the basaltic rocks.

These rocks, of which about 1/4 is accounted for by the Basaltic rocks. These rocks have negligible primary porosity and hold limited quantities of ground water contained in the weathered and the fractured zones. However, sizeable quantities are available at some locations in vesicular lava flows, inter-trappean beds, cavernous limestones and along certain lineaments which are deeply weathered and fractured.

3. Resource Availability and Ground Water Development

3.1. The annual replenishable ground water resources of the country estimated as per the norms of Ground Water Estimation Committee work out to be of the order of 45.66 mham. Keeping a provision of 15% for drinking, industrial and other committed uses, the utilisable ground water resources for irrigation work out to 38.62 mham per year. The static resources available in various hard rock terrains and the quantity of storage available in the confined and semi-confined sediments in general provide the required cushion in a series of dry years. The total ground water draft for irrigation in the country is estimated presently at 10.47 mham leaving a balance of 28.14 mham for further ground water development. Thus when we consider the country as a whole, there appears to be good scope for substantial additional ground water development. But locally there are

several pockets where intensive ground water development has led to a critical situation caused by declining water levels, decrease of well yields and deterioration in the quality of well waters.

3.2. There are a large number of 'Dark' or critical blocks, where net abstraction is in excess of 85% of the utilisable ground water resource for irrigation. On the other hand, in certain areas brought under the surface irrigation projects (canal command areas) the water table is progressively rising and has locally created water logging and land salinisation problems.

3.3. Because of some distinct advantages like wide distribution, assured and dependable supply even during droughts in many areas, low gestation period, the ground water development has gained considerable momentum. The total number of dugwells in the country have gone up from 3.86 million in 1950-51 to 9.167 million by March 1937 and similarly the shallow tubewells have increased from a mere 3000 to 3.846 million during the same period. However, the pace of the development of this dynamic resource is required to be by systematic planning aiming at optimal resource utilisation without upsetting hydrodynamic balance.

4. Problems of Regulating Ground Water Development to ensure Sustainability of the Resources

The sustainability or the adequacy of the availability of ground water resources in most areas depends on the optimum development and management of ground water reservoirs.

4.1 Optimum development concept :

The optimum development of the aquifers is related to the hydrologic system and mode of occurrence of the water resource. The type of development to be achieved can be broadly divided into following classifications (Johnson Div., 1975) :

1. For aquifers readily recharged from the surface, average pumping may equal average recharge but should not exceed it. In most individual years, however, such a balance may not be achieved. When the recharge is large, the precipitation and stream flow are likely to be above normal and the need for ground water may be less. The requirement of ground water is greatest in drought years.
2. For deep artesian aquifers with little or no natural discharge in areas where water is needed, average pumpage may exceed recharge but this must be managed based on quantitative estimates. In the case of highly potential and extensive artesian aquifers, the quantity of storage is many times and annual recharge and withdrawal from such aquifers can exceed recharge during a series of dry years without causing permanent depletion.
3. In coastal aquifers average pumping must be considerably less than average recharge in order to maintain the interface between salt water and fresh water at a safe distance seaward from the well sites. Coastal aquifers of limited potential should be developed only with great care if unavoidable. Such limited aquifers are best left almost untapped to keep it as a buffer so that the sea water — fresh water interface does not move inland.

In hard rock areas, the ground water studies carried out revealed the existence of deeply weathered and fractured zones locally along certain lineaments capable of yielding potential supplies of water. These lineaments zones are found to be highly productive for construction of borewells. Proper demarcation, development and management of these fractured aquifers is essential in the hard rock areas.

4.2. Significant management efforts

The technical management aspect of ground water reservoirs need to be identified through well-planned field oriented technical feasibility programmes/projects and also through modelling techniques. Some of the significant management efforts that are suited to Indian conditions are discussed below. Others include desalination, weather modifications, evaporation suppression and waste water management involving advanced technologies which are not emphasised for the purpose of this paper.

4.2.1. Natural and artificial recharge :

A significant management effort lies in providing for better natural and artificial recharge of important ground water reservoirs. This can be accomplished by a comprehensive understanding of the hydrogeology. The specific purposes for which artificial recharge is practised are important enough and quoted below as stated by Walter (1970, p. 364) :

1. Conserve and dispose of run off and flood waters
2. Supplement the quantity of ground water available

3. Reduce or eliminate the decline in the water level of ground water level of ground water reservoirs
4. Reduce, prevent, or correct salt-water intrusion
5. Store water to reduce costs of pumping and piping
6. Store, clear, cool water in winters, for use during the summer.
7. Obtain suspended-solids removal by filtration through the ground.

Several ground water reservoirs contain appreciable amounts of water in storage but are prevented from receiving more than negligible recharge by enclosing or overlying materials. A significant management effort lies in providing for better natural and artificial recharge of the important ground water reservoirs. It is necessary to deplete these reservoirs through construction of production wells in order to increase the natural recharge and also adopt suitable artificial recharge methods.

4.2.2 Importing of water :

Another management effort lies in importing or supplementing by other means, water for recharging ground water reservoirs. In many cases transfer of water from one river basin to another basin is necessary due to inadequacy of water. There are some examples of such surface water transshipment from one basin to another in India. A portion of Periyar river waters from Kerala side have been diverted to feed the drought stricken lands of Madurai district in Tamil Nadu. These surface waters contribute greatly to the ground water recharge in the ayacut areas of the Project.

4.2.3. Induced streambed infiltration :

When a well is pumped near a stream hydraulically connected to an aquifer, water is first withdrawn from the storage within the aquifer in the immediate vicinity of the well. The cone then spreads drawing water from the storage within an increasing area of influence. Water levels in the vicinity of the stream are lowered and more and more of the water which under natural conditions would have discharged into the stream as ground water runoff or into atmosphere as evapotranspiration is diverted towards the pumped well. Ultimately, water levels are lowered below the stream level in the immediate vicinity of the well and the aquifer is recharged through influent seepage from surface water or sub-surface flow below the river bed. There are a number of rivers and streams in the country where induced stream bed infiltration will sustain a battery of wells along the banks of such rivers and streams.

4.2.4. Conjunctive utilisation of surface and ground water :

Integrated use of surface and ground water to achieve better economy in water utilisation has to be carefully analysed and worked out in various canal command areas in the country. This aspect has been receiving adequate attention by the various Central and State Agencies in the country.

4.2.5. Environmental aspects :

Seventy per cent of the world population does not have access to safe water or hygienic sanitation. Pollution of ground water reservoirs in India is of two distinct types; one due to industrialisation and the other due to under development. In addition, const-

ruction of some engineering structures such as dams, canals and highways and urbanisation cause changes frequently in the ground water regime. Such changes need to be assessed in the context of its impact on the environment.

4.3. Water supply to urban and rural areas :

The water supplies of cities and big towns are large and hence are not generally met with from ground water reservoirs alone. There are several villages and towns in the country where the entire water supply or a major supply or a major part of it is met with from ground water resources. Water supply of many villages and towns in the country was not seriously affected during summer of 1987 which is considered to be the worst drought in a century as the water supply to them was mainly met with from ground water resources whereas the water supply position of most of the urban areas in the country has deteriorated greatly.

4.4. Droughts :

Drought occurs when precipitation falls short of the natural ecological requirements. Drought seriously curtails crop yields and animal productivity. These effects are particularly severe in areas of low rainfall. Rainfall effectiveness reduces greatly during droughts by low water infiltration and low soil water retention in the root zone and high evaporation. Water resource planning in any area should take the possibility of recurrence of droughts into consideration particularly in areas with comparatively low ground water recharge.

4.5. Constraints for ground water development in arid regions.

4.5.1. Deep water table :

In the arid regions the annual ground water recharge is generally low except in canal command areas. The strategy of efficient management of the limited ground water resources, therefore, acquires vital importance. One of the chief problems of ground water development is the depth to water table which varies from 20m to over 100 m below ground level in parts of Western Rajasthan. In view of this deep water table, the development of ground water resources for minor irrigation is very much on the low side in most districts of Western Rajasthan. This is mainly because of the high capital cost involved for constructing a well and subsequent maintenance. The present unit cost of an average dug well with pumpset in the Western Rajasthan is estimated to be of the order of Rs. 25,000. Wells deeper than 20 m would cost more. The unit cost of tubewells is of the order of Rs. 70,000. It is felt that accelerated ground water development in arid regions is feasible only by providing heavy subsidies towards the capital cost of well construction.

4.5.2. Terrain and scarcity of water :

Agricultural production in arid regions is governed by a number of factors. Scarcity of water is one of the most important constraints. The soil conservation methods like contour bunding, contour furrowing, wind strip cropping, wind breaks are essential to increase the ground water recharge and to protect the soil from water and wind erosion. Dunes are an ubiquitous feature and overgrazing and cultivation makes the dune surface unsuitable. In Western

Rajasthan ground water is exploited to a limited extent in most of the area only for protective irrigation during the kharif period and for domestic use. Efficient method of irrigation has to be decided based on the availability of water, irrigability of soil, nature of terrain, quality of irrigation water and wind regime. Drip system of irrigation is not affected by winds, uneven topography and to some extent the quality of water in sandy arid plains apart from restricting percolation and evaporation losses. The salinity rate normally allowed is upto 3000 micromhos/cm at 25°C but crops like tomato can tolerate salinity upto 10,000 micromhos/cm at 25°C. It is suited for high value crops in view of better yields and extra returns apart from a host of other advantages. The sprinkler irrigation is more preferable in certain circumstances. This type of irrigation is not efficient on soils of high permeability, undulating topography and shallow soils. The irrigation water requirements are much less by both these methods. However, they entail high installation cost and there is need to develop low cost systems. The sprinkler and drip irrigation systems have been receiving some attention in various minor irrigation schemes of the State Government in the arid regions.

4.5.3. Energy alternatives :

With the rising cost of traditional energy sources and the spectre of power famine that often haunts many parts of the country, there is need to consider energy alternatives in favourable localities. These arid regions are ideally suited for the development of the inexhaustible solar energy and wind power. A major part of Western Rajasthan receives sunshine exceeding 3000 hours annually and is also favour-

ably placed in respect of wind velocity. Efforts should be made to harness conventional energy forms. As a long term strategy, wind and solar energies promise to be major alternatives for the development of ground water resources in the arid regions.

5. Equitable Distribution of ground Water Utilisation

5.1. Since ground water is very widely distributed, there is more scope for equitable distribution of ground water utilisation if the resources are developed based on scientific planning. Some additional restrictive measures like specific cropping patterns, stoppage of electricity to pumpsets and banning of further ground water development are to be resorted in difficult situations to conserve the available resources from depletion and to ensure that maximum benefits are obtained by maximum number of people. There is also a need to spell the priorities for beneficial uses in areas of acute water scarcity so that restrictive measures can be applied to non-priority users.

5.2. Basin-wise ground water development :

To provide maximum development of ground water resources for beneficial uses requires thinking in terms of a ground water basin. By visualising a basin as a large natural underground reservoir, it is clear that utilisation of ground water at one location influences the quantity of water available at other locations within the basin. The management objective consists of providing an economic and continuous water supply to meet a usually growing demand from an underground water resource of which only a small portion is perennially available (Todd, 1980).

5.3. Watershed management :

Many experiments have emphasised the importance of maintaining high levels of soil structure. Accordingly a good vegetative cover is of paramount importance for crop production. Establishing vegetative cover and adopting techniques to conserve soil and water resources must be implemented on the basis of an easily delineated area or small watershed. The integrated use of surface and ground water resources in a watershed enables maximum use of ground water resources.

5.4. Water supply to rural and urban areas :

The water supply to urban population has been the responsibility of State or local authority and efforts have always been made to ensure equitable distribution of water supply. The rural water supply programmes aim at providing adequate safe drinking water to all villages. These rural water supply programmes have been intensified in the country in the wake of International Drinking Water Supply and Sanitation Decade and establishment of Technology Mission for Drinking Water at National Level and in all States.

5.5. Minor Irrigation :

Minor irrigation programmes have to be planned such a way that the welfare of the backward and vulnerable sections of rural population are protected and the gulf between the rich and poorer sections is reduced. The Central and State Governments have been making several efforts to ensure that adequate institutional finance and subsidies are provided to the backward areas and poorer sections of the society under various minor irrigation schemes through

Rural Electrification Corporation (REC) Small Farmers Development Agency (SFDA), Integrated Tribal Development Plan (ITDP), Command Area Development (CAD), Drought Prone Area Programme (DPAP), Rice Thrust Programme, NREP, RLEGP, Jeevan Dhara Scheme, Desert Development Programme etc. These programmes have enabled to envisage a more equitable development of ground water resources in the country.

5.6. Ground Water Legislation :

The control being adopted at present in India for regulating ground water development to some extent is in the form of administrative measures. The control that exists at present is through indirect measures built in the lending mechanism of the institutional finance where the technical clearance of the scheme proposals are linked with the certification by the competent authorities regarding adequacy of the ground water availability. Self financed ground water abstraction structures, however, are free to come up at the owners choice anywhere irrespective of the ground water balance situation. Primarily, legislative competence and responsibility for water lies with the State except in the matter of inter-state rivers. A draft Model Bill, 1970 was circulated by the Govt. of India to the States for adoption and enacting the Law through State Assemblies for the control and regulation of ground water development on scientific lines. Keeping the implementation of the law at ground level in view, the Bill envisages setting up of an 'Authority' by each State Government. Such an authority should aim at operationalisation of the law to promote ground water development and must not appear restrictive. The policy has to aim at the optimality of the ground water resource utilisation and its equitable

distribution commensurate with the hydrogeological environment and ground water regime conditions. It would, therefore, be necessary that the 'Authority' is served by competent ground water specialists (Dutt, 1988).

Ground water legislation with restrictive measures have been introduced in Madras Metropolitan area, within 10 km belt from coast in the Union Territory of Pondicherry and in parts of Gujarat in view of the heavy ground water draft.

In several hard rock areas of South India, heavy ground water draft is taking place from certain productive zones particularly along lineament zones for raising paddy and sugarcane. There is need to restrict the cropping pattern to avoid the harmful effects of over development and for a better equitable development of the available ground water resources.

6. SUM-UP

6.1. Water supplies have to keep pace with the development of irrigation, extensive urbanisation, population growth and expansion of industry. As the resources of surface water alone are not adequate, the development of ground water resource is essential to meet the growing demands of the

country. Although ground water is a renewable resource, it should be noted that the natural supply to ground water body is usually limited both in time and space. Water resource planning in any area should take the possibility of recurrence of droughts into consideration particularly in areas with comparatively low ground water recharge. Ground water resources are being over developed in certain pockets of the country. However, when we consider the country as a whole, there appears to be significant scope for further ground water development. The problem related to development of ground water reservoirs are complex and available resources have to be managed properly based on sound planning and resource evaluation to avoid the harmful effects of over exploitation. The minor irrigation and water supply programmes have to be planned such a way that the welfare of the backward and vulnerable sections of rural population are protected and ensure an equitable development of the available ground water resources. There is need for ground water legislation to have an effective control and regulation of ground water development in the country. The chief aim of these legislative measures should be optimum ground water utilisation and its equitable distribution commensurate with the hydrogeological environment and ground water regime conditions.

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The Legal Principles and Institutional Mechanisms for Optimising Water use in River Basins

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1. INTRODUCTION

Water is a natural resource fortunately renewable. The only source for water is precipitation. Precipitation of any type, dew, drizzle, rain, hail storm, and snow, helps to renew and recharge this resource which is indispensable for the sustenance of life on this planet, Earth. Water is also a dynamic resource, always in the move above, on and under the earth in all forms, solid, liquid and gaseous. Who owns this water, in what measure within what limits has always been a debatable question and all the laws so far made by mankind have failed to define these precisely with a result disputes continue to arise between individuals, between governments and between Nations, which defy the end solutions.

An attempt will be made in this paper to trace the historical development in the acquisition of right on water, the

legal principles and Institutional mechanisms now in practice in South India in general and in Tamil Nadu in particular, and the improvements and amendments that may be needed to guide and aid better management of the scarce resource, water.

2. South India — A few Features

Most parts of South India now within the political boundaries of the States of Orissa, Andhra Pradesh, Karnataka, Kerala and Tamilnadu were in the erstwhile Madras Presidency and the few princely states around like the Hyderabad, Mysore Cochin and Travancore. They have many features in common and even though the languages people speak may differ, there is an underlying current of similarity in tradition, culture, living conditions etc. and the society, adjusted itself to the available resource in Nature in the different parts of the region. Many of

the legal instruments created and the institutional mechanisms adopted for administering the different facets of the society in this region had much in common and this is particularly so in the development and use of waters for the needs of the society.

The entire South India lies south of the Tropic of cancer and hence has the tropical climate. There is abundant sun. While this helps in improving the yield from our fields, the loss of water through evaporation is high.

South India experiences two monsoons in the year. The first is the south west monsoon coming in summer from about the first of June to end of September which is fairly dependable and has a larger sphere of influence covering practically the entire region barring the parts of Tamilnadu. Lying in the leeward side of the western ghats, the second is the winter monsoon of shorter duration mostly coming in spells from mid October to end of December referred to as the north east monsoon. This is largely confined to the southern half of the peninsula covering the southern coast of Andhra Pradesh and the Tamil Nadu coast.

The alignment of the hills with respect to the prevailing winds and their elevation profoundly influence the distribution of the rainfall brought by the monsoons. The Western ghats running north south close to the Arabian coast mostly continuous and high rising serves as an effective barrier to the south west monsoon winds resulting in heavy rainfall in the coastal Karnataka and Kerala ranging around 2000 to 3000 mm. The Eastern Ghats on the other hand stretching from the Orissa coast in the north to the Nilgiris in south are low in elevation discontinuous and do not influence

either monsoon effectively. They more or less lie bordering the Deccan plateau which gently dips from the Sathpura and Vindhaya ranges towards south and south east. East of these ghats lie the costal plains. On the east coast the rainfall is high near the coast and decreases fast as we proceed inland.

Except for the coastal plains, carrying loamy alluvium brought down and built over millennium by the river systems, the rest of the Southern Region is underlain by archaic igneous rock formations with a shallow soil cover of either porous laterite, red loam soils, or down or clayey black soils.

The physiography, the weather, the rainfall pattern and the soils decide the vegetation and the cropping on the land, which in turn mould the economy, the civilisation and the culture of the people of the land. The Southern Region presents a picture of densely populated, fertile plains all along the 3000 km of the coast from Panajim on the west to Cuttack on the east, round the Kanyakumari tip, while the interior is of undulating country sporting a variety of dry crops.

The principal avocation of the people of the land is agriculture. Farming without assured irrigation is as good as rain fed cultivation with all its risk factors. Agricultural economy registers a wide scale of difference between farming with assured irrigation and cultivation with no irrigation support. Within the same river basin one can see the vast difference in the standard of living between those in the command area of the irrigation systems and those living in the non irrigated areas.

Harnessing the available water resources and planning the optimum utilisation

of these resources for the benefit of the maximum number of people hence becomes the most essential task for the Government. 85% of the present use of water is for irrigation for the production of food and fibre. Water use for drinking and domestic consumption of course has the highest priority. Industry is to be developed for the economic well being of the society and this needs water. Hydro power though non consumptive is important to support the industry and agriculture. Water has many such uses in the society and its allocation among those uses and the priority is to be determined on principles of social justice and social need.

3. Stage Development in Water use

All over the world, early civilisations flourished on the banks of the rivers, people were heavily dependent on the surface flows in the river systems for growing crops. It is the river Nile that was responsible for the Egyptian civilisation which began around 3200 BC when the whole of Egypt was united under King Menes. Eupheretus and Tigris enriched the Mesopotamian valley. Indus valley civilisation flourished with the abundant water resources of the river Indus. In the southern region Cauvery delta irrigation is considered to be the most ancient. There are references of irrigation channels having been dug in the Cauvery delta in the Sangam literature and Tamil Sangam period is several centuries before the Christian era.

With the mounting pressure of population habitations moved inland and the development of skill and technical knowhow helped them to lead the river waters inland for their

use. Individuals dug wells, to tap ground water using various types of lifting devices. Groups of people joined together to form the small tank systems. Many local chieftans with the active co-operation of the beneficiary formed these tanks in chains which served as storages of monsoon run off to ensure crop production.

With the development of political systems and when small kingdoms came into existence creation of irrigation systems and their maintenance gained importance and the governmental support for the active beneficiary is in evidence.

The contribution made by the Cheras, Cholas, Pandyas and the Pallavas in this is significant. Their rule in the region lasted until the early fourteenth century when the Moghal supremacy wiped them out.

Even otherwise they were plagued in internal strife and the political instability had its impact on the creation of new irrigation works and their maintenance.

Besides the small tank systems which our numerous people also built a number of small diversion works called anicuts on the streams and tributaries of the rivers to lead the flows inland to be either stored in tanks for indirect irrigation or to feed their own commands directly. The most significant of these ventures in the building of the Grand Anicut across the river Cauvery by Raja Karikala Chola in the second century AD. The Grand Anicut is unique in its construction and is considered to be the most ancient structure of the type in the World still in the service.

Very old anicuts like the Kodimelazhagan in the Tambaraparani system, the

series of anicuts in the Cumbum Valley and those in the Pennar and Palar river systems continue to serve thousands of hectares of cropped land. The other notable contribution is from the Vijayanagar Kings between the 14th and 17th centuries by way of several anicuts across Tungabhadra and large tanks like Anatarajasagar in Cudappah district, Buddasamudram in Anantapur district and the Cumbum big tank in the present Prakasam district.

Stage development moved with time either serially or overlapping one another from the wells, small tanks, open head channels from the river systems, flood flow channels to carry floods to interior storages and the diversion works to feed supply channels for direct or indirect irrigation. All development of the water source for irrigation incidentally met the needs of domestic use as well. Hydropower had not yet come in the scene. Industries were very few and far in between.

All these however were local efforts made at a time when the resources were high and the demand was low. The benefits at best flowed over a few village groups and there was mutual understanding among the villagers for the division of these benefits.

The theoretical sciences like the Hydrology, Hydraulics and Structures and Dam Design and Dam construction had not developed enough till about the middle of last century to create large reservoirs across the river courses. With the advent of large reservoirs and near abstraction of total flows available at a given point in the river system and creation of commands extending over large areas comprising several taluks and sometimes even districts, the allocation of waters for different uses in different

regions became more complicated necessitating enactments of laws and rules for management and administration of the water source.

4. River Basin as an unit for Water Administration

Though water is dynamic its availability is confined to a drainage basin and the ridge line or the water divide around a river basin becomes its geographical boundary. Water use may transcend the basin. We may have transbasin diversions of which we have already a few and many more are being planned. But the natural unit for water resources or water availability is only the River Basin.

For the development of water resources and drawing up a Water Plan or a Water Budget the River Basin is the appropriate unit. Fortunately the River Basin concept was adopted in our country even before the Constitution was drafted and hence this concept was also favourably reflected in the Articles of the Constitution dealing with water and its usage.

This has been also stressed in the clause 3.2 of the National Water Policy adopted by the National Water Resources Council on the 9th September 1987 which reads :

"Resource Planning in the case of water has to be done for a Hydrological unit such as a drainage basin as a whole or for a sub-basin. All individual development projects and proposals, should be formulated by the States and considered within the framework of such an overall Plan for a basin or a sub-basin so that the best possible combination of options can be made".

For water resources planning and water administration the River Basin is therefore the ideal and appropriate unit. But unfortunately no where in the world the political boundaries, coincide with those of the River Basin with the result most of the rivers have their catchments spreading over more than one State and hence are to be termed as inter-state rivers. A few of them spread beyond the country's boundaries and become inter-national rivers too. This situation hence necessitates the formulation of legal principles and procedures for the equitable allocation, utilisation and management of the resources in the inter-state and international context.

5. Development of Legal Instruments Relating to Water Administration

5.1. Pre-British :

Village has been available administrative unit for several centuries in this country. Sir Bamplyde Fuller a British administrator writing on India — The Land and People in the first decade of this century says :

"The Hindus have preserved two institutions these are caste and the village. By the caste men are grouped according to their race or occupation; the village to groups them according to the locality they inhabit. The two systems overlap; there are many castes in a village and many villages contribute to from the community of caste. But the two institutions converge towards a single purpose — the development of small self contained societies which can resist the shock of outside aggression and of natural calamities. The caste and the village may be likened to communities of Zoophytes which the tides and currents of the ocean may ruffle but

cannot uproot. Streams of conquering Tartars have flooded India again and again; but within the caste and the village, Hindu society has preserved its organised vitality".

Village administration was also local and self reliant. Matters of social interest got sorted out at the village level itself. With some facilities provided for irrigation and agriculture people produced their food and were generally satisfied with a peaceful living. The elders in the village constituted the village Panchayat and they managed and administered all common facilities in the village like the temple, the village pond, the grazing lands and the irrigation tank and the use of its waters. They developed unwritten conventions for the distribution of waters of the tank among the farmers and laid down the turn systems (Murai) which is being followed even to this day and in many areas. Disputes arising on the sharing and use of waters were heard and solved by the village Panchayat. Individuals acquired right on water and he uses and it was this 'use right' that was upheld in his favour when disputes arose. The Panchayat also held powers to implement 'Kudumaramath' for the maintenance of the irrigation system which is essentially through voluntary labour and pulled up the defaulters promptly either through fines or social compulsions.

5.2. British Period :

The British were wise enough to by and large retain the village structure in administration and many functions including the allocation and use of waters in the irrigation tanks got decentralised.

But when it came to the construction and management of large development

project in irrigation and water resources, government involvement became necessary.

Until 1921, the construction and management of all water resources development in this country including irrigation and power were under the authority of the Government of India and closely controlled by the Secretary of State in London. In 1921 with the introduction of administrative reforms, irrigation became a provincial subject with certain reservations. Still development projects costing more than 5 million rupees or those that affected the interests or more than one province could be taken up only with the prior approval of the Secretary of State in London. Several matters of concern and importance which were an offshoot of irrigation development in the different Provinces came up to the Government of India for decision. Though there were no statutory laws on water right, the Government of India, followed certain principles and guidelines in giving decisions and in case of disputes between the provinces and between provinces and princely States they were settled on merits of each individual case through Arbitration.

In April 1937, the British Government introduced through the Government of India Act 1935 another set of administrative reforms of far reaching consequences in declaring provincial autonomy. Irrigation became a 'transferred' subject and the provincial Governments got full power over irrigation works and development. Item 19 of List II (Provincial Legislative List) of the Seventh Schedule to the Government of India Act 1935 reads "19 — Water that is to say water supplies, irrigation and canals, drainage and embankments water storage and water power".

The Central Government was no longer concerned with the development of Irrigation except when either a province or a princely State would take objection to some development in an adjoining province and the dispute could not be resolved by mutual agreement. In the case the dispute was required to be referred to the Governor General who was empowered to give a decision in the matter of dispute IN HIS DISCRETION after investigation by a Commission to be specially appointed for the purpose.

5.3. After Independence :

Water and its administration received the necessary attention from the Constitution makers. After due consideration 'Water' was brought in the State list backed by suitable legislative measures.

Under Article 246(3) of the Constitution and Entry 17 of List II of the Seventh Schedule every State Government has powers to legislate in respect of 'Water'.

Under Article 245(I) this can be exercised for the whole or any part of the State.

Under Article 162 "the executive power of a State shall extend to the matters with respect to which the legislature of the State has power to make laws".

Under Entry 17 of List II, the State can exercise authority over 'Water' that is to say water supplies. It can undertake irrigation works, construct canals, drainages and embankments. It can store water and generate water power — all these subject to the provision of Entry 56 of List I.

Entry 56 of List I reads as :

"56 Regulation and development of Inter State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the Public interest".

Article 262 of the Constitution authorises Parliament by law to "Provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter - State river or river valley".

It may be mentioned that Entry 56 of List I does not take away from the States any of the powers to which they are entitled under Entry 17 of List II. The authority of the State over 'Water' of such inter-State rivers is to be exercised within such limitations as may be imposed by law by Parliament in respect of their "regulation and development" only. The union Government by virtue of Entry 56 cannot acquire the right of user or of constructing canals, drainages and embankments of storing water or generating water power; these rights vest only with the State Government.

With the launching of Five Year Plans several large irrigation and power projects which involved inter-State rivers and spread the benefits in more than one State were taken up. This necessitated the Parliament enacting two important Acts of regulation and development of Inter-State rivers and river basins.

5.4. The River Boards Act 1956

This Act provides for the establishment of River Boards for the regulation and development of inter - state rivers and river valleys. As per this Act the

Parliament has given the authority to the Central Government to set up for any inter-State river a River Board.

- (i) to advise the basin State on any matter relating to the regulation and development of the waters of the rivers.
- (ii) to advise the basin States in particular in relation to the coordination of their activities with a view to resolve conflicts among them and to achieve maximum results in respect of the measures undertaken by them in the inter-state River or river valley for the purpose of conservation, control and optimum utilisation of the water resources of the river, and for the purpose of promotion and operation schemes for irrigation, navigation, power, flood control, water supply and drainage and also to control soil erosion and prevent pollution of the waters of the inter-state river etc. and
- (iii) to make technical studies, prepare schemes of development and advice the basin state regarding their execution including questions relating to the allocation of costs etc.

Setting up of River Boards is a good institutional approach for the development of River Basins and the maximisation of the natural resources utilisation. But unfortunately the Central Government has not so far been able to set up any River Board perhaps for many political reasons and the Act is thus utilised.

5.5 The Inter State Disputes Act 1956

The Inter-State Disputes Act was passed by the Parliament under the provisions of the Article 262 cited above.

If it appears to the Government of any State that a water dispute with the Government of another State has arisen or is likely to arise by reasons of the fact that the interests of the State or of any of the inhabitants thereof in the waters of an inter-State river or river valley have been or are likely to be affected prejudicially by

- (a) any executive action or legislation taken or passed or proposed to be taken or passed by the other State or
- (b) the failure of the other State or any authority therein to exercise any of their powers with respect to the use, distribution or control of such water; or
- (c) the failure of the other State to implement the terms of any agreement relating to the use, distribution or control of such waters.

The State Government may in such form and manner as may be prescribed request the Central Government to refer the Water dispute to a Tribunal for adjudication.

The Central Government shall publish the decision of the Tribunal in the official gazette and the decision shall be final and binding on the parties to the dispute and shall be given effect to by them.

6. Theories Internationally Adopted for Sharing Waters

The broad principles that have emerged over the past few years when international jurists started paying more attention to this problem of sharing of waters may be stated as below :

- i) The Territorial Sovereignty Theory
- ii) Natural Water Flow Theory
- iii) Community of Interest Theory
- iv) Equitable Apportionment Theory

1) The Territorial Sovereignty

Territorial Sovereignty Theory put forward by Attorney General Harmon of the U.S.A. in 1896 advocated an extreme view that the riparian States have exclusive or sovereign rights over the waters flowing through their territory. "The fundamental principle of international law is the absolute sovereignty of every nation as against all others within its own territory". This theory has not been accepted by many. With the evolution of Helsinki Rules this doctrine does not find favour. Even the countries asserting the doctrine have yielded rights to the lower riparian owners either on account of international comity or other reasons. The U.S.A. which asserted the doctrine has also conceded some rights to the lower riparian on the ground of good neighbourly policy.

ii) Natural Water Flow Theory

Every lower riparian owner is entitled to the natural flow of the river untampered by the upper riparian owners. The upper riparian owner must allow the water to go in its natural flow to the lower riparian owner in its ordinary channel though of course he can make reasonable use of the water while it was in its territory. This is based on English Common Law. Some however hold that this is another extreme and it is considered obstructionist in nature as it denies the benefits arising out of modern technological uses of international river.

iii) Equitable Utilisation and Community of Interest Theories

In International Law the equitable utilisation of an international river by the different State is gaining acceptance. Helsinki Rules have adopted this theory as their basis to some extent. Under this theory the whole basin is regarded as an economic unit irrespective of State boundaries and the waters are vested in the community or divided among the co-riparian States. An integrated development of the basin as a whole is to be planned. This can be done either through separate programmes by each riparian State with the permission of other riparian States or by a joint effort by the basin States to develop the river for their joint benefits without any reference to the State boundaries. The joint approach includes joint planning, joint construction, Joint management and joint sharing of expenditure on construction and maintenance. This may be possible and easy while dealing with virgin river basins where development is to be newly planned.

iv) Equitable Apportionment Theory

The equitable apportionment formula does not lend itself to precise articulation or rules. The underlying postulate of equitable apportionment is equitability and not equality. The idea is the maximum benefit accruing to all the riparian States of the river, keeping in view the economic and social needs of the different riparian States. It is difficult to evolve principles for determining the equitable share of each riparian State which may apply in all cases or situations. The problems of each State or river are unique. Working out of equitable share of each basin State requires analysis of complex technical and economical data and judicial balancing of conflicting

claims of and uses of the river by different riparian States.

The problem is further complicated by the fact that the different uses of the river by the different States are simultaneous. Depending upon the social and economic developments of a country these uses may take place at different points of time.

The first principle that should be specified while considering the equitable apportionment of water in a basin is weightage to the existing usage in the basin before recognising the eligibility for new uses contemplated by the basin States. The general consensus on this has been that weightage to be given for existing beneficial use is rather substantial. This has been honoured in a number of treaties concluded between the different States and different nations. The 1924 agreement between Mexico and Madras itself was conceding full protection for existing uses.

In the treaty of 1906 was between the United States and Mexico over the Rio Grande River. Though the United States asserted the doctrine of Sovereignty Theory (The Harmon Theory) the actual practice in terms of international comity they were willing to provide Mexico with waters equivalent to which she had used before the treaty negotiations took place.

Both in 1925 and 1929 in the treaties concluded between Sudan and Egypt with regard to the use of the Nile River, Sudan willingly conceded the rights of the lower riparian State Egypt following the theory of Natural Waters Flow Commonly accepted in English Law.

The equitable apportionment theory which finds favour generally in recent times was largely discussed in the 52nd conference of the International Law Association held at Helsinki in 1966 when certain rules called Helsinki Rules on the uses of the international waters were adopted. Article VII of the Helsinki Rules Provides.

"A basin State may not be denied the present reasonable use of the waters of an international drainage basin to reserve for a Co-basin State a future use of such waters".

The question now centers round deciding on what is the reasonable use of the existing beneficiaries in the basin whose interests are to be protected and given weightage over the new uses. An use must be termed reasonable as long as it is beneficial. "Again a 'Beneficial Use' need not be the most productive use to which the water may be put, nor need it utilize the most efficient methods known in order to avoid waste and ensure maximum utilization". The reasonable use also implies the reasonable use to maintain the present pattern of cropping and the traditions and the practices of the beneficiaries which are difficult to be altered.

Thus it is admitted on all sides that all existing uses in the basin are to be given adequate weightage to the extent their reasonable requirements are to be ensured as long as they are beneficial.

The next question that can be raised may be as to how this principle of equitable apportionment gets applied when there are already binding agreements relating to use of waters in the Inter State Rivers.

The Indus Commission known also as the Rao Commission appointed to investigate the complaint of the province of Sind against, the State of Punjab over the latter's proposals to divert the waters of the River Indus, agreed on the adoption of the equitable apportionment theory with some reservation and said.

"If there is no agreement the rights of the several provinces and States must be determined by applying the rule of 'equitable apportionment' each unit getting a fair share of the common river".

This implies that the existence of an agreement will be an important factor to be taken into account when considering water sharing.

This principle of Equitable Apportionment was enunciated by the United States Supreme Court in adjudicating upon disputes among the constitution States of the United States regarding allocation of Inter State River Waters. The disputes which arose between the States Colorado and Kansas, Colorado and Wyoming, Connecticut and Massachusetts, New Jersey and New York, Nebraska and Wyoming and Arizona and California were all decided by the Supreme Court at different times. In all these cases the theory of absolute territorial sovereignty (Harmon Doctrine) was rejected and the common law theory of riparian rights or the doctrine of prior appropriation were not accepted wholly. The doctrine of equitable apportionment only emerged as the guiding principle in settling these disputes. Several factors came for consideration while examining the conflicting claims of co-riparian States.

These factors have all been compiled and given in the Helsinki Rules meant for international disputes, a few interesting articles of which are given below :

Article IV

Each basin State is entitled within its territory, to a reasonable and equitable share in the beneficial use of the waters of an international drainage basin.

Article V

(1) What is a reasonable and equitable share within the meaning of Article IV is to be determined in the light of all the relevant factors in each particular case.

(2) Relevant factors which are to be considered include, but are not limited to :

- (a) the geography of the basin, including in particular the extent of the drainage area in the territory of each basin State ;
- (b) the hydrology of the basin, including in particular the contribution of water by each basin State ;
- (c) the climate affecting the basin ;
- (d) the past utilization of the waters of the basin, including in particular existing utilisation ;
- (e) the economic and social needs of each basin State ;
- (f) the population dependent on the waters of the basin in each basin State ;
- (g) the comparative costs of alternative means of satisfying the economic and social needs of each basin State ;

(h) the availability of other resources ;

(i) the avoidance of unnecessary waste in the utilization of waters of the basin ;

(j) the practicability of compensation to one or more of the co-basin States as a means of adjusting conflicts among uses ; and

(k) the degree to which the needs of a basin State may be satisfied without causing substantial injury to a co-basin State.

(3) The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable share, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

Article VI

A use or category of uses is not entitled to any inherent preference over any other use or category of uses.

Article VII

A basin State may not be denied the present reasonable use of the waters of an international drainage basin, to reserve for a co-basin State a future use of such waters.

Article VIII

1. An existing reasonable use may continue in operation unless the factors justifying its continuance are outweighed by other factors leading to the conclusion that it is modified or terminated so as to accommodate a compelling incompatible use.

2(a) A use that is in fact operational is deemed to have been existing use from the time of the initiation of construction directly related to the use or, where such construction is not required the undertaking of comparable acts of actual implementation.

(b) Such a use continues to be an existing use until such time as it is discontinued with the intention that it be abandoned.

3. A use will not be deemed an existing use if at the time of becoming operational it is incompatible with an already existing reasonable use.

The above rules provide only flexible guide lines and even the factors listed are not exhaustive. Further no listed factor can have a fixed weight and "each factor is to be given such weight as it merits relating to all other factors".

7. Legal Principles Generally Adopted in India

We may now see as to how this principle of equitable apportionment expounded by the Supreme Court in the U. S. A. has found acceptance in resolving the Inter State disputes in our country. From the beginning it has been recognised in our country that the Inter State rivers are for the general welfare of all the State through which they flow irrespective of political boundaries. Under the Government of India Act 1935 even though irrigation became a provincial subject the Governor General retained the full powers to take decisions on Inter State disputes on Waters. The Constitution of India also empowered the Parliament to provide "for the adjudication of any disputes or complaint

with respect to the use, distribution or control of the waters of or in any interstate river or river valley". The Inter State Waters Disputes Act of 1956 is the legal instrument.

At no time has the Harmon doctrine found favour in this country. The dominant principle embodied in the resolution of Inter State Water Disputes in the pre independent and post independent era has been the equitable allocation of waters among the States each unit getting a fair share of the water of the common river. The Indus Commission of pre independent times (1942) which went into the complaint of Sind against new abstractions by Punjab decided that barring existing agreement between parties the principle of equitable apportionment could be followed and allowed Punjab to take new projects after allowing Sind time to take necessary remedial measures to avoid material injury.

In the adjudication of the disputes on the waters in Mahi river between Madhya Pradesh, Rajasthan and Gujarat three new projects in the basin were accommodated making every effort to equalise the burden and benefits among the riparian states generally following the principle of equitable apportionment.

Three Tribunals have been so far been constituted under the Inter State Water Disputes Act 1956.

Krishna Water Disputes Tribunal	—	Maharashtra, Karnataka, Andhra
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Godavari Water Disputes Tribunal	—	Maharashtra, Karnataka, Madhya Pradesh, Orissa, Andhra Pradesh
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Narmada Water Disputes Tribunal — Madhya Pradesh, Rajasthan, Gujarat and Maharashtra.

All the three have by and large followed the principle of equitable apportionment in settling the disputes. The Narmada Tribunal which gave its judgement last have devoted one full chapter for discussing on the basic principles that will apply in adjudicating on such disputes and finally concludes that the court could follow the principle of equitable apportionment "going through a weighting and balancing process". But all these Tribunals have held that they need allocate only the 'dependable' flow and not the average flow. They have also not considered the ground water.

Though the principle of equitable apportionment has been universally accepted, yet this principle is vague and cannot be defined with precision. The application of the principle would have to vary according to the circumstances of each case. A particular formula followed in one river controversy may not be suitable for application in another as each river basin presents unique problems requiring solution of its own rather than finding a solution through the application of general principles.

8. Water Law in Tamil Nadu

There is as yet no comprehensive water Law for Tamil Nadu. At present some 20 laws relating to Water reflect a piecemeal approach that defy a coordinated attempt to achieve the policies and strategies of better Water management. Many of the existing laws are out dated and inadequate to deal with all aspects of water resources manage-

ment. Also there are a number of agencies directly or indirectly connected with water administration which do not have the necessary coordination in their functioning. An attempt was made in the 70s to frame a comprehensive Irrigation Law on the lines suggested in the Model Irrigation Bill circulated by the Government of India in 1976. A Bill for the control and utilisation of Ground Water in the State was also introduced in the State Assembly in the 70s but was deferred. Recently in 1988 a preliminary draft for Tamil Nadu Water Resources Act was prepared with the help of the Legal Adviser from United Nations which is under scrutiny by the Government.

A few relevant laws now in force are given below :

- 1) The Madras Compulsory Labour Act 1858
- 2) The Madras Irrigation Cess Act 1865
- 3) The Madras Land Encroachment Act 1905
- 4) The Madras Irrigation (Voluntary Cess) Act 1942
- 5) The Madras Irrigation Works (Repairs Improvements and Construction) Act 1943
- 6) The Madras Irrigation Tanks (Improvements) Act 1949
- 7) The Madras Irrigation (Levy of Betterment Contribution) Act 1955
- 8) The Madras Irrigation Works (Construction of Field Bothies) Act 1959
- 9) The Madras Additional Assessment and Additional Water Cess Act 1963

It may be seen that most of the Acts now in force relate to levy of cess and revenue Collection for irrigation services and none of them relate to management aspects and devolution of powers on the Water managers to enforce discipline in the water use.

9. Legal Sanctions for Water Resource Management

A comprehensive Water Resources Act for the State should address itself on all aspects of sharing the available waters, administrative economic and political, besides others.

i) The Nature of Water Right

Under either riparian or appropriation doctrine, the only right which exists on water in its natural state is right of use. Water is of a fugitive nature and the rights of property in it is only usufructuary. Such right is not in the ownership of the corpus of water, but springs from the legal privilege to use it.

State should reserve itself the right to control and administer water resources.

ii) Water Rights Relating to Surface and Ground Water.

For the purposes of planning new uses in a river basin, the engineer should collect all relevant data of all abstractions already permitted, analyse and identify whether there are uses though legally allowed out of proportion to the benefits which ensue from such abstraction and propose rationalising such rights. For altering such existing rights State should aim itself with suitable legal enactments. This is true of both surface and ground water. When the dug wells were mostly used for lifting ground water the use was

very much restricted and did not call for special efforts on legislation. When large scale extractions are now made from deep aquifers, the problems of mutual interference, saline intrusions have arisen in many areas calling for a statutory control on ground water.

iii) Interse priority in Water Use

Clash of interest may arise in allocating water resources of a basin for different uses and the State should fix the priority. Though this may not need a legal sanction the interse priority decided on by the State must be made known so that decisions on disputes can be taken on those lines.

Clause 8 of the National water Policy adopted in September 1987 has detailed that water allocation priorities in planning and operation of systems should be broadly

Drinking Water
Irrigation
Hydro Power
Navigation
Industrial and other uses

iv) Limitations on Resources Utilisation

The project planning for new uses should also include the provision for periodical or continuous release of flows to meet the need of downstream users. The operational and regulation rules of the new schemes are to be framed such that the right of use of the existing beneficiary is duly respected and these should have the legal sanctions.

v) Land Acquisition

Land Acquisition is involved invariably in all development schemes

and in order to proceed with the work with the least delay the Acquisition Act should help procure the land needed speedily while at the same time reasonable compensation is ensured to the land owner in time. To this extent the Act requires to be amended:

vi) On-Farm Management

The Field bothies which serve as the last link in the distribution network are to be excavated and maintained by the beneficiaries themselves through a cooperative effort which has developed over a long period of time. To avoid field to field irrigation these bothies are to be taken through farmer's lands which cannot all be acquired and maintained at Government cost. The State should have legislative sanction to run these small bothies in private land without protest in the interest of creating a good network for proper irrigation application. Also the rotational delivery of waters to individual owners and the quantities delivered have got fixed by tradition and convention and any modification of the practice for better water management is usually resented. Breaking the tradition is challenged as interference with the customary rights. It is necessary for the Government to enact suitable laws or modify the existing laws to an extent so as to enable the State achieve maximisation of the benefits with the available resources by scientific planning of the on-farm development.

vii) Kudimaramath As a Measure of Maintenance

'Kudimaramath' a system of contribution of free voluntary labour for maintenance of the distribution system has failed in some parts and is slowly showing signs of failure in others. The Government cannot accept respon-

sibility for direct maintenance of the channel system in the tertiary sector and has to enact laws to revive and strengthen this traditional practice. Imposing collective fines or refusing irrigation water delivery if the system is not kept in good condition can be thought of.

viii) Illegal Abstraction

Illegal abstraction from the rivers and streams and also from the irrigation canals through pumping or unauthorised diversions are becoming a menace to planned water management. Existing laws to curb such illegal practices do entail long drawn procedures before the culprit could be booked. Irrigation officers are to be clothed with enough magisterial powers to remand to custody by issue of warrant and seize the materials and tools used in the unauthorised abstraction if such illegal acts are to be prevented in time.

ix) Encroachment

People squat on canal banks, surplus courses, supply channels and eventually build their homes restricting the flow courses and in some cases even obliterating them. Farming is done in the fore-shore of tanks and reservoirs unauthorisedly resulting in silting up of the tanks and reservoirs and in some small tanks the water spread is badly modified as a wide channel consequently affecting the ayacut.

The Madras Land Encroachment Act 1905 provides measures for checking unauthorised occupation of Government lands, Collection of penalties when levied and also for summary eviction in cases such encroachment is prejudicial to the interests of the State. But authority for eviction is at present vested with the

district administration. The process of eviction being time consuming and demanding the coordination of the revenue, police and other agencies several cases of chronic encroachments obstructing free flow of irrigation waters have remained untackled. Amendments to existing laws simplifying the procedures of eviction providing for inflicting deterrent punishment on such encroachers and vesting the authority with the irrigation officials themselves will serve to improve the efficiency of irrigation systems.

x) Pollution

Pollution of water with heavy flow of raw sewage from Urban concentrations and industrial waste indifferently allowed to flow down the drains has brought in toxic effects and dangerously limited the use of water, resources. Government have enacted laws and created recently the Pollution Control Board. Government in their administrative departments stipulate several conditions while licensing the industrial concerns to insist on their returning the used waters in a safe condition. But the implementation is posing many problems and constant vigil is to be kept on the industrial flows to check both quantity and quality.

xi) Water Cess and Betterment Levy

The State Government are empowered to levy betterment fees on areas served by new Irrigation Schemes executed with heavy investments to partly meet the capital costs. Legislation to this effect has been made. But in many areas collection of betterment levy has not been quite successful.

Water rates in Tamil Nadu are awfully low and do not meet even a small part of the maintenance cost. There is need for revision and rationalisation of these

assessment rates. This needs political will and suitable legal sanctions for effective Collection.

There is variance in the collection machinery too. In the Northern States Irrigation cess assessment is made by the irrigation engineers themselves whereas the collection is done by the revenue authorities. In the Southern States, Tamil Nadu in particular, both the assessment and collection is done by the revenue authorities with the irrigation engineers kept blissfully ignorant of the benefits derived by the irrigation they provide. This is not a sensible involvement of the agency supplying water in the ultimate water utilisation and to this extent cannot yield the best results in irrigation management and efficiency.

Conclusion

God made the Man and endowed in him the faculty to observe the physical laws of Nature governing the universe and to learn to make laws for himself to live in peace among his fellowmen. Laws are made, amended and altered to keep pace with the times and to reflect the objectives and the goals of the Nation and the people. Governance with minimum laws, simple to interpret, is ideal. But life is becoming more and more complicated with time.

Legislative measures are required to control and channelise the activities in every field of social living.

Legislative measures for utilisation and management of water resources now available need revision, expansion and periodical review in the context of the increasing use of waters for multifarious purposes by the over growing population.

Ground Water Management in Hard Rock areas

by

L. P. Swaminathan* and P. Kandaswamy**

I. Introduction

Ground water occupies a signal position in rural as well as metropolitan economy of India, its depletion overtime is bound to give rise to serious problems. Every summer, one reads pathetic accounts of insufficient supply of ground water for civic uses in big cities. Since long ground water has played a vital role in meeting the drinking water needs of both the villages and small towns during drought time when availability of surface water in rivers and ponds is poor, more so during summer season.

As a source of irrigation, ground water has become particularly important in the Indian farm economy. In aerial coverage it now compares well with major and medium surface irrigation works which can presently cover 300 million ha. of crop area of the nation. In fact, Indian agricultural development since mid-sixties has come to be identified more

with ground water development than with canal or tank irrigation.

II. Need for managing the ground water

There are spatial differences in the stage of ground water development within India. In most of the Southern states ground water development has reached the stage of near-optimum utilization. This higher stage of development of ground water is not free from some hydrological and agrarian consequences. There are two dimensions of this problem time and class differentiation, given level of water supply determined by the size of the aquifer and rate of recharge one must consider the rate of drawal in short run and long run perspectives, simultaneously. Excessive drawals amounting to water mining may result in short run gains but however will lead to drop in water levels

result would tend to be abandoned irrigated farming and consequently in output and employment.

Class dimensions also has questions related to time dimensions and more critically, prospect of small farmers diminishes both in short and long run. The ground water is a common property resource, and in their competition to reach the maximum supply through investment in wells, small farmers tend to loose their battle to large and rich farmers. The economic distance widens with serious social and political consequences. What type of policy intervention is needed to make the use of ground water development more equitable and sustainable? This paper examines the issue. In this process, a case study of water mining in Coimbatore district of Tamil Nadu, will be presented and policy options identified.

III.a. Coimbatore District — A Scenario

Tamil Nadu has utilized canal water to the maximum extent of over 90 percent and its 47.9 per cent of irrigated area is supported equally by canals, rainfed tanks and wells. Further expansion in irrigated area has to depend on ground water for sole irrigation and conjunctive use. The level of ground water extraction varies widely among the districts (Appendix I).

Among the districts, Coimbatore is one of the districts where ground water is heavily utilized. The percentage share of different sources of irrigation in this district at various points of time is given

in Table I. It could be seen that percentage share of wells had increased from about 54 per cent in 1950s to 63 per cent in early 1980s. This increase had come inspite of completing few major and minor irrigation projects in the past three decades. This showed the pivotal role played by ground water in this district.

III. b. Fluctuation in Water Table

The block wise stage of ground water development is given in Table II. It could be seen that out of 21 blocks ten blocks are dark, and among the rest, ten are grey and only one is white.¹

Such high development of ground water through wells naturally raised the question whether the rate of extraction had matched with the rate of recharge or there is a long term decline in ground water to indicate over-exploitation. For more precise understanding of the geographical variations, these data were analysed taluk wise.²

The mean rainfall for the district is 684 mm. There was some deficiency in taluk wise mean rainfall data. So it could be obtained only from 1976 though the data on ground water fluctuations were available from 1972. For one of the taluks (Palladam) it was not possible to get the data even for few continuous years, so they were not plotted.

The mean water table for the district as a whole was about 9m below the surface in 1972. It went down to

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1. Dark area is one where ground water extraction has exceeded 80 per cent of recoverable recharge, grey where the extraction is 65 to 85 per cent and white is one where it is less than 65 per cent.

2. Ground water wing of Public Works Department monitor the fluctuations in ground water in 60 control wells in this district. The annual means of water table was arrived at from these data.

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TABLE : I

Source of Irrigation (Coimbatore District)
Area Irrigated (in Hec)

Years	Canal	Tank	Wells	Other Source	Net area Irrigated
1956-57	83280 (41.62)	6341 (3.17)	108657 (54.30)	1834 (0.91)	200112 (100)
1961-62	111302 (43.09)	6831 (2.64)	137840 (53.37)	2312 (0.90)	258285 (100)
1966-67	82676 (35.77)	6221 (2.69)	139987 (60.59)	2262 (0.98)	231146 (100)
1971-72	139359 (48.59)	5959 (2.08)	137900 (48.06)	3594 (1.25)	286812 (100)
1976-77	71225 (33.27)	2617 (1.22)	139553 (65.19)	9921 (4.63)	214074 (100)
1982-83*	51916 (34.11)	3895 (2.55)	96368 (63.32)	3613 (2.37)	152186 (100)

* From 1979 the Coimbatore District was bifurcated into two and the data for undivided district is available upto 1982. Figures in parenthesis are percentages to total area.

Source : District Statistical Office, Coimbatore.

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TABLE II

Groundwater State in Coimbatore District

Sl. No.	Block	Ground water recharge (ham)	Utilisable ground water recharge (ham)	Net ground water draft (ham)	Stage of Development as date %
1.	Anaimalai	6,393	5,434	3,412	63
2.	Malathakulam	4,069	3,459	1,929	56
3.	Udumalpet	6,034	5,129	3,358	65
4.	P. N. Palayam	2,804	2,383	2,147	90
5.	Pongalur	3,995	3,396	2,253	66
6.	Sulur	3,007	2,556	2,339	92
7.	Tiruppur	2,044	1,737	1,658	95
8.	Valparai (Hills)	2,322	1,974	—	—
9.	Annur	11,155	9,482	8,172	86
10.	Avinashi	5,903	5,018	4,904	93
11.	Kinathukadavu	7,807	6,636	5,406	85
12.	Madukkarai	3,497	2,972	2,230	85
13.	Palladam	9,628	8,184	8,111	99
14.	Porur	3,699	3,144	3,008	96
15.	Pollachi (N)	7,738	6,577	5,012	76
16.	Pollachi (S)	4,863	4,134	2,671	65
17.	Sarkarsamkulam	1,158	984	819	83
18.	Sultanpet	3,131	2,661	2,259	85
19.	Gudimangalam	10,231	8,696	4,320	50
20.	Kammadai	8,050	6,842	5,241	77
21.	Thondamuthur	4,484	3,811	3,629	95
Coimbatore District		1,12,012	95,209	72,882	77

Source : Report of the Working Group on Ground Water Resources, Chief Engineer (Ground Water) Public Works Department, Tamil Nadu, 1968.

nearly 14m in 1986 registering a decrease of 5m in a period of 14 years. In Coimbatore and Avanashi taluks rainfall was the only source of recharge as there was no tank or canal irrigation. There was a steep rise in ground water table in 1980 not only in these two taluks but also in other two taluks as well due to unusually heavy rainfall (1205 mm) received during late 1979. Since 1980 there is a clear declining trend in the ground water levels. Though the rainfall went up in 1984, it could not push up water table as proportionately as in earlier years.

The behaviour of the ground water table for Pollachi and Udumalpet taluks are shown in Figures 3 and 4. After a steep increase in 1981, the level of the water table did not increase significantly. But there was some flattening trend. As mentioned earlier these two taluks are irrigated by a major surface irrigation project (Parambikulam Aliyar Project). Perhaps seeped-in water from the canal arrested the declining trend in water table, to some extent. The declining trend in Palladam taluk was more pronounced than these two taluks.

It could be concluded that in three taluks of Coimbatore districts, (Coimbatore, Palladam and Avanashi) there was a permanent imbalance between ground water recharge and with-drawals, and the stock of the ground water is getting depleted.³ In the taluks irrigated by the surface irrigation declining trend could be halted to some extent through the additional recharge from canals.

3. Only when the stock of the ground water is depleted there would be a secular decline in ground water table. The short term decline is caused by depletion of flow of the ground water only. See Dhawan, B.D. "preventing ground water over-exploitation", paper presented in Workshop on Efficiency and equity in ground water management, IRMA, Jan. 1989.

4. Swaminathan, L.P. and P. Kandaswamy opcit :

The causes for this stage of ground water development need not be dealt at length. The commercialised agriculture in this area promising incentive returns had motivated the farming community in this district to sink more number of wells at frequent intervals and deeper the existing ones resulting in over exploitation.

The consequences of over-exploitation of ground water are :⁴

a. Reduction in the area commanded by a single well : it was observed that for the district as a whole the area commanded by a single well decreased from 1.30ha in 1961 to 0.97 ha in 1982. It was also found through a cross sectional data that area irrigated has reduced during the past three decades among all class of farmers.

b. Investment in wells had become an annual feature : it was found that in Avanashi taluk even the marginal farmers had deepened the well by 31 m within the last 10 years.

c. Abandoning of wells and outmigration of labour : it was found that in two of the villages in selected block 20 per cent of the wells had been abandoned and the farmers had either become the non-agricultural labour in the village or moved to the near by city as labourers in hosiery industry.

III. c. Ground Water Ownership

Though ground water is considered as a common property resource it is

actually owned by those who have access to it. At present it is largely being appropriated by the larger farmers. The distribu-

tion of wells among the various categories of farmers in one of the selected villages in Coimbatore district is given in Table II

TABLE III

Well Ownership Pattern in Annur Block of Coimbatore District, 1988

Size group	No.	No. of wells	Area commanded/ wells in ha
Marginal	60	39	0.52
Small	60	54	0.82
Large	60	85	1.14

Source : ICAR Scheme for increasing Income and Employment

It could be seen that nearly 33 per cent of the marginal farmers were non well owners while there were only four small farmers, without well and large farmers there were farmers owning more than one well. The area commanded by the large farmers' wells were also higher, since they were deeper and fitted with high horsepower pumps.

V. Policy Issues : Ground Water Management

The case of Coimbatore district, particularly of Coimbatore and Avanashi taluks is indeed a challenge for the scientists, economists, administrators, politicians and farmers. Here the ground water development has reached a stage here inspite of fast depletion farmers continued to invest in well digging. It is showed that private gains have

exceeded the private cost although the social cost would have exceeded the social gains.

Discussions with the farmers clearly revealed that there existed an appreciation of the problem among all group of farmers. But given the problem of survival in the farming particularly in the absence of opportunities for alternative activities they tended to draw maximum now for the survival rather than for the stability of tomorrows. This leads us to the question how long this fragile stability can be sustained.

In a situation like this two lines of action-negative and positive-can be thought of.

The major negative lines of action prescribed are : regulation of spacing, restricting power connections, change of

power tariff to the larger consumers and crop controls. The positive lines of actions are : improving the recharge through artificial methods and adopting modern methods of irrigation like drip and sprinkler. The various implications of following these policies are discussed below.

i. Negative measures

2. Regulation of spacing

This is already in operation through indirectly, by controlling institutional finance for the intending borrower if his well falls within the minimum prescribed spacing. There is no such restrictions for the farmers who do not need institutional finance.

In the absence of such restrictions for all farmers it is discriminatory especially against the resource poor farmers. It was observed that more than 60 per

cent of the small and marginal farmers wanted to deepen their well but could not do it since financial assistance was denied to them whereas those who had the capital continued to be a "free rider".

The need for spacing regulations could be appreciated well if the existing density of wells is seen. The Table IV shows the spacing between the wells in three selected villages in Avnashi Block.

The minimum spacing prescribed for this block is 200 m. It could be seen from the Table IV that nearly 80 per cent of the existing wells were located within the minimum spacing. This is what is likely to happen in other areas also unless there is a comprehensive ground water regulation act to control the over crowding of wells. If it is delayed, enough damage would be done in Coimbatore district and the legislation will have little effect in halting the over exploitation.

TABLE IV

Spacing of wells in Avnashi Block

Distance	V1	V2	V3
1 — 100	16 (45.71)	26 (55.31)	16 (45.71)
100 — 200	13 (37.14)	15 (31.91)	13 (37.14)
200 — 300	4 (11.42)	5 (10.63)	6 (17.14)
300 — 400	2 (5.71)	1 (2.10)	—

Water being a state subject in Indian constitution the centre has been commending the need for such regulatory mechanisms to the state governments. Centre passed a model bill in 1974 and circulated among states. So far except in Gujarat where a ground water act has already been passed, and in Tamil Nadu where serious thought is being given, no other state had responded.

b. Electricity Pricing :

In a way rural electrification has enhanced the pressure on ground water resource, firstly electric power for agricultural pumpsets is heavily underpriced both in comparison to its resource cost and alternative sources of energy for lifting the water. Linking power tariff with horse power of motor instead of actual consumption of power makes the well owners to behave as if the marginal cost of lifting water is zero. Thus the structure of power tariff badly needs modification.

Two Part Electricity Tariff :

Two types of electricity tariff can be levied. The normal flat rate tariff for the farmer with the wells of a threshold depth and make the rate progressive if they go deep. The success of this method depends on how effectively the farmers with deeper wells are clearly identified.

c. Crop control :

It is sometimes argued that restricting the cultivation of certain high water consuming crops like sugarcane, turmeric etc. would discourage the farmers to mine the ground water. Crop restrictions have not met with great success even in the command areas of irrigation

projects where the farmers receive the water through public source. Apart from that, it is necessary that the recommended crop should assure him the same level of profit as the restricted crops if the farmers are to switch over.

d. State or Community Ownership of Ground water :

It is suggested by few scholars that in future the ground water exploitation should be through public or community tube wells, instead of privately owned wells. The experience from the existing public tube wells are not encouraging. An evaluation study conducted by the author on performance of community wells in Pasumpon Muthuramalingam District of Tamil Nadu showed majority of the wells have failed because of one or other of the following reasons.

- Lack of village level organisation to operate the well and political interference in deciding who operates the well ;
- Poor location of the wells and frequent failure of pumps. Long delay in getting them repaired ;
- Declining water yield from the wells ;
- Water salinity :

So it is necessary to create effective institutional support at the village level if these wells are to succeed.

ii. The Positive Measures :

a. Adopting — Drip or Sprinkler Irrigation :

Sprinkler irrigation is more suited a relatively water abundant situations. So it is often argued that drip irrigation would help greatly in halting the mining

of ground water. One has to be cautious on the limitations of large scale adoption of this method because :

- Installing the drip is still a costlier technique. The average cost of installing drip system even for a widely spaced high value crop like coconut, is around Rs. 5000/ ac.. If this is to be subsidised then we can imagine the amount of social cost involved.
- In a recent study made by the author it was found that about 60 per cent of non adopters expressed that joint ownership of the well was the main reason for not installing drip. It was shown that majority of the marginal and small farmers had joint ownership in the study area.
- It was also found that many farmers had to deepen their well even for getting the water supply to drip system.
- Reliable and uniform information on water requirements of the various crops have not been made available to the farmers.

VI. Increasing the possibilities of recharge

It was already shown that declining trend in ground water could be halted to

some extent in canal command areas. This showed that wherever possible attempts should be made to increase the artificial recharge through new surface irrigation projects, constructing percolation ponds, check dams, nullah bunding etc. In the command areas of the existing projects it is necessary to enforce a policy of extensive irrigation instead of intensively irrigated agriculture. This would also minimise the danger of water logging.

The possibilities for inter basin transfer of water from Kerala should also be explored if not for direct irrigation but for filling up of the village ponds and tanks which can recharge the ground water.

Most important aspect to be realised is that the primary reason for such indiscriminate use of a common property resource like ground water is the high level of subsidies given for inputs like electricity to all class of farmers should be made to pay the real cost of such enterprises.

What is needed today is a comprehensive legislation on the use of ground water for various purpose after carefully appraising the wide range of alternative policies including their impacts on various interest groups. The different policy options available and their likely impact on different sections and the farmers are indicated in Table V.

TABLE V

Policy Options for Groundwater Management in Coimbatore

Option	Who gains (%)? Who loses (—) ?		Feasibility	
	Large farmers	Small farmers	Financial	Political
1. Inter basin transfers (from Kerala)	+	+	?	—
2. Reduce water use (like channels, drip, sprinkler)	++	?	+	++
3. Water conservation (bundling recycling artificial recharge)	+	+or—	+	+
4. Control density of wells	+	—or+	++	+
5. Ration electricity	+	+	+	—
6. Two part electricity tariff (higher not lower charges above a certain level of consumption)	—	—	+	—
	—	++	+	?
7. Alternative farming systems				
— irrigated	+	++?	?	?
— dry land	—	+	?	?
8. Regulate crops permitted (paddy, sugarcane etc.)	?	?	?	—
9. Nationalise groundwater	—	?	?	?
10. Tax groundwater (tradeable ground water quotas)	—	+	+	—
11. Alternative use-organisation (co-ops etc.)	—	++	—	—
12. Do nothing	++	—	+	+

From Economic Aspects and Policy Issues in Ground Development, World Bank staff report No. 496, 1981.

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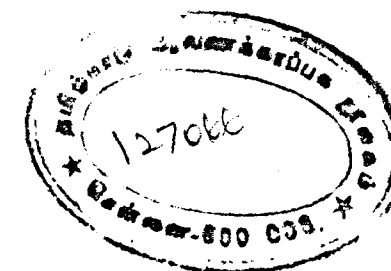
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APPENDIX I

District-wise Ground Water Potential in Tamil Nadu
(1984-85)

Sl. No.	District	Ground water recharge MCM	Utilisable GW MCM	Net Draft MCM	Balance Available MCM	Stage of GW Dev. %
1.	Chingleput	2584	2196	1116	1080	56
2.	North Arcot	3115	2647	1677	970	70
3.	South Arcot	5150	4377	1463	2915	50
4.	Dharmapuri	1562	1328	563	765	47
5.	Salem	1767	1502	1033	469	76
6.	Coimbatore	1120	952	729	223	84
7.	Nilgiris	60	51	—	51	1
8.	Periyar	1365	1160	778	382	74
9.	Thanjavur	2133	1813	599	1214	36
10.	Tiruchirapalli	2809	2388	1066	1322	49
11.	Pudukkottai	1036	880	251	629	31
12.	Madurai	2388	2030	1016	1014	55
13.	Ramanathapuram	3140	2669	452	2217	19
14.	Tirunelveli	1864	1584	692	892	48
15.	Kanyakumari State	351	298	13	285	5
		30444	25875	11448	14427	

Source : Report of the working group on ground water resources, Chief Engineer (Ground Water), Public Works Department, Tamil Nadu, 1988).



Publications of the Institute consist of the following categories

1. Publications brought out by Messers Sangam Publishers : These consist of a series of monographs mainly relating to Rural Development of Tamilnadu brought out between 1972 & 1980. Detailed list including prices available on request from the Programme Coordinator of MIDS. Orders may be placed with Sangam publishers, 11, Sunkurama Chetty Street, Madras - 600 001 for these.

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The aim of the Institute is to contribute to the economic and social development in Tamilnadu and India.

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