REPORT ON THE TECHNO-ECONOMIC SURVEY OF THE SOUTH ARCOT DISTRICT. PART-II-1973.

(45)

TECHNO-ECONOMIC SURVEY OF SOUTH ARCOT DISTRICT

PART - II

REPORT ON THE TECHNO-ECONOMIC SURVEY OF SOUTH ARCOT DISTRICT

(PART II)

(NOVEMBER 1973)

FACT ENGINEERING AND DESIGN ORGANISATION,
THE FERTILISERS AND CHEMICALS TRAVANCORE LIMITED
UDYOGAMANDAL

CONTENTS

1.0 INDUSTRIES

1.1.0 Introduction

South Arcot district was in many ways a fore runner in industrialialisation. This was due to historical factors. But the impact of industrialisation has not become perceptible since the tempo was not kept up in the succeeding years. Sugar and oil milling industry have taken roots in the district and encompass a large section of people. Textile mills and rice mills belong more to the traditional category. Cashew industry, though concentrated in Panruti area, has been performing satisfactorily. Ceramic industry is gradually developing under the patronage of the State Government. Marine products, though of recent origin, hold out bright prospects for development. Neyveli Lignite Corporation, the giant public sector undertaking, situated in this district, was conceived as a major phenomenon. But the problems in mining have belied their hopes considerably. As a languishing industry, the contribution of Neyveli Lignite Corporation could not be upto the mark. A process of ancillary development and spurt in general industrial activity should have been a natural consequence of Neyveli Project. But this did not take place in a considerable measure, owing to lignite shortage and non-availability of the by-products expected from Neyveli. But it may be hoped that the problems in mining would be overcome by installing new machinery and the unit would be brought upto a viable level in the foreseeable future.

A brief review of the major categories of industries in the district is attempted in this chapter. The items covered include sugar, oil milling, vanaspati, rice milling, textiles, ceramics, Neyveli project, engineering fabrication, fertiliser, food products and other miscellaneous units. Marine products industry has been covered in Part-I, Chapter 2.0 (page 66-79). Therefore a separate coverage has not been attempted in this section.

1.2.0 Sugar Industries

1.2.1 General

Sugar industry occupies a prominent place in the economic map of India. In 1969-70, the value of sugar produced was of the order of about Rs.690 crores. The cane cultivators alone received about Rs.337 crores from this industry. The income to the Government was about Rs.185 crores by way of excise duty, cane cess, income-tax, sur-tax etc. Sugar industry is the major agro-based industry in India. It is closely controlled by the Government of India. Sugar prices are controlled by the Government either fully or partially. Sugarcane prices are also fixed by the Government from time to time. The by-product molasses supply also is restricted.

1.2.2 Sugar industries in Tamil Nadu

There are seventeen sugar factories functioning in the State with a total daily crushing capacity of about 20940 tonnes. Four new factories are licensed with a daily crushing capacity of 1250 tonnes each.

Some of the existing factories are granted license for expansion as shown in Table-II. It is estimated that in 1976, the production of sugar @ 9% average recovery will be about 5.8 lakh tonnes and in 1981-82 it will be about 6.7 lakh tonnes. The requirement of sugar in Tamil Nadu in 1976 will be only about 2.3 lakh tonnes and the balance will have to be exported to other States or foreign countries.

1.2.3 Sugar industries in South Arcot District

Sugarcane is grown in wet lands in rotation with paddy or some other wet crops. During 1967-68, the area under cane cultivation was about 44703 acres and in 1971-72, it was about 44975 acres (Table-III). The areas where intensive cultivation of sugarcane is taking place are the taluks of Cuddalore, Kallakurichi, Villupuram and Vridhachalam. There are four sugar factories in this district. They are M/s. Arcna Sugars located at Pennadam, Vridhachalam taluk, M/s. E.I.D. Parry at Nellikuppam near Cuddalore, The Co-operative Sugars Ltd. at Moongilthuraipattu in Kallakurichi taluk and M/s. South India Steel and Sugars Ltd. at Mundiyambakkam in Villupuram taluk. There is a Sugarcane Research Centre functioning at Cuddalore. The registered area of sugarcane cultivation for all the four factories in 1967-68 was 24,209 acres, by now it has increased to 41,291 acres. For details and break-up see Table-IV attached. The sugar factories in South Arcot district have a total daily crushing capacity of about 4750 tonnes. It will be

about 10,500 tonnes by 1976. For break-up and details, see attached Table-V. The production of sugar in 1976 will be about 1.7 lakh tonnes and in 1981-82, it will rise to 1.822 lakh tonnes. The sugar content in the cane varies between 9 and 11% on cane weight depending on the type of sugarcane and also the age. Detailed information on sugarcane cultivation is furnished in Part-I of this report. The average working days of sugar industry varies between 150 and 180 days per year. In order to suit the operation of sugar industry, the plantation of sugarcane has to be judged and planned. A continuous supply of good quality sugarcane should thus be assured. The recovery of sugar in the industry is generally about 9 to 10% on cane weight. The average production of bagasse ranges between 30 and 33% on cane weight. Molasses production is about 4-5% of cane weight. The sugar in the bagasse goes upto 3%. The sugar content in the molasses is about 30 to 32%. Filter mud which is a waste or residue comes to about 3% of the cane weight. The sugarcane should be processed within 48 hours after it is cut and hence a well-organised mode of transportation is absolutely necessary. Otherwise, sugar content in the cane will be fermented resulting in considerable losses.

1.2.4 <u>Existing Sugar Mills in South Arcot District</u>

<u>Aruna Sugars Limited</u>: This factory is located at Pennadam, in Vridhachalam taluk on the left bank of river Vellar. The plant started with a crushing capacity

of 1200 tonnes per day in 1971-72. Now, it is licensed for an expansion to 4000 tonnes per day. At present the expansion work is in progress. From the coming crushing season, it will be able to crush 4000 tonnes per day. It is the biggest unit in the district. In 1967-68, the registered area for cane cultivation was about 3564 acres, but in 1972-73 it has expanded to 15547 acres (Table-IV). By-product molasses is being supplied to the Aravind Distillery, a sister concern of Aruna Sugars at Panruti. This sugar factory has all facilities like road, rail connections etc. It has good supply of water from the river nearby. The effluent from this factory is conveniently treated and disposed. Sugarcane is available steadily and the soil in the growing areas is also very fertile. In general the performance of this unit is satisfactory.

E.I.D. Parry Ltd: This is the first sugar plant in South Arcot district, situated at Nellikuppam near Cuddalore. River Gadilam is flowing near the site. The original capacity of the plant was 2200 tonnes per day. It is further licensed for an expansion to 2750 tonnes of cane per day. In 1967-68, the registered area for cane cultivation was 13036 acres. The registered area for cane cultivation during the years 1968 to 1973 is given in Table-IV attached. This factory has good transportation and communication facilities. Molasses from this factory is used in their own distillery.

South India Steel and Sugars Ltd.: Original capacity of this plant was 1250 tonnes per day of cane. It is now licensed to expand to 2500 tonnes per day. The expansion work is in progress and will be completed by 1974. At present this plant is able to crush about 1500 tonnes per day of sugarcane. The registered area for sugarcane cultivation in 1972-73 is 6671 acres (Table-IV). The factory is located at Mundiyambakkam adjoining the National Highway 45.

Kallakurichi Co-operative Sugar Mills Ltd.: This is the only mill in the co-operative sector. It is located at Moongilthurapattu in Kallakurichi taluk. It is about 37 km. from Kallakurichi. This plant is situated on the bank of river Pennar. The original capacity of the mill was about 1000 tonnes per day. The present capacity is 1250 tonnes per day. By-product molasses is being sold to Trichy Distillery. The total number of people employed in this unit is about 450. The registered area for sugarcane cultivation in 1972-73 is 6700 acres (Table-IV).

1.2.5 Development of sugar industry in South Arcot

The district is already having four major factories with a total crushing capacity of 10500 tonnes per day. These units are scattered in all the four taluks. Amongst the remaining taluks, Tirukoilur has potential for locating a new sugar factory. Sathanur Reservoir

in Penniar River assures a steady supply of fresh water. This reservoir receives water both from South West and North East Monsoons. Tirukoilur taluk has an irrigated area of about 135176 acres. The soils of Tirukoilur, Thiruvannainallur, Mugaiyur Panchayat Unions consist of pennair alluvium. It is reported that the District Collector of South Arcot has submitted a preliminary feasibility study for a sugar factory to be located at Periasevalai near Madapattu in Tirukoilur taluk. For a plant with a capacity of 1250 tonnes per day, the sugarcane required will be about 2.25 lakh tonnes. The total area required for cane cultivation would be about 9000 acres. The area under sugarcane cultivation in 1971-72 in this taluk was about 3492 acres (Table-VI). Considering all the facilities available in this taluk, there is good scope for a sugar factory to be established in Tirukoilur taluk.

1.2.6 Bagasse utilisation

All the four existing units in South Arcot district are prepared to spare their surplus bagasse which is about 10% of its production of bagasse. The Government of Tamil Nadu, Industries Department, has commissioned M/s. IBCON Pvt. Ltd. Madras to study the possibility of a paper factory using bagasse as raw material. M/s. IBCON has prepared a project feasibility report for a 100 tonne per day papar plant using sugarcane bagasse. It has recommended Pennadam as the ideal location for a paper factory. Another

important use of bagasse is in the manufacture of furfurol, an important organic chemical used in several industries. The recovery of furfurol from bagasse was first developed by M/s. Quaker Oats of U.S.A. Furfurol from bagasse is an economically viable proposition and many countries have taken to it. The spent bagasse could be further utilised for the production of pulp for viscose rayon or in the manufacture of paper boards etc. or as fuel.
M/s. Southern Agrifurane Industries Ltd. is setting up a furfurol plant based on bagasse. The site work is in progress. This plant is located at Mundiyambakkom, near Villupuram, adjacent to their sister concern South India Steel and Sugar Limited. The production capacity of the furfurol plant is around 6000 tonnes per year.

(Tables -- contd...)

Table-III

Area under sugarcane during the past five years in South Arcot District.

Year	Acres
1967-68	44,703
1968-69	74,183
1969-70	59,266
1970-71	52,560
1971-72	44,975

Table-VI

Registered area under cane in Tirukoilur Taluk for the last five years

Year	Acres
1967-68	3976
1968-69	7113
1969-70	3420
1970-71	4808
1971-72	3492

Table-VII

Estimated bagasse production in 1976

Name of factory	Expanded Capacity TCD	Expected Cane Crushing in lakh te.	Anticipated bagasse production - te. (40-45% moisture)
Aruna Sugars Ltd.	4000	8.00	2.40
Kallakurichi Co-operative Sugar Mills	1500	2.50	0.75
E.I.D. Parry Ltd.	2750	5.50	1.65
South India Steel & Sugars Ltd.	2500	5.00	1.50

(Assumed 200 operating days).

1.3.0 Oil Milling Industries

Oil milling industry has taken roots in South Arcot since the district has a considerable produce of groundnut and gingelly - two major sources of vegetable oil. Groundnut production in this district in 1970-71 was about 1,55,500 tonnes and gingelly about 5,960 tonnes. Since groundnut and gingelly are major crops, a number of oil mills are in operation. Hundreds of country chucks also are functioning. Most of the oil mills are located around Tindivanam, Villupuram, Tirukoilur, Chinnasalem, Vridhachalam, Panruti and Cuddalore. Some of the major units in operation are listed below:-

1. Seeniyappa Oil Mills, Villupuram
2. Reddiar Oil Mills, "
3. Krishna Oil Mills, "
4. Aruna Oil Mills, "
5. Murugan Oil Mills "
6. Saradha Oil Mills, "
7. Kandhan Oil Mills, "
8. Bharat Oil Mills, "
9. Murugan Oil Mills, Panruti
10. Revathi Oil Mills, Valavanur
11. Jayalakshmi Oil Mills, "
12. Vijaya Oil Mills, "
13. Sri Narayana Moorthy Oil Mills, Tindivanam
14. Periyaswamy Oil Mills, Panruti & Villupuram
15. A.M. Hasin & Bros. Oil Mill, Cuddalore

16. Ramachandran & Co. Oil Mills, Tindivanam
17. Oil Products, Cuddalore
18. Muthukumaraswamy Chetty & Co., Cuddalore
19. Erusappa Chettiar Oil Mills, "
20. Saraswathy Oil Mills, "

A dozen more small mills are functioning around Tirukoilur, Chinnasalem and Kallakurichi. In Vridhachalam also there are a few small oil mills. Most of the oil mills are in small-scale sector. The oil mills operate during the groundnut harvesting season, and hence probably the total operating days are between 100-120 days per year. Soaring groundnut prices of today pose a problem to the small-scale oil mills. These mill owners are facing financial difficulties due to shortage of working capital. They are not able to purchase the raw material in competition with outside bidders. The oil milling industry is almost swept off its feet due to these developments. Further, groundnut kernels cannot be stored for more than a month, since it would deteriorate. The oil content also will be substantially reduced. Therefore the oil millers have to be very cautious in stocking the kernels. The groundnuts, groundnut oil and groundnut oil cakes are all bought by wholesalers from other States. The oils and cakes are mostly purchased by Bombay market. The small mill owners in this district are not able to compete with others. It

is understood that all the cake is transported to Bombay for solvent extraction units to recover the oil present in the cake. Solvent extraction facilities inside the district may help to relieve this situation considerably. An effort has to be made for rehabilitating this industry with the help of the Government. An Oil Complex should be planned centering Villupuram. Suitable measures have to be devised to support the oil milling industry in the district. Villupuram has necessary facilities such as road, railway etc. and is situated in groundnut producing area. Madras Vanaspati Plantalso is situated at Villupuram. Groundnut kernels and cake would be available in large quantities. Therefore, Villupuram could be chosen for developing an oil milling complex which would gradually rehabilitate the industry.

1.4.0 Vanaspati Industry

The All-India production of vanaspati in the year 1971 was around 574,735 tonnes. The Southern States account for a total production of 52,963 tonnes. About 18 factories are engaged in Vanaspati production in the South. Most of the Vanaspati is exported to Northern States and for Defence Forces. In 1971, the four Southern States have exported about 9,987 tonnes to the North and 6,298 tonnes to Defence department. The balance 36,678 tonnes were consumed by all the four States.

1.4.1 Vanaspati Industry in Tamil Nadu

There are five factories manufacturing vanaspati in Tamil Nadu. They are Tata, Madras.; B.T., Madras.; HLL Trichy.; Mettur Chemicals and Madras Vanaspati Ltd. Villupuram. The average total production of vanaspati in 1971 was around 20,000 tonnes, the consumption in the State being around 14,000 tonnes. The production of vanaspati was far below the licensed capacity. This points to the fact that the local demand at that time was rather poor. Though Tamil Nadu is a major producer of groundnut, the price level of groundnut oil is very high. The prices are steadily on the increase. This poses a serious problem to the manufacturers. The imposition of using cotton seed oil in Tamil Nadu Vanaspati Plants also have not proved to be much helpful. The supplies of cotton seed oil have been unsteady. The cost also is rather high due to transportation and other incidental expenses. The power shortage last year has affected production considerably. Packaging cost is very much increased due to the rise in tin prices. These factors have adversely affected the industry.

1.4.2 Vanaspati industry in South Arcot District

M/s. Madras Vanaspati Limited, the only Vanaspati unit in South Arcot, is situated at Villupuram. The plant started production in April 1968. It has a production capacity of 25 Tonnes/day of Vanaspati and 10 tonnes/day of Refined oil. This plant was supplied by M/s. Gorey and Co. London. The oil mill working in conjunction

with this unit has a capacity of about 800 bags of groundnut kernels per day. Madras Vanaspati Ltd. has a soap plant also with a capacity of 8 tonnes per day. But it is not functioning at present due to financial difficulties. Though this vanaspati plant is located among the major raw material producing area, it has incurred a heavy loss so far. According to their report and accounts for the year ended 30th June 1972, the company has incurred a loss of Rs,15.26 lakhs. The company was able to produce 129,801 tins of 16.5 kg. net vanaspati and 12,876 tins of 15.5 kg. net refined oil during the year on eight months working. Apart from the main products, by-products like groundnut cake and soap stock were marketed in large quantity this year. Expeller section was commissioned as envisaged in January 1972 and since then, it is able to feed the plant with required groundnut oil for manufacture of vanaspati and refined oil. Recently they have introduced bakery quality vanaspati also. This company's products have earned good name in the market in spite of stiff competition. There are plans to commission the soap section to manufacture washing soaps. The company is still confident of tiding over the difficulties and come out successful. Necessary support from Government may help them to come out of the red.

1.5.0 Rice Milling Industry

1.5.1 General

India stands second in the World in production of rice. The total area in the country under paddy cultivation is about 370 lakhs hectares. For three fourth of the population, rice forms the staple food. In India, Tamil Nadu stands second in paddy production. The cultivable area in South Arcot district is around 7.02 lakh hectares of which 3.86 lakh hectares are irrigated. Paddy is the main food crop and this district has surplus production in paddy. The following table shows the district-wise figures of area and total production of paddy for the year 1968-69 and 1969-70.

Table-VIII

	1968-69		1969-70	
	Area in hect.	Production (M.T.)	Area in hect.	Production (M.T.)
1. Chinglepet	310000	341000	342000	499300
2. South Arcot	300400	456600	316000	584600
3. North Arcot	266000	335200	280000	414400
4. Salem	66900	118400	85000	158100
5. Dharmapuri	40500	60800	49000	80900
6. Coimbatore	98500	177300	101000	232300
7. Tiruchirapalli	233000	372800	236000	413000
8. Thanjavur	646200	1201900	647500	1204400
9. Madurai	147400	243200	161000	276900
10. Ramanathapuram	240300	216300	265000	259700
11. Tirunelveli	150000	270000	152000	288800
12. Nilgiris	3800	3800	3200	4800
13. Kanyakumari	56600	118900	57500	115000

From the statistics, it could be seen that out of about 27 lakh hectares of paddy in Tamil Nadu, the share of South Arcot is 3.2 lakh hectares and this works out to about 11.6%. Since paddy harvest is a seasonal one, the yield in every season should be immediately processed and stored, otherwise the grain will be spoiled due to dampness. Food Corporation of India has therefore put up a Modern Rice Mill near Chidambaram to process the paddy. Another Modern Rice Mill has been set up at Kallakurichi by Civil Supplies Corporation of Tamil Nadu. At least some three more mechanical drying units are required in this district for processing the paddy in time. In this district, Chidambaram taluk leads in the production of paddy followed by Cuddalore taluk. In Chidambaram taluk, Kumarachi Block, Keerapalayam Block and partly Kattumannarkoil Block are under double crop system. The Kuruvai harvesting season always coincides with North East Monsoon. A lot of wet paddy ~~gets~~ wasted in this season. To avoid this loss, at least two mechanical drying units should be set up in the Chidambaram taluk and one in Cuddalore taluk. There are different types of Rice Mills in Tamil Nadu. The following table shows the various types of rice mills in Tamil Nadu.

Table-IX

Rice Mills of different types in Tamil Nadu as at the end of 1971

	Huller	Sheller	Sheller cum Huller	Total
1. Madras	51	1	5	57
2. Chingleput	1228	9	8	1245
3. South Arcot	986	1	1	988
4. North Arcot	1629	1	1	1631
5. Salem	1070	-	-	1070
6. Dharmapuri	503	-	-	503
7. Coimbatore	1071	1	-	1072
8. Nilgiris	8	-	-	8
9. Thanjavur	2003	4	11	2018
10. Tiruchirapalli	1052	1	64	1117
11. Madurai	849	1	-	850
12. Ramanathapuram	763	-	2	765
13. Tirunelveli	868	-	4	872
14. Kanyakumari	288	-	-	288
Total	12369	19	96	12484

Source: Task Force on Large Industries, Planning Commissi Tamil Nadu.

The conventional rice mills have a very low efficiency. The quality of the by-products such as rice bran and husk are inferior to that from modern rice mills. The broken rice in the case of old types of mills are more and quality also poor, and seldom free from husk and other impurities. The oil content in the old type of rice mill bran is only 9-10%, whereas in the modern rice mill bran it is about 23-25%. Hence, Food Corporation of India has put up recently a Modern Rice Mill at Manalore near Chidambaram. There were about 986 huller type mills, one sheller type, and one sheller cum huller type at the end of 1971. An Evaluation Committee set up by the Government of India have found that not only

the quality of rice and the by-products from the modern rice mills is superior to that produced from the huller mills, but the milling yield is about 5% higher than the huller mills and about 1% to 2% higher than the sheller mills. In view of the report of the Evaluation Committee, the Government of India have recommended to the State Government that no new licences should be issued for the establishment of huller mills and that it is desirable to convert the existing huller mills into sheller mills with polishing cones. All the existing huller mills can be converted with installation of paddy cleaners, a rubber roller sheller, husk separators, paddy separators and cone polishers.

1.5.2 Rice Processing Methods

Rice milling is not yet a standardised process and several types of processes are in use. The rice milling equipment in India is ranging from crude hand pounding implements to modern rice mills. Midway between these two are the huller and sheller type mills.

1.5.2.1 Huller type mills

A large majority of commercial mills are of huller type with an average capacity of 300 to 600 pounds of paddy per hour. The majority of these mills in India are located in villages of rice producing and consuming centres close to the source of raw materials and in close contact with the growers. The huller

type of machine consist of a solid fluted cylinder rotating at 500 to 600 rpm with a hollow stationary cylinder, the lower half of which is perforated with slots of 0.06 to 0.30 inches. The flute on the cylinder is so arranged to carry the paddy to centre from the feeding end, get it milled by the scouring action at the centre of the cylinder and then carry it to the centre where milled rice is discharged.

1.5.2.2 Sheller type mills

This type of mills have better equipment than the huller machine and usually recover 2-3% more than huller type. It is provided with a cone polisher. The degree of milling paddy is controlled by varying the clearance of the polishing cones from the wire basket between which the rice grains undergo abrasion and get polished. The machine's milling capacity is usually 1-1.5 tonnes per hour of paddy. Such mills are usually located in marketing areas where electricity, labour and transport are available.

1.5.2.3 Modern rice mills

The main advantages of modern rice mills are the following:-

(i) Improvement in out-turn ratio,
(ii) cleaner by-products having greater value,
(iii) lesser cost of production per tonne of rice,
(iv) reduction of wastes and storage losses, and
(v) better return to producers and processors.

The general performance of modern rice mills have been

satisfactory. The percentage of head rice from cleaned paddy is around 72-73%. The percentage of head rice from the uncleaned paddy is around 68-70%. Cleaning loss is about 2% maximum. Rice bran production in Modern rice mills will be about 4.5 - 5% on cleaned paddy. Polish usually given by modern rice mill is 4-5%. The present rice bran is sold at Rs.960/- per tonne. The germ production during the process is around 0.1 to 0.2% on cleaned paddy. The germ can be used as poultry feed. The husk production is around 23% of paddy weight. It poses a problem to the modern rice mills to dispose off this husk. Only a small quantity of husk is used in their package boiler which consumes about 750 kg./hour of husk. The ash from the boiler can be used as manure. Rice bran oil production in India is not sufficient to meet our requirements. At present, India is importing rice bran oil in a substantial quantity. Bran from the modern rice mill can be used for extraction of rice bran oil. The de-oiled bran can be used as cattle feed. It is also understood that the deoiled bran has higher protein content.

<u>F.C.I. Modern rice mill at Manalore:</u> This rice mill is located at Manalore, a place between Keerapalayam and Chidambaram. This plant has a milling capacity of 4 tonnes per hour of paddy. The plant is reported to be working well. The mill has not experienced any

difficulty in procuring paddy. This plant has a well laid out storage and handling system. There are six parboiling tanks, three in each series. The soaking temperature is maintained in the tanks at 65-70° C. for about 3-4 hours depending on the variety and seasonal quality of the paddy. Subsequently steaming is done for about 10-15 minutes. Then the paddy is drained from one series of parboiling tanks on to a conveyor belt. The other series of tanks will be under cleaning and loading. The paddy is conveyed to a special type of drier in which it is dried by hot air to a moisture content of 13 to 14%. The dried paddy is milled, separated from husk and the rice is polished. A certain amount of unmilled paddy which comes out of the mill is recycled. The germs and the bran are also collected and separated. Polished rice is weighed and bagged.

Modern rice mill at Kallakurichi: This modern rice mill was originally put up by Thanjavur Co-operative Marketing Federation (TCMF). Recently all the mills owned by TCMF were taken over by the Civil Supply Corporation of Tamil Nadu. This plant was supplied by M/s. Koyava, Japan. It has a milling capacity of 2 tonnes per hour. The plant was commissioned in 1970. The total investment of the plant was about Rs.14 lakhs. The total personnel employed in this factory is about 60. It is reported that efforts are afoot to design and fabricate a new type of portable drier. Husk and straw will be used as fuel

to heat the wet paddy in this new drier. Hence the drying cost will be very much reduced. Present drying cost of paddy comes to around Rs.20/- per tonne, whereas it will be around Rs.2/- per tonne if husk is used.

1.5.3 Proposed mechanical drying units:

In this district, Chidambaram and Cuddalore taluks have large areas under double crop system. Invariably, Kuruvai harvest coincides with North-East Monsoon and results in a lot of wastage of paddy. Hence, it is suggested to set up two mechanical dryers in Chidambaram taluk. The dryer should be of a portable type. It should be capable of being easily dismantled and assembled in places where it is needed. The places which actually need dryers immediately are Kumarachi block and Keerapalayam block. There will be a lot of wet paddy available during kuruvai harvesting season and also during Thaladi season for feeding these dryers. The dryers should be designed to use paddy husk and straw as fuel, so that it will consume the undisposed paddy husk from the modern rice mill situated near Chidambaram. Drying cost also will be cheaper. One mechanical drying unit similarly can be proposed for Cuddalore Taluk.

1.6.0 Textile Industry

Except for the proposal for a new venture, there are no weaving units in South Arcot district. All the four existing factories are spinning mills. This is

in consonance with the general trend of the textile industry in the State where the production of yarn exceeds consumption. As a result, considerable portion of the produce finds its way to Gujarat and Maharashtra. The cotton yarn from Tamil Nadu is said to hold itself effectively in the face of competition with cotton produced in Maharashtra and Gujarat. The two factors which could upset the present balance are cost of transportation and cost of labour. The industrialists have complained that wage levels cannot be maintained anywhere below those prescribed in the industrially advanced textile centres like Coimbatore. Also faced with the problem of increasing cost towards transportation of raw materials and finished products the spinners in South Arcot may not be able to sell their products advantageously in the future. The obvious solution is to start weaving mills as an adjunct to the spinning facilities. Here also quite a few snags are encountered. Weaving establishment consumes appreciable quantity of water which may be difficult to come across at the present sites. The spinning mills in the district are sufficiently dispersed to justify the location of a single weaving mill at some vantage point. It has come to be realised that the minimum economic capacity for a spinning mill is 25000 spindles. Accordingly, all but one of the mills are in the process of expanding. Quite a few people will find regular employment in these units. The working of the existing mills for the last years has been considerably affected by the vagaries of power supply

in the State. A large quantity of cotton has to be imported. This is because indigenous cotton owing to shorter staple length cannot be used to manufacture yarns above sixty counts. Major cotton growing areas in Tamil Nadu are Thirunelveli, Rajapalayam and Theni. Indigenous and imported cotton is used by mills to varying extents according to the manufacturing schedule.

1.6.1 Arcot Mills, Kallakurichi

This mill has a capacity of 14688 spindles and expansion to 25,096 spindles is under way. When the expansion is completed, the labour strength will increase by 100 from the present figure of 435. This is a sister concern of Anglo-French Textiles, Pondicherry, who is a major exporter of cotton goods. Thus, all the yarn produced is readily consumed by the Pondicherry unit. Yarns of 20 to 100 counts are manufactured here. Wide variations of prices are experienced. The recent scaling up of duty on imported cotton has also contributed to the upward revision of prices.

1.6.2 Kallakurichi District Co-operative Spinning Mills, Saram

This was one of the twelve mills established by the Government of Tamil Nadu. The objective was to ensure the supply of good quality yarn at reasonable price to the Co-operative Societies and thus stabilise the price of yarn. Under this scheme, the mill allotted for South Arcot district was located at Saram,

Tindivanam. The present installed capacity is 13,760 spindles. A proposal for furthering the capacity to 25,000 has been submitted. About 335 persons are employed in this factory.

1.6.3 Nagammai Cotton Mills, Vikravandi

This is a partnership concern with an investment of about Rs.60 lakhs. Number of spindles installed is 13,392 and 200 persons are employed in this factory.

1.6.4 National Sewing Thread Co. Ltd, Chidambaram

This is the smallest spinning mill in the district with an installed capacity of 6000 spindles. The factory runs on three shifts and the workforce is about 200 strong. This is a public limited company established with the objective of manufacturing sewing thread. The original scheme was shelved, however, and only the manufacture of yarn has been taken up. There is no proposal for further expansion.

1.7.0 Ceramic Industry

South Arcot holds a place of prominence among all Tamil Nadu districts so far as ceramic industry is concerned. In Vridhachalam, the Government Ceramic Service Centre has formed the nucleus for a functional industrial estate. Apart from this, there is also a TANSI undertaking manufacturing sanitary ware and salt glazed pipes. Then there are the two major units at Vadalur manufacturing between them a broad range of ceramic items. The industrialists were

attracted to this district by the prospects of getting china clay and LECO from Neyveli Complex. They have been denied both, by the unexpected reverses at Neyveli. Coal and fuel oil were the other alternatives. Coal has to be brought from West Bengal and sowith the exception of the Government Centre, all have switched over to oil fired kilns. The Centre is expected to follow suit in the near future. China clay also is being procured from elsewhere. In this context, the Government's recent decision to rejuvenate the Neyveli Lignite Corporation will be welcomed by all. It is to be hoped that good quality china clay will be made available to the ceramic industrialists in the district. The demand for ceramic items is reported to be sufficient to warrant further growth of the industry. One of the major units is exporting its products and expects to boost up its sales further in the Middle East and other European countries. The smaller units located in and around Vridhachalam mainly cater to the internal consumption of the country. In these units production is confined chiefly to electrical porcelain. Units employing less than fifteen persons are exempted from excise duty on their products. Still the competition from the major producers has forced them to concentrate on particular areas. The industrial training centre located at Vridhachalam supplies personnel trained in the ceramic field. The body mix and glazes for the functional industrial estate are provided by the Government Ceramic Centre. The units have been generally affected by the recent power cut imposed.

1.7.1 <u>The Functional Ceramic Industrial Estate</u>

<u>Government Ceramic Centre</u> The Centre prepares the body mix and glaze materials for the various small-scale units located in the Estate. This institution is controlled by the Director of Industries, Tamil Nadu. The investment in the unit is about Rs.3 lakhs and 60 persons are employed. The Centre purchases the raw materials and supply the paste to the various units at the estate. After shaping and glazing, the ceramic ware is brought to the Centre for firing in kilns. Only the cost of materials and labour is recovered from the small industrialists. The Centre has an installed capacity of 4 tonnes of ceramic body mixes and 2 tonnes of refractory mix per day. About 60 persons are employed at the Centre. It is learnt that the State Government has decided to set up a tunnel kiln in addition to the existing down-draught kilns. The latter will then be exclusively used for fire bricks.

1.7.2 <u>Ceramic Units in the Industrial Estate</u>

There are four types of sheds available on rent at the Estate, the details of which are given below:-

<u>Type</u>	<u>Nos.</u>	<u>Covered area (Sq. ft.)</u>
A	2	9000
B	6	4500
C	8	1800
D	1	1728

In addition, there are 12 inexpensive factory sheds available at a monthly rent of only Rs.42/- each.

The following are the various units located in the Estate:

Ceramics

1. Madha Ceramic Industries
2. Suresh Industries
3. Chandramohan Ceramics
4. A.J.M. Industries
5. South India Ceramic Manufacturing Company
6. Saravanabhava Ceramics
7. Vridhachalam Ceramics
8. Sreenivasa Ceramics
9. Balaji Ceramics
10. Sree Ram Ceramics
11. Gemco Electricals
12. Pearl Ceramics

Refractories

1. Wilson & Co.
2. Southern Ceramics.

The following factories are located in the inexpensive sheds:-

1. Devaki Pottery Works
2. Lavannia Enterprises
3. Balasubramonia Enterprises
4. Everhard Abrasives
5. ENCON Ceramics
6. Golden Ceramics
7. Prakash Ceramics
8. Arula Ceramics
9. Ceramics India

The working of these small scale units follows a definite pattern. The workforce is kept below the mandatory fifteen to secure exemption from excise duty. Since only machinery for casting/shaping is required, investment is kept to a minimum. Thanks to the training centre located nearby, there is no dearth of trained personnel. Most of the units are either proprietory

or partnership concerns. The average production at present stands at 50% of the installed capacity. This is mainly due to bottlenecks in supply of body mix as well as non-availability of kiln space. Also, the high cost of transportation of ceramic raw materials and coal has placed these industrialists at a disadvantage with their competitors from West Bengal etc. This has often limited the production to particular items among the electrical porcelain ware. It is to be hoped that the introduction of tunnel kiln and improvement of mining at Neyveli will provide the timely shot in the arm for the ceramic industry at Vridhachalam.

1. TANSI Ceramics, Vridhachalam:

This unit established at a capital cost of Rs.16.54 lakhs is geared to produce sanitaryware, insulators and crockery. About 172 persons are employed in this unit.

2. TANSI Stoneware Pipes, Vridhachalam:

This unit manufactures glazed pipes. The total investment is Rs.11.65 lakhs and 105 persons are employed in the factory.

3. Neyveli Ceramics Ltd. Vadalur:

Established in 1960 as a public limited company, this unit has an installed capacity of 3000 tonnes of sanitaryware per annum. An application for further expansion to 7100 tonnes has been submitted to the Government. The factory employs in all, around 390 persons. The firm managed to export a part of its production

to West Germany and the Middle East. The company has further expectations of exporting 35% of its production in the near future. The company has employed Sales Representatives in the various States. It has been found that frequent transhipment from metre to broad gauge faces serious problems in the movement of goods.

4. Seshasayee Industries Ltd. Vadalur:

This is a public limited company with installed capacity of 400 tonnes of high tension insulators and 200 tonnes of castings per month. The factory provides employment for 1200 personnel. The foundry section produces the metal fittings for the insulators and also automobile spare parts. At the time of establishing the factory, prospects of getting china clay and towngas from Neyveli Lignite Corporation were very bright. Now the china clay is being procured from Karur, Salem and Gujarat while oil is brought in from Neyveli. Since insulators will have to satisfy certain requirements with respect to its shape, manufacturing tolerances and electrical properties a certain amount of rejection at various stages of inspection and testing cannot be avoided. In practice nearly 20% of the total production goes as rejects. It is reported that this fired ceramic ware could be ground, made into a paste and used as a mortar for acid proof refractories. Alternatively, refractories requiring high strength and density also could be manufactured. It may be worthwhile to investigate on the feasibility for utilisation of the ceramic rejects.

1.8.0 Neyveli Lignite Corporation

Neyveli complex was one of the most ambitious and gigantic projects launched in the public sector of the country. The complex consists of an open cast mine for lignite excavation, a thermal power station, a fertilizer factory to produce urea, a briquetting and carbonisation plant to manufacture carbonised briquettes known as LECO and a clay-washing plant. The complex is a unique venture with its diverse and many-sided operations. The capacity of the lignite mine was planned at 4.5 million tonnes per annum. The power station has an installed capacity of 600 MW and the fertilizer factory has a rated capacity of 1,52,000 tonnes of urea per annum. The output of LECO was planned at 3,27,000 tonnes per annum. Lignite is the raw material for power generation, production of urea and manufacture of LECO. Lignite is mined and supplied directly from the mine to the consuming units by belt conveyors. The thermal power station meets the power needs of all the other units. After meeting the needs of the project, all the surplus power is absorbed by the Tamil Nadu Electricity Board, the Neyveli Power Station being directly connected to the State power grid. Urea, LECO and Nekolin (washed clay) are sold in the open market. A profile of the existing plants and facilities is given below:-

Lignite Mines		
Total lignite bearing area	-	100 sq. miles
Total lignite reserves	-	2,000 million tonnes
Present mining area	-	5.42 sq. miles
Annual capacity	-	4.5 million tonnes of lignite
Cost of the Project	-	Rs.32.05 crores
Fertilizer Plant		
Production	-	Urea containing 46% nitrogen
Capacity	-	1,52,000 tonnes per annum
Process	-	Raw lignite is crushed, dried and gasified in gas generators using steam and oxygen. Ammonia is synthesised by Montecatini process and urea by total recycle process.
Cost	-	Rs.38.81 crores
Briquetting and Carbonisation Plant		
Production	-	LECO and valuable by-products
Capacity	-	3,27,000 tonnes of LECO per annum and 1,09,000 tonnes of charfines per annum
Process	-	Dried lignite is briquetted through extrusion process. Raw briquettes are carbonised in eight internally heated carbonisers to yield LECO.
Cost	-	Rs.29.55 crores

By-products	-	Carbolic acid	- 1470 tonnes
		Multivalent phenol	- 480 "
		Ortho cresol	- 200 "
		Metapara cresol	- 990 "
		Xylenol	- 220 "
		Tar	- 49100 "
		Neutral oils	- 4820 "

Clay Washing Plant

Product	-	Washed white clay
Capacity	-	20 tonnes per day
Cost	-	0.15 crore

Thermal Power Plant

Capacity	-	600 MW
Cost of Project	-	Rs.77.38 crores

This gigantic complex and its functioning was considerably upset by the problems in mining lignite. The availability of lignite at the moment is far short of the planned output and hence this has adversely affected the production in the various units. Now that priority is given for power generation, fertilisers etc. Plans are afoot for acquiring new type of excavating equipment which will enhance the lignite output from the mines. The full capacity of the existing plants can be utilised only when the mining operations are established on a viable level. A discussion on the possibilities of utilising the by-products from Neyveli is furnished in the chapter on new industries.

1.9.0 Fabrication Industry

The fabrication industry has had a flourishing period in South Arcot district. The farm implements require regular servicing and overhauling in order to be in uninterrupted service. The persistent power problems have necessitated installation of a large number of generating sets. Over and above these, the demands by the manufacturing industry for spares and ancillary components have to be met with. To relieve the dependence on outstation agencies, fabrication units were started all over the district. Not content with serving the needs of the district, the industry endeavoured to extend the services to the neighbouring districts and in the process multiplied itself in number. As a result there are not less than fifty such shops in the district. Most of these units initially have only repairing facilities incorporated into the workshop. The expertise gathered over the years has prompted a few of the units to take the next step towards self-reliance, i.e. assembly from sub-components. The components for diesel generating sets are known to be available at very moderate rates from some of the North Indian States. The main obstacle to be surmounted by these units is the scarcity of raw materials. At times, to effect timely supplies, open market has to be taken recourse to. These small industrialists have not been able either to present their case in the correct perspective or to catch the attention of

the authorities. On the other hand, it is a stupendous task to keep track of the performance of each and every unit. Still no effort should be spared to ensure that innovative spirit of the entrepreneur is not smothered and that meritorious performance is amply rewarded. The first step should be to educate these industrialists on the requirements of the manufacturing industry. They must be appraised of what they might do towards keeping the wheels of the industry on the move. Proper line of communication must be established between the small industrialists and the manufacturers so that there is an awareness of the capabilities of the small sector. Thus, all the unutilised capacity can be tapped towards making the region more self-reliant.

1.9.1 M/s. Raj Industries, Villupuram

This is a parthership concern. The capital investment is Rs.14 lakhs and the factory employs 40 persons. The unit has two cupolas of 5 tonnes and 3 tonnes per hour capacity. There is yet another cupola of 2 tonnes per hour with the sister concern, M/s. Diamond Engineering Works, located nearby. The firm undertakes all types of job orders such as spares for boilers, water pipes (1" thick, 300 mm I.D.) and road rollers for P.W.D. and is specialised in supplying spares for sugar mills. At present, needs of all the neighbouring sugar mills are being catered to from this factory. (It is reported that this is only the second factory of its kind in the southern region which is equipped

to make sugar mill spares). The company has received querries from some of the advanced countries such as Japan for unmachined grey iron castings.

1.9.2 TANSI Furniture & Smithy Works, Cuddalore

With a capital investment of Rs.2.4 lakhs, this unit manufactures transmission line materials, steel fabrication items, trusses, windows, doors, grills, wooden furniture etc. 64 persons are employed in this unit.

1.9.3 Babu Industries, Cuddalore

This firm started business in 1950 essentially as a shop for repairing diesel generators, armature winding and miscellaneous fabrication. At present, assembly of diesel oil engines is carried out on specific orders. The components and spares for the above are supplied from manufacturers in Punjab at very competitive rates. A proposal to start a foundry for the manufacture of (i) cast iron fittings like valves, covers etc. required by the water supply scheme in the Municipality (ii) spare parts for textile mills is under consideration. This is a proprietory concern employing 16 persons.

1.9.4 T.S.R. Tools, Cuddalore

This is a proprietory concern engaged in fabricating steel items such as shafts and bushes for centrifugal pumps, ball pins for insulators, tie rods for Post and Telegraph etc. The factory is located on rented premises and the total investment is Rs.15,000/- A turner, a mechanic, and a helper make up the work force. There

is good demand for fabricated items and at present the firm has to depend on outside agencies for welding and large work-pieces which cannot be handled on the existing machines. The firm has applied to some of the State Agencies for loan.

1.9.5 Shanmugananda Workshop, Tindivanam

This is a proprietory concern started in 1972 with an investment of Rs.20,000/- Motors having 3 to 5 H.P. are manufactured at the rate of 3 to 4 per month. Castings are brought in from Coimbatore and only machining and assembly are carried out here. It is claimed that competition from established manufacturers has been effectively met and that there exists enough demand to warrant further expansion of production capacity.

1.9.6 D.K. Murthy Electricals, Villupuram

This firm was engaged for a long time in motor and armature winding and has now embarked on the ambitious project of manufacturing welding sets of the 200 amps. category. It is hoped that the requirements of small workshops in and around Villupuram could be met in this manner.

1.9.7 Thiruvannainalloor Blacksmithy Workers Co-operative Society, Cuddalore

To utilise the traditionally acquired skills of the blacksmiths of Thiruvannainalloor, this society was started under the administrative control of the Director of Industries. The workers around fifty in number form the members of the Society and earn wages at piece rates. All types of wooden and metal furniture is undertaken here.

1.10.0 Distilleries

Sugar industries generate a large quantity of molasses which is a useful industrial raw material. Major distilleries in the country are based on molasses for the production of potable and industrial alcohol. Potable alcohol is used in blending of liquors like whisky, brandy, gin, etc. Industrial alcohol is used in the manufacture of polyethylene, polyvinyl chloride, styrene butadiene rubber and a host of other chemicals. As per the Task Force Committee on large industries, the State of Tamil Nadu requires around 8 million gallons of alcohol per annum. Out of the 8 million gallons, 5 million gallons is used in industries and pharmaceuticals. The Committee estimated 3 million gallons for potable purposes. This estimate was made after the suspension of prohibition in the State. However, the State Government is contemplating introduction of prohibition again. According to the Government's present policy, all the arrack shops will be closed by 1974. Hence, the pattern of production in the present distilleries either should be modified or the potable alcohol should be exported to other States. By 1976, the estimated production of molasses (at 4.5% of sugarcane weight or 50% of sugar weight) will be around 2.895 lakh tonnes. Assuming 60% of it is available for alcohol production, the State can manufacture around 9.55 million gallons of alcohol. By 1982, the estimated molasses will be around 3.34 lakh tonnes. At 60% consumption for

alcohol manufacture, it will give about 11 million gallons of alcohol.

Distilleries in South Arcot District

Out of the five distillery units in Tamil Nadu, three units are functioning in this district alone. They are (1) Southern Agrifurane Industries Ltd. (2) East India Distillery Ltd. and (3) Aravind Distillery Ltd. The present molasses production in this district is around 52,100 tonnes (Table-X). The consumption of molasses in all the three distilleries is around 41,000 tonnes per year (Table-XI). The balance quantity is partly consumed by Trichy Distillery and partly by other industries such as cattle feed and similar plants. The estimated production of molasses in this district in 1976 and 1981 is shown in Table-X.

1.10.1 Southern Agrifurane Industries Ltd. (SAIL)

The distillery plant was commissioned in April 1973. It is located adjacent to the South India Steel and Sugar Ltd., a sister concern at Mundiyampakkam near Villupuram. The capacity of the plant is 1.2 million litres of alcohol per year. This distillery is the first in India to instal a plant for the production of highly pure alcohol equivalent to pharmaceutical grade or what is generally known as Silent Spirit or Neutral Alcohol, directly from the starting material cane molasses. Molasses is being allotted by the Government from South India Steel and Sugar Ltd. The distillery is provided with a modern blending unit. The plant was completely designed, fabricated and commissioned by M/s. ESKEYAR, Madras.

1.10.2 East India Distillery Ltd. (E.I.D. Parry)

This is the first distillery unit set up in the district. It is located near Parry's Sugar Factory and receives molasses from the mill. This distillery has a production capacity of 4.5 million litres of alcohol per year. E.I.D. Parry is also manufacturing potable alcohol. The annual requirements of molasses is about 18,000 tonnes.

1.10.3 Aravind Distillery Ltd.

The plant is located near Panruti. This plant is a sister concern of M/s. Aruna Sugars Ltd. The annual requirements of molasses is around 18,000 tonnes. The capacity of the distillery is about 4.5 million litres of alcohol.

Table-X

Estimated production of Molasses in South Arcot District

(in tonnes)

Name of the factory	Present Production	1976	1981
1. E.I.D. Parry Ltd.	17,800	22,200	22,200
2. Aruna Sugars Ltd.	16,200	32,400	32,400
3. Kallakurichi Co-operative Sugars Ltd.	8,100	10,000	16,200
4. The South India Steel & Sugars Ltd.	10,000	20,000	20,000
Total	52,100	84,600	90,800

Table-XI

Production of Alcohol in South Arcot District

Name of the distillery	Estimated consumption of molasses (in tonnes)	Production capacity of alcohol/year
1. E.I.D. Parry Ltd.	18,000	4.5 million litres
2. Aravind Distillery Ltd.	18,000	4.5 " "
3. Southern Agrifurane Industries Ltd.	5,000	1.2 " "
Total	41,000	10.2 million litres

1.11.0 Starch Industry

Salem is one of the leading centres of tapioca cultivation in Tamil Nadu. This, taken with the proximity to Coimbatore, the leading textile centre, will explain the rapid development of starch industry in Salem district. As the demand for textile grade starch grew, there was a rush for production of starch in areas surrounding the district. It was thus that starch industry took its roots in Chinnasalem of South Arcot district. There are, at present, about 25 starch factories in Chinnasalem. The method adopted in these units is, without exception, crude and substantial percentage of starch goes to waste. Unpeeled tapioca is crushed, digested with water and then allowed to settle. The starch is then dried and packed into bags. The process entails great losses in processing time. The dependence on solar heating has, of

1.12.C Cashew Processing Industries

Cashewnut is one of the major foreign exchange earners in our country. In South Arcot district, the chief commercial crops are groundnut, sugarcane, cashew and cotton. Cashew enjoys an important place among these cash crops. The yield of cashewnuts in this district last year was about 6,500 tonnes. The entire quantity of cashewnuts is processed locally. Further, about 2,000 tonnes of crude cashew oil is extracted from cashew shells with an export value of about Rs.45 lakhs. It is reported that a major part of this is being sent to Kerala State where it is refined and exported to foreign countries. Cashew cultivation is mainly concentrated around Panruti, Vridhachalam, Cuddalore, Marakkanam and Kurinjipadi. The total area under cashew is about 18000 hectares. The consumption of raw cashewnuts by the existing industries in this district is greater than the production of cashewnuts. Hence, usually cashewnuts are imported from the neighbouring State of Kerala during harvesting time and kept in store. The cashew apples are not utilisedby any factory here. M/s. Arvind Distillery started using cashew apples as raw material, but later they switched over to molasses. There are several cashew processing industries in this district. The notable factory is M/s. Lilaram Shewaram (India) Pvt. Ltd., located at Panruti. The other units engaged in cashew processing are M/s. T.R. Venketachalam Chetty Industry, International Traders & Co., Jayaram Cashewnut & Co., T.K. Rathanaswamy Gounder Co., Meenakshi Corporation

and a few small units.

1.12.1 Lilaram Shewram (India) Pvt. Ltd. (Lilashew Cashew Factory)

This is a major factory located at Panruti. The processing capacity of the plant is about 5000 bags of cashewnuts per year. This is equivalent to about 4,00,000 kgs. per year. The price of raw cashewnuts varies between 200-220 rupees per 80 kg. bag. The products are mainly cashew kernels and shell oil. Production of whole cashewnuts is about 80 tonnes per year. Broken kernels total about 16 tonnes per year. Shell yield isaround 240 tonnes annually. By a crude method of extraction, about 150-160 kgs. of oil is extracted from about 13 bags of shell. The average price of crude shell oil is around 65 paise per kg. M/s. Lilaram Shewaram have proposals to put up an oil refining plant and also a cashew apple wine factory.

1.13.0 Fertiliser Industry

The demand for chemical fertilisers is growing day by day. An investment of Rs.1500 crores has been planned by the Central Government during the Fifth Plan for establishing additional capacities in fertilisers. The estimated requirement of fertilisers for Tamil Nadu is furnished in Table-XII. Requirement for South Arcot district alone, estimated separately, is given in Table-XIII. The major fertiliser plant in the district is the urea plant under the Neyveli Lignite Corporation. This is treated separately under the section on Neyveli Lignite Corporation. A brief description of other fertiliser units is given below.

1.13.1 Premier Fertilisers Ltd.

It is a superphosphate plant having a production capacity of 40,000 tonnes per year. The sulphuric acid plant in the unit has a capacity of 50 tonnes per day. The plant was commissioned in 1962 and it functioned till 1971. Since then the factory has stopped production, as there is no market for superphosphate now. Presently they are engaged in manual mixing of fertilisers of various grades and selling in the market. There is a B.H.C. formulation unit also. As their production activities are curtailed, only the key personnel numbering around ten are working in the unit. There are about 29 superphosphate units in India. All these units are facing virtual extinction as a result of adverse market forces brought about mainly by technological developments. The superphosphate industry has all along been plagued by under utilisation of capacity, due to shortage of sulphur and also due to lack of demand in the market owing to stiff competition from other phosphatic and complex fertilisers.

1.13.2 FACT Granulation Plant

The Fertilisers and Chemicals Travancore Ltd. has set up a fertiliser granulation plant at Cuddalore. It is situated on the Cuddalore-Chidambaram Road, about 5 kms. away from Cuddalore Old Town. The plant is designed to produce 5 tonnes per hour of (9:9:9) grade NPK complex. The erection of the plant has been completed and commissioning is under

way. The plant would have gone into production earlier but for the powercut and certain other unfavourable factors. These have been settled and the plant is expected to go into production shortly.

Table-XII

Estimated consumption of fertilisers in Tamil Nadu

('00 tonnes)

Year	N	P_2O_5	K_2O
1973-74	2300	850	700
1974-75	2750	1000	750
1975-76	3200	1200	820
1976-77	3650	1400	900
1977-78	4250	1600	1000
1978-79	4750	1800	1200

Source: "Fertiliser News" page 64, May 1973.

Table-XIII

Estimate of consumption of fertilisers in S. Arcot Distr

('00 tonnes)

Year	N	P_2O_5	K_2O
1973-74	334	119	105
1974-75	398	140	112
1975-76	464	168	123
1976-77	528	196	135
1977-78	616	224	150
1978-79	689	252	180

Source: "Fertiliser News" page 64, May 1973.

1.14.0 Food Industry

There is only one major food products manufacturing unit in South Arcot district. That is AURO Food Products Limited, promoted by Auroville in Pondicherry. The plant is located just on the border of South Arcot and Pondicherry.

1.14.1 AURO Food Products Limited

This unit manufactures mainly biscuits. They have an installed capacity of 15 tonnes per day. But they produce only about 10 tonnes per day at present due to variety of reasons including power shortage and scarcity of flour. The plant was commissioned in the middle of 1972. Total investment amounts to about one and a half crores rupees. Though biscuits form the main product, the unit has a major flour mill, the capacity of which is about 125 tonnes per day of wheat. Further expansion of the flour mill is planned for meeting the needs of flour production in Tamil Nadu and Pondicherry. Biscuits marketed by the company bears the trade name of TRUE. The company employs about 200 people. The expansion plans of the factory involve another one and a half crores rupees and is expected to be completed by 1975.

1.15.0 Miscellaneous Units

There are a few factories in South Arcot district which cannot be treated under a particular category. A brief resume of their activities is given under this head.

1.15.1 Kumaran Industries, Vridhachalam

The only factory of its kind in South Arcot district, manufactures woven bags of high density polyethylene (HDPE). The installed capacity is 1000 metres per eight hours. Started in early 1972, this factory employs 32 persons.

1.15.2 Mechanised Fishing Boat Building Yard, Cuddalore

This is a new unit set up to manufacture about 12 fishing boats per annum. The capital investment is about Rs.1 lakh. With the fishing industry at Cuddalore poised to take rapid strides in the ensuing years, this unit can look forward to a bright future.

1.15.3 Soap Units

There are two soap factories in the district, viz.

(1) Thangamani Soap Works, Villupuram
(2) Star Soap Works, Kallakurichi.

Both are non-power units with production not exceeding half a tonne per day.

1.15.4 Paints, Chemicals and Pharmaceuticals

Deivanayagam Industries, Kottakuppam, is the only unit manufacturing varnishes with an installed capacity of around 25,000 litres. M/s. Dhanalakshmi Enterprises, Cuddalore have a crushing unitfor gypsum. The gypsum powder is used as a filler for fertilisers. No pharmaceutical units are known to be working in the district.

1.15.5 Hospital Equipment, Chemical and Dairy Equipment

(1) Vijayaraghavan Welding Works, Villupuram	Not working
(2) Selvaraj Industrial Corpn., Marakkanam.	" "

1.15.6 Panel clips, wire nails

M/s. Raj Industries, Kallakurichi	Not working.

2.0 PROPOSALS FOR NEW INDUSTRIES

2.1.0 Detailed investigations have been conducted to identify and locate feasible industrial units in different parts of the district. As far as possible the selection of industries has been made on the basis of either availability of resources within the district or the potential for consumption of products in and around the district. In addition to this certain industries which do not demand strict considerations on locational requirements have also been included.

2.2.0 In arriving at a final selection of viable industries, certain considerations of social factors and also need for developing the district on a uniform pattern have been taken into account. As such the locations and type of industries have been recommended with a view to achieve a proper distribution of industries in the district.

2.3.0 The industrial profiles projected in this report contain economic and technical information in a professional style to serve as guidelines for basic decisions in the establishment of small and medium scale industries.

2.4.0 In such proposals involving purchase of know-how from National Laboratories or other sources, the prospective enterpreneur will do well to gather maximum information from the source concerned and evaluate the scheme in a more detailed manner. In all cases a final assessment would be required considering all practical aspects before a project is implemented.

2.5.0 Economic capacities of each project have been fixed considering various aspects. To the extent possible, information on marketability has also been covered. The cost of land, buildings and utilities have been considered on a uniform manner although in the strict sense this is likely to vary from place to place. A prospective enterpreneur is also expected to look into all such details with respect to the specific locations and evaluate these schemes from their own stand point.

2.6.0 The schemes proposed are:

1. Fibre Boards and Speciality Papers
2. Glass Bottle Making Plant
3. Sugar Industry
4. Steel Lamination Project
5. Rigid PVC Pipe Unit
6. CNSL based Surface Coatings
7. Wooden Furniture Unit
8. Manufacture of Kaolin B.P.
9. Manufacture of Steel Balls
10. Boat Building Yard
11. Tin Container Unit
12. Pressure Sensitive Adhesive Products
13. Cattle Feed Plant
14. Fish Meal and Oil Plant
15. Paper Carton Making Unit
16. Tartaric Acid from Tamarind Leaves
17. Electroplating Unit
18. Two Hectare Dairy Farm Project
19. Triphenyl and Tricrysyl Phosphates

20. Biscuit Making Plant
21. Water Filter Candles and Filter Flasks
22. Manufacture of Collapsible Tubes
23. Recovery of Zinc, Carbon Electrode and Manganese Dioxide from used Dry Cells
24. Corrugated Board and Box Making Plant
25. Utilisation of By-products from Neyveli Lignite Corporation.

FIBRE BOARDS AND SPECIALITY PAPERS

1.0 Introduction

This project is for the manufacture of fibre boards and speciality papers from cotton linters and waste papers. Fibre boards and speciality papers are required by various industries. Major consumer of this product is electrical industry where the insulation characteristics are very important. The product mix and the respective capacities proposed are as follows:-

i. Cable paper	..	2,500	tonnes per annum
ii. Oil and water filter and gasket papers	..	500	" "
iii. Fibre press parts	..	250	" "
iv. Fibre boards	..	2,000	" "

Speciality papers are in great demand by the electrical industry in our country. During the past decade, there has been a phenomenal growth in the electrical industry, but a commensurate expansion has not taken place in many of the ancillary spheres. One such is the field of speciality papers. Substantial quantities of paper are being imported to cater to the requirements of special grades. The product pattern is conceived with a view to meet the immediate requirements in the country. The main raw materials are cotton rags, cotton linters, cotton waste and selected kraft waste papers. South Arcot is a fairly central location from where a wide spread collection of these materials could be arranged.

2.0 Technical know-how

It may be necessary to import the know-how from foreign sources. It is understood that M/s. Vyas & Vyas Pvt. Ltd. Bombay have established contacts with a consortium of world renowned manufacturers in West Germany through whom it would be possible to avail of the know-how for the above project.

3.0 Marketability

The products proposed will be consumed by various types of industries. While cable paperwould mainly go to electrical industries, oil, water filter and gasket papers would be required by the automobile industry. Fibre press parts are in demand in automobile, electrical and leather industries. Fibre boards find uses as a consumer item as well as industrial item. The demand for all these products are expanding at a very fast rate in our country. Therefore the market potential for these items is beyond doubt and could be considered for manufacture immediately.

4.0 Process description

The process starts with pulp making in the first stage. The pulp mill has two separate lines, one for cotton rags or linters, the other for waste paper. In the case of pulp from cotton rags and linters, the raw materials are digested with chemicals in spherical digesters, after which they are washed, beaten and cleaned in suitable machines. In the case of pulp from waste paper, the raw material is slushed

in hydro pulpers and then washed, beaten and cleaned as in the other case. The pulps thus produced is passed into fourdrinier or cylinder machines mixed in certain proportions as per the requirements of the finished product. Dyes, fixers etc. are added to the pulp in the mixing chest before it is taken to the fourdrinier or cylinder machines. The paper or board formed in the above machines is further subjected to finishing operations.

5.0 Raw materials

Major raw materials include cotton linters or rags, waste paper, lime, caustic soda and other chemicals. The textile mills at Coimbatore and various other spinning and weaving units in different parts of Tamil Nadu will have to be depended on for the supply of cotton linters. Waste paper will have to be collected through a collection agency on a contract basis. There would be adequate amount of both raw materials for feeding one unit of this kind in Tamil Nadu.

6.0 Plant and machinery

The plant has mainly two sections, the pulping section and the paper making section. Pulping section has vessels, tank and digesters as the main items of equipment. Paper making section consists of fourdrinier and cylinder machines and drying chambers.

7.0 Investment Analysis

Capacity

i. Cable paper	..	2,500 tonnes per annum
ii. Oil and water filter and gasket papers	..	500 tonnes per annum
iii. Fibre press parts	..	250 tonnes per annum
iv. Fibre boards	..	2,000 tonnes per annum
Total	..	5,250 tonnes per annum

Investment		Rs.
(a) Fixed Capital		
i. Land - 10 acres @ Rs.200/- per cent	..	2,00,000
ii. Building and civil works	..	35,00,000
iii. Erected plant cost	..	215,00,000
Total	..	252,00,000
(b) Working Capital	..	8,00,000
Total Investment	..	260,00,000

Equity capital = Rs. 65,00,000
Barrowed capital = Rs. 195,00,000

Annual cost of production		Rs.
(a) Raw materials - fibres and chemicals inclusive - 7,500 tonnes @ Rs.1,400/- per tonne	..	105,00,000
(b) Utilities and labour	..	84,00,000
(c) Depreciation @ 10% on machinery and 5% on building	..	21,67,000
(d) Interest on borrowed capital	..	15,72,000
@ 8% on fixed capital Rs. 15,12,000		
@ 10% on working capital Rs. 60,000		
Rs. 15,72,000		
(e) Overheads and selling expenditure @ Rs.1,100 per tonne for 5,250 tonnes	..	57,75,000
Total annual cost of production	..	284,14,000

Sales Realisation	Rs.
Gross sales realisation @ Rs.8,900/- per tonne of product on an average	462,80,000
Less Excise duty	27,60,000
Net realisation	435,20,000
Surplus	151,06,000
Gross surplus before taxes	151,06,000

Return on Investment

Return on investment before taxes = 58%

Return on equity before taxes = 232%

9.0 Location

This plant could be ideally located in Cuddalore.

GLASS BOTTLE MAKING PLANT

1.0 Introduction

Glass bottle making occupies an important place in the field of container industry. A large number of consumer goods, pharmaceutical products, drugs and chemicals are packed in glass bottles and hence the demand for glass bottles will always be on the increase. The breweries under erection in various parts of Tamil Nadu and Pondicherry would require a substantial quantity of glass bottles. Production of this item can be profitably undertaken in Tamil Nadu, so as to meet the requirement thus generated. Glass bottles can be made in a fully automatic plant or in plants with various degrees of mechanization. Our recommendation is for an intermediate level of technology so that there is an optimum level of employment, without sacrificing standards of quality. A fully indigenous plant with a capacity of about 10,000 tonnes per annum is being offered by a firm in Bombay by name "Glass Engineers". They have already commissioned two plants in Bombay. We were also given to understand that more units are under various stages of erection in different parts of the country. A glass bottle making plant of this type is recommended for South Arcot district. It may also be mentioned that this plant can produce beer bottles of standard quality and hence could cater to the needs of the breweries. Though the plant is not fully automatic, it is suited to Indian conditions and has the advantage of saving in foreign exchange.

2.0 Marketability

This plant could easily aim at a local market, mostly confining to the State of Tamil Nadu. As stated above, the new breweries going into production would form a potential source of consumption. Pharmaceutical industry, distillery units, etc. also would form bulk consumers. As such there would be no problem in marketing glass bottles in the State.

3.0 Process description

Raw materials are properly crushed, washed and screened and then weighed. This is properly mixed to obtain uniform quality and is then fed into continuous glass melting furnace. Through a feeder mechanism, fixed quantities of molten glass passes into the molding machines where bottles are formed, the operations are being controlled manually. The bottles formed are passed through a conveyor into the annealing lehr and from there to the packing section.

4.0 Raw materials

Main raw materials are silica sand, soda ash and calcite. Sand forms nearly two thirds of the total quantity of raw materials. The location should have facilities for rail transport of sand, calcite and soda ash. The State of Tamil Nadu has both calcite and soda ash available in the State. Sand of the requisite quality could be brought from traditional centres.

5.0 Machinery

1. 50 tonnes/day capacity furnance
2. Raw material mixing section - including mixer, hoppers, crusher and balance.
3. Compressor, vacuum pumps etc.
4. 2 nos. indigenous molding machines
5. 2 nos. feeder mechanisms
6. 4 nos. metal belt conveyors
7. 2 mould cooling blowers
8. 2 nos. annealing lehrs
9. Workshop equipment

6.0 Investment Analysis

Capacity

Annual capacity - 9375 tonnes glass bottles

Investment		Rs. in lakhs
(a) Fixed capital		
i. Land cost - 5 acres of land including development expenses		1.00
ii. Building and civil works		7.90
(a) Factory shed - 1200 sq.m. @ Rs.250/sq.m.	3.00	
(b) Raw material storage and mixing shed - 400 sq.m. @ Rs.250/sq.m.	1.00	
(c) Finished goods shed - 600 sq.m. @ Rs.250/sq.m.	1.50	
(d) Office block, canteen, time office etc. 250 sq.m. @ Rs.350/sq.m.	0.90	
(e) Water tank, boundary wall, roads, etc.	1.50	
	7.90	
iii. Erected plant cost		58.75
Total		67.65

		Rs. in lakhs
Total B/F		67.65
(b) Working Capital		
i. Accounts receivable - 750 tonnes @ Rs.1000/te.	7.50	
ii. Finished product storage - 750 tonnes @ Rs.700/te.	5.20	
iii. Raw materials for one month - 800 tonnes @ Rs.350/te.	2.80	
iv. Cash in hand	1.00	
	16.50	
Working capital margin (assuming 25% of the total working capital)		4.12
Total investment		71.77

Borrowed capital (60%) .. Rs.43.00 lakhs
Equity capital (40%) .. Rs.28.80 lakhs

Annual Expenditure	Rs. in lakhs
(a) Raw materials - 9375 tonnes @ Rs.350/- per tonne	32.80
(b) Utilities	12.60
i. Fuel 9.6 lakhs	
ii. Power 3.0 "	
(c) Consumables like moulds stores and spares	3.00
(d) Packing @ 70/- per tonne	6.60
(e) Salaries and overheads including wages and office expenses	12.00
(f) Depreciation @ 10% on plant and 5% on bldg.	6.20
(g) Interest on borrowed capital @ 9%	5.00
(h) Selling expenses	1.00
Total annual expenditure	79.20

Profitability	Rs. in lakhs
Sales realisation from 9375 tonnes of glass bottles at an average price of Rs.1000/- per tonne	93.75
Annual expenditure	79.20
Net surplus before taxes	14.55

Return on Investment before taxes

Return on total investment	=	20%
Return on equity capital	=	51%

7.C Employment

The staff and labour requirement would be as follows:

Labour requirement

Department	Skilled and Semi-skilled	Unskilled
1. Raw material	3	24
2. Compressor and electrical	7	4
3. Production	120	40
4. Inspection	32	32
5. General, despatch, clearing etc.	2	20
6. Workshop	8	8
7. Maintenance	3	3
8. Furnance	4	4
9. Watch and ward	-	8
10. Packing	-	15
	179	158

The factory will run for 3 shifts and all 365 days in an year. The average daily rate in the glass industry is Rs.8/- for skilled and semi-skilled categories and Rs.6/- for unskilled labour.

Staff requirement

1. Works Manager	..	1
2. Production Manager	..	1
3. Workshop Engineer	..	1
4. Chief Glass Technician	..	1
5. Shift supervisors	..	4
6. Supervisors - production	..	4
7. Clerks	..	3
8. Stenographer	..	1
9. Sales Officers	..	2
10. Accounts Officers	..	2
11. Time Office Clerks	..	4
12. Peons	..	4
Total	..	28

8.0 Location

The glass plant can be ideally located at Vridhachalam or Cuddalore.

SUGAR INDUSTRY

1.0 Introduction

Tamil Nadu ranks fourth among the States producing sugar in India. The first three in the decreasing order of ranks are Maharashtra, Uttar Pradesh and Mysore. There are 17 major sugar factories in the State and the total production of sugar in 1971-72 was estimated to be about 3.39 lakh tonnes. This is somewhat more than the consumption of sugar within the State. Hence planning for additional capacity for sugar has to be judiciously made considering all economic aspects of the industry within the State as the cost of production has to be maintained at a competitive level. Sugarcane in Tamil Nadu when compared to the variety available in Maharashtra is of a low yield. The yield is only 8 to 9% compared to a yield of 11% in Maharashtra. On this aspect alone the cost of production is likely to be high even though the cane prices have been fixed on the basis of the recovery.

2.0 Raw material

Sugarcane is advantageously cultivated in different parts of the district and there are already four sugar factories. These factories are not able to utilise the cane available in certain taluks of the district owing to stratogic disadvantages in transportation. Therefore apart from expansion of the present sugar factories, new sugar factories also will have to be set up. This will not only give boost to the overall agricultural economy of the district but also offer a uniform pattern of development.

3.0 Investment

Investment analysis for a typical plant capable of crushing 1250 tonnes of cane per day and having provision for increasing the capacity to 2,000 tonnes per day is given below. This plant cost is based on the information furnished by M/s. Protos Engineering Co. Pvt. Ltd. Bombay.

		Rs. lakhs
1. Land		
50 acre of land @ Rs.20,000/- per acre		10.00
2. Erected plant cost	Rs. lakhs	420.00
Equipment Ex-works	250.00	
Sales tax, freight and insurance	20.00	
Civil works	40.00	
Piping	40.00	
Erection and Commissioning	20.00	
Offsites and Township	25.00	
	395.00	
Pre-operatives	25.00	
	420.00	
3. Working capital		30.00
Total investment		460.00

Equity Capital : Rs.115.00 lakhs
Loan Capital : Rs.345.00 lakhs

Annual Cost of Production

Crushing capacity .. 1250 tonnes cane per day
Crushing Season .. 200 days
Average recovery .. 8.5%

		Rs. in lakhs
(a)	Sugar cane 250,000 tonnes @ Rs.85/- per tonne	212.00
(b)	Utilities, operating supplies and consumables (lump sum)	10.00
(c)	Packing materials @ Rs.40/- per tonne for 21,200 tonnes of sugar	8.48
(d)	Labour and overheads	50.00
(e)	Maintenance @ 4% on plant cost	17.00
(f)	Insurance @ 1% on total investment	5.00
(g)	Depreciation @ 10% on equipment and 5% on civil works	41.00
(h)	Interest on loans @ 10%	34.50
	Total	377.98
	Less credit for 10,000 tonnes of Molasses @ Rs.10/- per tonne	1.00
		376.98

5. **Sales realisation**

21,200 tonnes of sugar at an average price of Rs.2,000/- per tonne ex-factory (Partial de-control)	424.00
Surplus	47.02
Return on equity before taxes	40%
Return on total investment before taxes	10.2%

6. **Employment**

Each sugar factory will give direct employment to about 600 people and indirect employment to about 10,000 people.

7. **Location**

The sugar factories can be located in Thirukoilur and Chidambaram Taluks.

STEEL LAMINATION PROJECT

1.0 Introduction

Steel laminations are assembled together to form the stators and rotors in electric motors. They are also used to form the core for transformers. The starting material for the manufacture of laminations is electrical steel sheets. At present part of the requirement of the country is being met through imports. This void is expected to be filled when the Salem Steel Plant goes into stream. It is reported that electrical steels form a sizeable portion of the product mix scheduled for the steel unit at Salem. Hence it is only appropriate that the State should take the lead in providing an outlet for the products of this plant by setting up industrial units which could utilise this basic raw material. It may also be pointed out at this juncture that a unit manufacturing steel laminations will be a boon to the motor manufacturers of the State. Electric motors manufactured at Coimbatore are known to have put in years of uninterrupted service to the agriculturists of the Southern region. It is hoped that this unit will provide the impetus to these manufacturers to achieve still higher production levels. The present report deals with the manufacture of 650 tonnes of electrical laminations per annum. It may be pointed out that the profitability of this type of unit depends on the efficient utilisation of raw material. Also a unit of this type should be geared to meet the demands of transformer industry which has also come a long way over the past few years. This could be accomplished by adding more

lines of manufacture to the present one. But such an expansion is advocated for a future date when the present unit has established a firm foothold.

2.0 Outline of the process

The electrical steel sheet wound up on stock reels is fed into a power press having progressive dies. The laminations can be produced to any shape by proper design of the dies. The blanked out pieces are then heat treated to relieve the stresses induced in the material by the press operation. This is accomplished in an electric furnace with a protected atmosphere or a vacuum attachment.

3.0 Investment Appraisal

		Rs.
Erected plant cost	..	5,64,000
Building - 150 sq.m. @ Rs.250/sq.m.	..	37,500
Land - 50 cents @ Rs.200/cent	..	10,000
Working capital	...	10,00,000
Total investment	..	16,11,500

Equity .. Rs. 4,01,500
Loan .. Rs.12,10,000

Annual Expenditure

A. Direct Cost

1. Raw materials - 730 tonnes - @ Rs.6,000/te.	..	43,80,000
2. Utilities 5,04,000 units power @ Rs.0.15 per unit	..	76,000
3. Staff and labour	..	40,000

		Rs.
B. Fixed Cost		
1. Maintenance @ 3% on erected plant cost	..	16,000
2. Depreciation		
(i) @ 10% on machinery	...	56,000
(ii) @ 5% on building	...	2,000
3. Interest on loan capital	...	1,10,000
4. Overheads	...	50,000
Total annual expenditure (A+B)	...	47,30,000
Profitability Analysis		
Annual Sales receipts - 650 tonnes @ Rs.8,000/tonne	...	52,00,000
Annual Expenditure	...	47,30,000
Sales expenditure	...	2,60,000
Gross margin	...	2,10,000
Return on Equity	...	52.4%
Return on Total Investment	...	13.1%

4.0 Employment

The unit will provide employment to the following:

Operators	..	3
Helpers	..	4
Clerk	..	1
Manager	..	1
Total	..	9

5.0 Location

This unit can be conveniently located in Industrial Estates planned at Vadalur or Shemmandalam.

RIGID PVC PIPES UNIT

1.0 Introduction

A solution to the chronic shortage of steel in our country could be the development of suitable materials which can replace steel in all but those areas where use of steel cannot be dispensed with. Plastics have proved to be the answer in many instances as in the automobile and machine building industry, thus, effectively filling the vacuum left by steel. The most note-worthy property of plastics is its chemical inertness. Although it has received only token acceptance in our country, plastics have been doing yeoman service to the process industry in other countries for over a decade. The performance of these plastic pipes and ducts has been commended time and again for their excellent corrosion resistance to a very wide range of chemicals. The present report envisages manufacture of rigid PVC pipes which could find use in domestic water supply schemes and as cable conduits. It is noteworthy that indigenously manufactured machines can fabricate pipes in the range of 16 to 160 mm. However, it is suggested that production be restricted to the 16-75 mm range initially. The production schedule should be expanded to include 300 mm pipes by installing new machinery as and when the demand increases in the locality. The raw material is PVC pellets which is manufactured in India by quite a few units. Of late this indigenous supply has had to be augmented by imports. But the present scarcity is expected to ease off in course of time.

2.0 Outline of process

The PVC pellets is fed into the hopper of a twin screw extruder. The pipes emerging from the dies are hauled off and cut to required size by suitable machines.

The machines required for the process are:

i) twin screw extruder
ii) haul off equipment
iii) cooling water trough
iv) pipe cutting machine

The entire plant is being supplied by a few reputed firms in the country.

3.0 Investment analysis

Capacity : 330 tonnes of pipes per annum

Investment		Rs.
Erected plant cost	..	4,90,000
Building - 690 sq. m. @ Rs.250/sq.m.	..	1,50,000
Land - 50 cents @ Rs.200/- per cent	..	10,000
Working capital	..	4,30,000
Total investment	..	10,80,000
Equity capital .. Rs. 2,70,000		
Loan Capital .. Rs. 8,10,000		

Annual Expenditure

1. Raw materials - 330 tonnes of PVC @ Rs.7,000/te.	..	23,10,000
2. Staff and labour	..	1,08,000
3. Utilities - Power 339,000 units	..	68,000
4. Consumables Water	::	5,000 30,000
5. Maintenance @ 3% on plant cost	..	15,000
6. Depreciation: (i) @ 10% on machinery	..	49,000
(ii) @ 5% on building	..	7,500
7. Interest on loan capital @ 9%	..	72,900
8. Overheads	..	25,000
Total	..	26,90,400

Profitability Rs.

Annual sales receipts - 330 tonnes of pipes @ Rs.8750/tonne	..	28,90,000
Sales expenditure	..	50,000
Gross margin	..	1,49,600

Return on Investment

Return on equity before taxes	..	55%
Return on total capital before taxes	..	14%

4.0 **Employment**

This unit would provide employment to the following personnel:

Manager	..	1
Operators	..	8
Clerks	..	2
Unskilled workers	..	20
Total	..	31

5.0 **Location**

The existing industrial estates at Vadalur and Shemmandalam could be possible locations.

6.0 **Plant and Machinery**

	Rs.
1. Brimco model BRRG - 25 extruder, with die adaptor, dies, motor and water cooling trough	1,18,900
2. Brimco model BRRG - 30 extruder with die adaptor, dies, motor and water cooling trough	1,66,870
3. Extra dies (sum of (i) and (ii))	29,400
4. Cutting device - 2 nos. (sum of (iii) & (iv))	30,600
5. Pumps for water circulation, water storage tank	40,000
6. Packing and forwarding charges (sum of items (v) &(vi))	4,750
Total Cost F.O.R. Bombay	3,90,520

Erected Plant Cost		Rs.
F.O.R. cost of plant and machinery		3,90,520
Freight and Insurance @ 5%		19,526
Sales tax @ 3%		11,715
Installation cost @ 10%		39,052
Contingencies @ 5%		23,040
Total		4,83,853
	say Rs.	4,90,000

CNSL BASED SURFACE COATINGS

1.0 Introduction

1.1 Cashew nut shell liquid (CNSL), which is the by-product of cashew industry is one of the major sources of naturally occuring phenols in India. CNSL, present in the pericarp of the cashewnut, is obtained during roasting of the nuts for the isolation of kernels. About 0.3 million tonnes of cashew kernels are annually processed in India. The potential availability of CNSL is estimated to be 40,000 tonnes but the actual production is below 10,000 tonnes. This is mainly due to lack of indigenous demand. The quantities produced are exported to USA and UK. The only way to enhance CNSL production is to put it to industrial uses in our country and thus generate a market.

1.2 Panruti in South Arcot district is already a centre for cashew industry. Production and utilisation of CNSL in this region can be promoted through the establishment of industrial units which use CNSL as raw material. Hence this project to make surface coatings from CNSL would have bright prospects and has scope for diversification at a later stage. Moreover, this will act as a booster to cashew industry in the area.

1.3 Regional Research Laboratory (RRL) Hyderabad has developed various surface coatings to be produced from CNSL. They include refined CNSL, cardanol and laquer. This report is based on the process developed by RRL, Hyderabad and comprises the different surface coatings covered by their know-how licence.

2.0 Products and the Process

(1) Refined CNSL: CNSL is exposed to drastic heat treatment during its extraction from the nut. The resultant product contains polymerised material in colloidal suspension and inorganic impurities and has high viscosity. Commercially produced CNSL, therefore, does not conform to any standard specifications. The refining is done by a simple acid treatment and by this treatment, the product is made to conform to international standard.

(2) Cardanol: CNSL due to its dark colour cannot be used for producing light coloured coatings but CNSL could be distilled and the product obtained, known as cardanol, can be used for pale coloured coatings. A residue is also left behind, which could again be used in dark coatings.

(3) Varnish and Enamels from CNSL: The process consists of the following steps:

(a) Polymerising CNSL by heating with a suitable catalyst

(b) A phenolic resin is prepared and mixed with drying oil at a high temperature

(c) Polymerised CNSL is dissolved in a solvent and ~~is~~ reacted with formalin to get CNSL formaldehyde condensate

(d) Phenolic drying oil varnish and the CNSL formaldehyde condensate are mixed in suitable proportion to obtain a high grade varnish

(e) The varnish so obtained is suitably pigmented to obtain enamel of the desired colour and properties. Only dark shades could be obtained from this varnish.

(4) Cardanol Lacquers: There are two or three cardanol lacquers with varying characteristics. They differ only marginally in the process of production.

In one process cardanol is reacted with hexamine. Drying oil is then added in different proportions and the temper ture is raised to a suitable level. The cooking is conti nued for some time and then the product is cooled. This is thinned with white spirit. Driers are also incorpora- ted in the varnish in usual quantities. This is good as a decoration lacquer for tin and as insulating varnish.

Another type of lacquer could be produced by reacting cardanol with styrene monomer at suitable temperatures. The product is cooled and thinned with requisite quantity of mixture of solvents. Drior is incorporated in usual quantity. This is recommended for use as decorative lacquers for cans and as lacquer for wooden furnitures.

3.0 Investment Analysis

Cost estimates in respect of each product is separately given, so that suitable combinations could be chosen for implementation either separately or together.

Basis:

i)	Refined CNSL	- 500 kg./day Single Shift
ii)	Cardanol	- 2 Tonnes/day " "
iii)	Lacquers based (3 types) on CNSL	- 1½ Tonne/day Three shif operation
iv)	Lacquers based (3 types)on cardanol	- 1½ Tonne/day Three shif operation

Capital Investment - Rs.

	Refined CNSL	Cardanol	Lacquer based on CNSL	Lacquer based on cardanol
i) Land and building	30,000	70,000	30,000	30,000
ii) Erected plant cost	20,000	1,50,000	70,000	40,000
iii) Working capital	50,000	2,70,000	4,00,000	5,00,000
Total investment	1,00,000	4,90,000	5,00,000	5,70,000

Annual cost of production

i) Raw materials	1,32,000	9,75,000	12,46,500	14,03,700
ii) Utilities	10,000	42,000	51,000	16,500
iii) Labour and supervision	15,000	30,000	45,000	42,000
iv) Packing and overheads	24,000	57,000	2,24,000	2,58,000
v) Fixed costs	15,000	70,000	60,000	58,000
Total	1,96,000	11,74,000	16,26,500	17,78,200

Profitability	Refined CNSL (159 T)	Cardanol (600 T)	Lacquer based on CNSL (450 T)	Lacquer based on cardanol (450 T)
Sales Realisation	3,00,000	13,50,000	18,00,000	20,00,000
Surplus	1,04,000	1,76,000	1,73,300	2,21,800

4.0 **Employment**

Refined CNSL section would give employment for about five workers along with other office staff and a manager.

Cardanol plant affords employment opportunities for 12 workmen along with other office staff, managers and supervisor.

The lacquer sections would also accommodate about 15 workmen each besides the necessary office staff and a supervisor.

WOODEN FURNITURE UNIT

1.0 Introduction

Of late, the concept has gained ground that it does not augur well for society to deny the basic amenities of life to any member irrespective of status, financial position etc. Accordingly, it has been found necessary to broaden the scope of community development activities. A beginning was made in some States by constructing houses for the homeless poor. Without exception, all States have constituted Housing Boards who provide furnished houses or provide long-term loans for construction of such houses. The metropolises of the country are faced with the problem of accommodating the large influx of populace who throng to the city seeking better opportunities in life. Construction activities have been stepped up to meet the requirements of these people who have to look for accommodation. In short, there is a boom in the building industry in the country. This accelerated pace may prove to be a severe strain for the industries which cater to the needs of the construction industry. In this context, the need to install additional capacity for these items need no particular emphasis. Wooden furniture and fittings cannot be dispensed with in any household. Therefore, it is felt that, to sustain the tempo of construction in the State, a factory could be established to manufacture these items. The present report deals with a workshop which can produce about 15 cubic metres of timber in a single shift. A timber workshop concentrating on a single item, viz. doors or windows alone, may not

be a profitable venture. Along with doors and windows, other household items like chairs, tables etc. also should be taken up for manufacture.

2.0 Investment Appraisal

		Rs.
Erected plant cost	..	1,70,000
Building 200 sq. m. @ Rs.250/sq.m.	..	50,000
Land - 1 acre @ Rs.200/- per cent	..	20,000
Working Capital	..	8,60,000
Total Investment	..	11,00,000
Equity Capital	.. Rs. 2,20,000	
Loan Capital	.. Rs. 8,80,000	

Annual Expenditure

A. Direct Cost

Raw materials - 4300 cubic metres of timber @ Rs.1200/- per cu.m.	..	51,60,000
Power - 1,68,000 units @ Rs.0.15/unit	..	25,000
Staff and labour	..	2,16,000
Consumables (lump sum)	..	20,000

B. Fixed Cost

Maintenance @ 3% on erected plant	..	5,000
Depreciation @ 10% on machinery and 5% on building	..	19,000
Interest on loan capital @ 9%	..	80,000
Overheads	..	25,000
Total annual expenditure	..	55,50,000

C. Basis:-

Production of doors alone 76,000 square metres per year @ Rs.75/- per square metre.

Profitability Analysis

Selling Price	..	Rs.75.00 per sq. metre
Annual Sales Receipts	..	Rs. 57,00,000
Annual Expenditure	..	55,50,000
Gross Margin	..	1,50,000
Return on equity	..	68%
Return on investment	..	13.6%

Employment

This unit would provide employment for about 54 persons including 17 staff members, 10 carpenters and 27 other workers.

MANUFACTURE OF KAOLIN B.P.

1.0 **Introduction**

Pharmaceutical grade Kaolin is used in pharmaceutical preparations as a filler and also for combating intestinal irritations. The product has a considerable demand and a major requirement is being met by imports. The main raw material for the manufacture of Kaolin is China Clay. A unit can be set up at Vridhachalam, where there is already a concentration of China clay based industries.

2.0 **Description of the Process**

Regional Research Laboratory, (R.R.L.), Hydorabad, has developed a process for making Kaolin B.P. This discussion is based on the process developed by them. Powdered kaolin is treated with hydrochloric acid to remove impurities. Treated kaolin is washed with water and the washed clay is mixed with a dispersing agent. Excess water is evaporated and the residual mass is dried and ground to the required particle size. Particle size of the product is important as the acceptability of this product would depend on the micron size.

3.0 **Plant and machinery**

Important items of equipment required for the manufacture of Kaolin B.P. are acid treatment tanks, dilution vessel, filter press, evaporator, jet-o-miser mill, cyclone collector etc.

4.0 **Raw material**

Main raw materials are kaolin and hydrochloric acid. A dispersing agent also will be required.

5.0 **Capital Investment**

Plant capacity	..	1.7 tonnes per day
No. of working days	..	300 with three shift operation

	Rs.
(a) **Fixed Capital**	
i) Land - 50 cents @ Rs.200/cent	10,000
ii) Building - 300 sq.m. @ Rs.250/sq.m.	75,000
iii) Plant and machinery	5,00,000
(b) Working capital	1,00,000
Total investment	6,85,000

Equity Capital	..	Rs. 1,75,000
Barrowed Capital	..	Rs. 5,10,000

6.0 **Annual Expenditure**

(a) Raw materials	..	3,15,000
(b) Utilities	..	1,50,000
(c) Salaries and wages	..	1,00,000
(d) Packing	..	30,000
(e) Maintenance @ 3% on plant cost	..	15,000
(f) Depreciation @ 10% on plant and 5% on building	..	54,000
(g) Interest on borrowed capital	..	51,000
(h) Overheads	..	50,000
Total annual expenditure	..	7,65,000

7.0 **Sales Realisation**

500 tonnes @ Rs.1,750/- per tonne	..	8,75,000
Annual returns before taxes	..	1,10,000
Return as percentage of equity capital		62%

8.0 **Employment**

This unit would provide employment for about 35 people. About 15 of them would be skilled including the managerial staff and the rest would be unskilled.

9.0 **Location**

Vridhachalam is the best suited location for a Kaolin unit. There is well developed infrastructural facilities for industries based on china clay. Railway facilities are also available for movement of product as well as raw materials.

MANUFACTURE OF STEEL BALLS

1.0 Introduction

Steel balls find a variety of uses in the engineering industry. They go into the making of quite a few industrial components. Foremost among them is the ball bearing. The capital investment required for establishing a ball bearing unit could be considerably reduced if steel balls are made available at reasonable rates. Considering the consistent demand for bearings in the country, such an alternative merits a thorough investigation. Steel balls find direct load bearing applications in the bicycle. The performance of the bicycle industry in India has been note-worthy. Even while the industry met the home consumption effectively, it has managed to establish a foot hold in the foreign countries. Indian firms have been catering to the needs of quite a few developing countries. More significant has been the recent interest evinced by some of the most advanced countries in the bicycles manufactured in this country. Judging from reports available, the industry seems well set to meet the stringent quality standards laid down by these advanced nations. This report deals with the manufacture of 450 tonnes of bicycle steel balls (1/8 - 1/4" dia) per annum. It is sought to highlight the nature of investment that goes into the establishment of a typical ball manufacturing project and the profitability analysis of such a venture. Capacity is flexible depending upon the range of sizes chosen for manufacture. The investment

appraisal and the profitability analysis which follow provide the skeleton of the project over which a typical manufacturing programme such as bicycle steel balls has been fitted over as an illustrative example.

2.0 Outline of the process

The starting material for ball bearings is S.A.E 52100 steel. The steel rod required for the project is available indigenously. The rod is forged in a high speed cold heading machine. The balls are then trimmed in ball flashing machines. They are then fed into an electrically heated drum furnace where they are heated to the hardening temperature, quenched and tempered. Balls are then ground to proper size and finish. This is a highly automatic unit capable of producing upto 700 pieces per minute or 252 million pieces per annum. All the equipment for the project will have to be imported.

3.0 List of machinery

1. High speed ball heading machine
2. Drum heating furnace
3. Ball flashing machine
4. Ball lapping machines
5. Ball grinding machines

4.0 Investment Appraisal

	Rs.
Erected plant cost	40,46,000
Building 300 sq.m. @ Rs.250/sq.m.	75,000
Land 1 acre @ Rs.200/- per cent	20,000
Working capital	9,28,000
Total investment	50,69,000
Equity capital ..	Rs. 15,69,000
Loan capital ..	Rs. 35,00,000

Annual Expenditure	Rs.
A. Direct Cost	
Raw materials - 450 tonnes of alloy steel @ Rs.7200/tonne	32,40,000
Utilities - Electric power 10,80,000 units @ Rs.0.15/unit	1,62,000
Staff and labour	2,08,000
Consumables	2,50,000
B. Fixed Cost	
Maintenance @ 3% on erected plant cost	1,20,000
Depreciation @ 10% on machinery and 5% on building	4,03,000
Interest on loan capital @ 9%	3,15,000
Overheads	50,000
Total annual expenditure	47,48,000

Profitability		
		Rs.
Selling Price	..	12,500/tonne
Annual sales receipts	..	56,25,000
Sales expenditure	..	2,80,000
Annual expenditure	..	47,48,000
Gross margin	..	5,97,000
Return on equity	..	38%
Return on total investment	..	11.8%

5.0 **Employment**

The unit will provide employment for the following:

Manager	..	1
Foremen	..	4
Clerks	..	2
Mechanics	..	2
Unskilled workers	..	52
Total	..	61

6.0 **Location**

The unit can be conveniently located in Cuddalore.

BOAT BUILDING YARD

1.0 Introduction

The abundant potentialities and unexploited resources of the East Coast offer vast scope for developing marine fisheries all along the coastline. As a pre-requisite to the development of marine fisheries, mechanised boats and trawlers should be made available to the fishermen community in the area. A campaign has to be initiated to manufacture cheap mechanised boats, whereby fishing operations are boosted up. With this in view, we propose a medium size boat building yard for manufacture of 36 and 43 footer mechanised fishing boats to be established in a strategic centre like Porto Novo.

1.1 There is good demand for mechanised boats from the fishing community in the coastal areas. But the purchasing power of the fishermen is very low. Hence, fishermens' Co-operative Societies will have to be formed, which will be in a position to buy mechanised boats with Government's assistance. An integrated programme of fishery development should give due importance to this factor and frame a suitable programme to increase the mechanised boats for fishing.

1.2 Tamil Nadu Government already has about four boat building yards situated at Marina, Royapuram, Mandapam and Nagapattinam. Another unit in the Co-operative Sector is working at Tuticorin. There is one more private boat building yard at Cuddalore. All these boat building yards are constructing only 31 footer and 32 footer sizes. For deep sea fishing bigger vessels are required

to function safely and satisfactorily. Hence it is proposed to have 36 footer and 43 footer boats to be built in this yard.

2.0 Major equipments required

1. Thickness planer machine
2. Log band saw machine (horizontal & vertical)
3. Wood turning lathe
4. Sliding, surfacing, screw cutting lathe
5. Five tonne hand operated winch
6. Automatic band saw blade sharpener
7. Electric chain hoist (2 tonnes capacity)
8. Wolf electrical drilling machine
9. Wolf heavy duty electrical drilling machine
10. Thermo electric welding transformer
11. Portable drills 3/8"
12. Wolf heavy duty electric sander
13. Circular saw
14. 8" bench grinder
15. Wolf portable electric blower
16. Powersoldering iron
17. Hand operated hydraulic crane, screw face etc.

3.0 Raw material for boats

Aini, Venteak, Teak, Hardware materials etc.

4.0 Scheme-I

4.1 Investment analysis:

Capacity of boat building yard: 36 footer 36 nos./year

(a) Land and buildings	..	Rs. 1,00,000
(b) Machinery equipment etc. including installation	..	Rs. 1,50,000
(c) Working capital forlmonth	..	Rs. 2,00,000
Total	..	Rs. 4,50,000
Equity capital	..	Rs. 90,000
Loan capital	..	Rs. 3,60,000

.2 Process Economics

Cost of production per boat		Rs.
(A) Direct Operating Cost		
(i) (a) Timber		
Aini 500 cu.ft. @ Rs.20/- per cu.ft.		10,000
Venteak 400 cu.ft. @ Rs.15/- "		6,000
Teak 100 cu.ft. @ Rs.50/- "		5,000
		21,000
(b) Hardware materials		20,000
(c) Fuel and water tanks, plumbing etc.		2,000
(d) Remote control and steering gear arrangement		2,000
(e) Erectional items		1,000
(f) Deck, rigging and under water fittings		2,000
(g) Labour and overhead charges		10,000
		58,000
(ii) (a) Winch gallows etc.		4,000
(b) Navigational items		3,500
(c) Life saving items		1,500
(d) Fire fighting		500
(e) Marine diesel engine with steering gear fittings etc.		70,000
Total direct cost (i+ii)		1,37,500
(B) Fixed operating cost		
(a) Depreciation @ 10% on machinery and insurance 1%		450
(b) Depreciation @ 5% on buildings		140
(c) Interest @ 10% on loan capital		1,000
Total Fixed Cost		1,590
Total cost of production/boat 36' (A+B)		1,39,090
		say Rs.1,39,000
Assumed selling price of boat	..	Rs.1,50,000
Gross profit/boat	..	Rs. 11,000
Annual gross profit	..	Rs.3,96,000
Return on total investment	..	87%

5.0 Scheme-II

5.1 Investment Analysis

Capacity of boat building yard	..	43 footer boats 27 nos./year
		Rs.
(a) Land and buildings	..	1,00,000
(b) Machinery, equipment etc. including installation	..	1,50,000
(c) Working capital for 1 month	..	2,10,000
Total	..	4,60,000
Equity capital	..	95,000
Loan capital	..	3,65,000

5.2 Process Economics

Cost of Production/boat

			Rs.
A. Direct operating cost			
(i) (a) Timber			
	Aini 1000 cu.ft. @ Rs.20/cu.ft.		20,000
	Ventoak 500 " @ Rs.15/ "		7,500
	Teak 100 cu.ft. @ Rs.50/ "		5,000
			32,500
(b) Hardware and other materials			30,000
(c) Remote control and steering arrangements			3,000
(d) Electional materials			2,000
(e) Galley, bath fittings etc.			1,500
(f) Deck, rigging and under water fittings			5,000
(g) Labour and overheads			15,000
			89,000
(ii) (a) Marine diesel engine etc.			1,00,000
(b) Winch gallows etc.			6,000
(c) Navigational items			5,000
(d) Life saving items			2,500
(e) Fire fighting			1,000
(f) Echo sounders and radio telephones etc.			10,000
Total direct cost			2,13,500

		Rs.
B. Fixed Cost		
(a) Depreciation and maintenance of machinery including insurance		700
(b) Depreciation on buildings		300
(c) Interest @ 10% on loan capital		1,350
Total fixed cost		2,350
Total cost of production/boat 43 footer (A+B)		2,15,850
	say	2,16,000
Assumed selling price/boat	Rs.	2,30,000
Gross profit/boat	Rs.	14,000
Total gross profit/year	Rs.	3,78,000
Profit on investment		80%

TIN CONTAINER UNIT

1.0 Introduction

Tin containers are widely used in packaging of various consumer products. Biscuits, sweets, cashew nuts are some of the items which need tin containers. Expansion of cashew processing industry in Panruti area will give rise to an increase in demand of tin containers, especially the 18 litre standard containers, which are used for export of cashew nuts. A unit to manufacture tin containers to cater to the demand from cashew processing unit could be established in Panruti easily. Tin sheets are in short supply in the country. Therefore, allotment of quota of tin sheets will have to be depended upon for the functioning of the unit. The scheme discussed here is for a small-scale unit to manufacture about 1450 tin containers per day (one shift basis).

2.0 Method of production

The plant consists of a series of cutting and bending/forming machines, presses, seamers etc. The sides are formed by two pieces suitably cut and shaped in those machines. Top and bottom plates are also formed in respective machines and the tin is finally assembled by seaming the edges. Finally the joints are soldered and tested with compressed air against leaks.

3.0 Plant and machinery

The plant consists of cutting, bending and grooving machine along with presses, meters and soldering equipment. All the machines are available indigenously. In fact those machines can be easily fabricated and erected. A number of fabricators are offering the

machinery required for container assembly.

4.0 Raw materials

About 900 standard 18 litre containers can be made out of 1 tonne of tin. Per day requirement of tin sheet 26 gauge for this unit would be 1.6 tonnes. On this basis about 480 tonnes of tin would be annually required assuming the unit would run for 300 days in an year.

5.0 Investment analysis

Basis : 1450 tins per day - single shift - assuming 300 working days.

Total investment		Rs.
(a) Fixed capital		
i. Land - 50 cents @ Rs.200/- per cent		10,000
ii. Building 20 M x 10 M @ Rs.250/- sq.m.		50,000
iii. Erected plant cost		1,00,000
Total		1,60,000
(b) Working capital		1,50,000
Total investment		3,10,000
Equity capital	.. Rs. 77,500	
Borrowed capital	.. Rs.2,32,500	

Annual Expenditure		Rs.
(1) Raw materials		15,40,000
i. Tin sheet 26-28 gauge - 480 tonnes @ Rs.3200/tonne	15,36,000	
ii. Tin and soldering chemicals	4,000	
	15,40,000	
(2) Utilities		10,000
(3) Salaries and wages		80,000
(4) Maintenance @ 3% on plant cost		3,000
(5) Depreciation @ 10% on plant and 5% on bldg.		12,500
(6) Interest		20,900
(7) Overheads		20,000
Total annual expenditure		16,86,400

Profitability

		Rs.
Sales realisation @ Rs.4/- per tin container for a production of 4,35,000 pieces	..	17,40,000
Net surplus	..	53,600

Return on Investment

Return on equity	..	68%
Return on total capital	..	17%

6.0 **Employment**

Employment in this unit will be under the following categories:

Manager	..	1
Stenographer	..	1
Peon	..	1
Supervisor	..	1
Skilled workers	..	12
Unskilled "	..	6

7.0 **Location**

Panruti would be a suitable location for the plant.

PRESSURE SENSITIVE ADHESIVE PRODUCTS

1.0 Introduction

In recent years, different types of pressure sensitive products have been developed for a wide range of uses. Mainly these could be categorised as tape products and labels. Tape products are used to perform holding, marking, sealing, packaging, insulating and protecting functions. Pressure sensitive labels are used in sales promotion, decorative and packaging labels, bottle labels, service labels etc. Pressure sensitive products are used even for lamination, wall covering, name plates etc. Main components of a pressure sensitive product are: (1) a backing or base (2) a base coat or tie coat (3) a pressure sensitive adhesive coating (4) a release liner with a release coat. The backing is usually a thin flexible material of papers, plastic films or cloth. The base coat is supplied as a primer on the backing prior to the pressure sensitive adhesive. The base coats are usually elastomeric type and may be acqueous or solution. The adhesive in solvent solution is applied over the base coat. Glassine paper is usually used for release liners. It is coated with a silicone resin. This is a consumer and industrial product of increasing potential and hence a new unit for manufacture of tape products and labels, totalling 1000 sq. metres per day could be thought of for establishment in South Arcot district.

2.0 **Process description**

The base coat is applied on the base paper with a roll coater and then dried by passing through a tunnel drier. A second coater then spreads the pressure sensitive adhesive. This is dried by evaporating off the solvent. The release liner (glassine paper) is coated with silicone resin. After complete drying, the paper coated with pressure sensitive adhesive and the liner are combined in a roll. Thereafter the roll may be die-cut and printed if necessary. The process know-how for the above would be furnished by Regional Research Laboratory, Jorhat. The present report is based on the data provided by R.R.L., Jorhat.

3.0 **Raw materials**

Main raw materials include, art or glazed paper, base coat, solvents, adhesive, glassine paper, silicone resin etc.

4.0 **Plant and machinery**

Major item of machinery involved is the coating machinery with drying arrangements. Other itemsconsist of kettle, roller mixers, driving rolls, boiler and other accessories.

5.0 **Investment analysis**

Basis : 1000 sq. m. of product per day
300,000 sq.metres of tapes or labels per year.

(a) **Fixed capital**

	Rs.
i) Land - 60 cents @ Rs.200/cent	12,000
ii) Building - 80' x 30' @ Rs.25/- per sq.ft.	60,000
iii) Erected plant cost	9,00,000
	9,72,000

L45588

			Rs.
(b) Working capital			5,00,000
Total capital investment			14,72,000
Equity capital	..	Rs. 4,72,000	
Borrowed capital	..	Rs. 10,00,000	
Annual cost of production			Rs.
(1) Raw materials		Rs.	2,82,000
(a) Art paper 21 te @ Rs.3000/te.		63,000	
(b) Paper coat 900 kgs. @ Rs.10/kg.		9,000	
(c) Solvents 30,000 lts. @ Rs.2/lit.		60,000	
(d) Sensitive adhesive 1200 kgs. @ Rs.20/- per kg.		24,000	
(e) Glassine paper 18 tonnes @ Rs.5,000/- per te.		90,000	
(f) Silicon resin 900 kgs. @ Rs.40/- per kg.		36,000	
Total		2,82,000	
(2) Utilities			1,40,000
(a) Power - 1,80,000 units @ Rs.0.15 per unit		27,000	
(b) Steam - 3600 tonnes @ Rs.30/te.		108,000	
(c) Water		5,000	
		1,40,000	
(3) Salaries and wages			1,50,000
(4) Maintenance @ 3% on plant cost			27,000
(5) Packing @ Rs.50/- per day			15,000
(6) Depreciation @ 10% on plant cost and 5% on building			93,000
(7) Interest @ 9% on borrowed capital			90,000
(8) Overheads			1,00,000
(9) Taxes, Insurance etc.			50,000
Total			9,47,000

		Rs.
Profitability		
(a) Sales realisation 3,00,000 sq, metres @ Rs.5/- per sq. metre of product		15,00,000
(b) Less sales and distribution expenses @ 10% on sales		1,50,000
(c) Less royalty @ 2½% on sales		37,500
Net Income		13,12,500
Surplus before taxes		3,65,500
Return on Investment		
Return on equity	..	77%
Return on total capital	..	21%

6.0 **Employment**

Manager	..	1
Accountant	..	1
Clerks	..	2
Peons	..	2
Labour		
Supervisor	..	1
Mechanic	..	1
Skilled workers	..	6
Unskilled workers	..	10

7.0 **Location**

The unit can be located in the existing or proposed industrial estates.

CATTLE FEED PLANT

1.0 Introduction

With the expansion of dairying activity all around the country, animal feeds in the form of concentrates have become very popular and are in great demand. Healthy dairy farming requires a proper balance of green fodder and food concentrates. Considerable shortage is experienced in the market for compounded feeds. With the present emphasis on white revolution advocated by Central and State Governments, the demand for animal feeds is bound to increase. Therefore, industrial units to manufacture animal feeds have a definite and vast potential. The State of Tamil Nadu is piloting many schemes for the development of dairy farming. The districts of Tanjore and South Arcot are quite suitable for large-scale dairy development. Intensive cattle development programmes will make their impact in these districts in a short while. Manufacturing capacity for cattle feed to match the demand will have to be built up in these districts. With this in view, it is proposed that one unit each of about 12 tonnes per day capacity may be set up both in South Arcot and Thanjavur districts. A decentralised arrangement of this type will facilitate the use of local raw materials and also marketing in the adjoining area.

2.0 Marketability

Though cattle feedshave a country wide demand, the units proposed here are initially to market their products within the district and its vicinity. It would be advantageous to concentrate in the adjoining

marketing area since the transporting costs could be kept to a minimum. However, there is enough potential for selling the product in the whole of Tamil Nadu.

3.0 Process description

The process consists of simple operations like grinding, proportioning and mixing of various ingredients that go into the composition. Usually the preparation is done in batches. Accordingly the ingredients for the particular batch are weighed and these are ground in a pulveriser with closed circuit recycle. The fines are conveyed to the batch mixer through screw conveyors. Vitamins and minerals are also added at this stage. All the ingredients are fed into the batch-mixer and mixing takes place for a fixed interval of time. Part of the product can be directly packed and the other part is sent to the molasses admixing section where a controlled quantity of molasses is injected under pressure. The material is packed in polythene lined gunny bags.

4.0 Raw materials

Different materials like rice bran and wheat bran, tapioca, maize, groundnut oil cake, molasses, minerals, vitamins etc. in varying proportions are used in making animal feeds. The final product should conform to the prescribed ISI standard in the matter of its protein and energy content. It is suggested that spent grain - a waste from breweries - also be made use of as a raw material for this unit, as this would be cheaply available from the new breweries of the State. A typical formulation is given below.

Groundnut cake	..	30 part
Spent grain	..	25 part
Rice bran	..	25 part
Tapioca	..	10 part
Molasses	..	7 part
Mineral mixture	..	1 part
Salt	..	2 part
Total	..	100 part

5.0 Plant and Machinery

Main items of plant are the following:

1. Vibrating screen
2. Screw conveyor with receiving hopper
3. Hopper with feeder for hammer mill
4. Bucket elevator
5. Hammer mill
6. Cyclone with rotary lock
7. Bag type filter
8. High pressure fan
9. Hopper and batch-mixer
10. Molasses admixing machine
11. Molasses pump
12. Molasses service tank with steam heating elements.

6.0 Investment analysis

Plant capacity .. 1.5 tonnes per hour

Annual production .. 3,600 tonnes

(a) Fixed Capital

		Rs.
i. Land - 1 acre @ Rs.200/- per cent	..	20,000
ii. Building and civil works - approximately 240 sq. metre of built up area @ Rs.250/- per sq. metre	..	60,000
iii. Erected plant cost	..	3,00,000
Total	..	3,80,000

(b) Working Capital

		Rs.
i.	Raw material storage for one month average @ Rs.530/- per tonne of product	1,70,000
ii.	Accounts receivable for one month @ Rs.850/- per tonne of product	2,55,000
iii.	One month's product storage @ Rs.750/-, per tonne	2,25,000
iv.	Cash	50,000
	Total	7,00,000
Working capital margin		1,75,000
Bank Borrowing		5,25,000
Total investment .. Rs.3,80,000 + 1,75,000	=	5,55,000

(c) Total equity capital .. Rs. 2,80,000
Total long term loans .. Rs. 2,75,000
Total short term loans .. Rs. 5,25,000

7.0 Annual Cost of Production

(a) Raw materials

			Rs.
i.	Groundnut cake - 1080 tonnes @ Rs.700/- per tonne	..	7,56,000
ii.	Spent grain - 900 tonnes (dry) @ Rs.400/- per tonne	..	3,60,000
iii.	Rice bran - 900 tonnes @ Rs.400/- per tonne	..	3,60,000
iv.	Tapioca chips - 360 tonnes @ Rs.1,000/tonne	..	3,60,000
v.	Molasses - 250 tonnes @ Rs.100/- per tonne	..	25,000
vi.	Minerals - 36 tonnes @ Rs.1500/- per tonne	..	54,000
vii.	Salt - 72 tonnes @ Rs.100/- per tonne	..	7,200
Total			19.3?,200

			Rs.
(b) Utilities		..	50,000
i. Power	Rs. 45,000		
ii. Water	Rs. 5,000		
	50,000		
(c) Packing @ 60/- per tonne of product		..	2,16,000
(d) Salaries and wages		..	75,000
(e) Maintenance @ 3% on plant cost		..	9,000
(f) Depreciation @ 10% on plant and 5% on building		..	33,000
(g) Interest @ 8% on fixed capital borrowing and 10% on working capital borrowing		..	75,300
(h) Overheads		..	50,000
Total annual expenditure		..	24,40,500

8.0 Sales Realisation

Gross sales realisation - 3,600 tonnes @ Rs.900/- per tonne	.. 32,40,000
Less distribution costs, sales overheads and commission on sales @ Rs.150/tonne	.. 5,40,000
Net realisation	.. 27,00,000
Surplus	.. 2,59,500

9.0 Return on Investment

Return on equity capital = $\frac{\text{Rs.2,59,500}}{\text{Rs.2,70,000}}$ = 98%

Return on total investment = $\frac{\text{Rs.2,59,500}}{\text{Rs.5,55,000}}$ = 47%

10.0 Direct Employment

Manager	- 1
Accountant	- 1
Accounts Clerk	- 1
Typist	- 2
Peon	- 2
Supervisor	- 1
Operator	- 2
Store-keeper	- 1
Unskilled workers	- 10

There would be scope for indirect employment by way of collection and transporting of raw materials, movement of finished products etc.

11.0 Location

One unit each is suggested for South Arcot and Thanjavur districts.

FISH MEAL AND OIL PLANT

1.0 Introduction

Concerted efforts are now being made to tap the fishing resources of the Coromandel Coast, by the Government of Tamil Nadu. Freezing and canning industry, processing prawns and lobstors is catching up all along the coast. This industry throws up a lot of fish waste which can be utilised for the production of fish meal. A large quantity of trash fish also is caught all along the coast which does not find a proper utilisation. Such trash fish also finds beneficial utilisation in a fish meal plant. Fish meal is a rich source of proteins and formsan essential ingredient in cattle and poultry feeds. This product has a ready market all over the country. Therefore one unit may be established near Cuddalore and another near Nagapattinam for processing fish waste and trash fish into fish meal. Fish oil also is obtained in the process as a bye-product.

2.0 Process description

2.1 The raw material is collected in a hopper and is cut into suitable pieces in a hasher and all the material is then processed in a cooker by means of indirect steam. The material from the cooker is transferred by means of a strainer screw conveyor to a twin screw press in which water and oil are squeezed out. The press cake is now disintegrated in a tearing machine and dried in a rotary drier. The material then passes on to a vibrator straine and is finally ground to meal in a grinding plant. This is weighed and packed into bags.

2.2 The press water from the screw press is subjected to the following treatment. Insoluble dry matter is removed by means of centrifugal sludge separator, oil is extracted in a separator and the oil free stick water is evaporated in a concentrating plant. The concentrate stick water is passed into the drier where it is mixed with the press cake to obtain the whole meal.

3.0 Raw materials

The raw materials required are trash fish and fish waste including prawn heads and fish cuttings obtained while dressing. Trash fish should be used to a greater extent to yield a higher percentage of oil and richer meals. Arrangements should be made for the supply of a regular quantity of raw material from various peeling sheds and canning units located in the coastal area. It would not be difficult to bring the raw materials to a central location. Care should be taken to bring the raw materials before deterioration starts.

4.0 Employment

This unit would provide employment for about 25 persons. Out of them, three should be qualified operators and about 20 unskilled labourers. One manager and his staff would be enough to look after the administration of the unit.

5.0 Location

One unit each could be established in South Arcot and Thanjavur districts.

6.0 **Investment**

Basis:

Capacity : 25 tonnes of raw material per day

Product : 5 tonnes of fish meal and 1 tonne of oil per day on an average

It is assumed that the plant would process on an average 25 tonnes of raw material per day for 200 days in a year.

	Rs. in lakhs
Plant and machinery	10.0
Land and Building	2.0
	12.0
Working capital	2.5
Total investment	14.5

Equity capital .. Rs. 3.6 lakhs
Loan capital .. Rs.10.9 lakhs
Rs.14.5 lakhs

7.0 **Annual Expenditure**

(1) Raw materials Fish waste 5000 te. @ Rs.150/te.	7.50
(2) Utilities Power 48000 kWh 0.72 Fuel oil 200te. @ Rs.360/- per tonne 0.72	1.44
(3) Salaries and wages - 25 persons	0.75
(4) Maintenance @ 3% of plant cost	0.30
(5) Depreciation @ 10% on machinery and 5% on building	1.10
(6) Interest @ 9% on loan capital	0.98
(7) Packing @ Rs.80/+ per tonne for fish meal and Rs.300/- per tonne for fish oil	1.40
(8) Overheads	0.27
Total annual expenditure	13.74

8.0 **Sales Realisation**

		Rs. in lakhs
1,000 Te.of fish meal @ Rs.1,000/- per tonne average	..	10.00
200 te.of fish oil @ Rs.2,500/- per tonne	..	5.00
		15.00
Gross margin	..	1.26
Profit as a percentage of equity capital	..	35%

PAPER CARTON MAKING UNIT

1.0 Introduction

Paper cartons are widoly used in packaging a variety of products ranging from pharmaceuticals to frozen fish. As the coastal belt from Cuddalore to Nagapattinam is developing fast as a centre of fishing operations, waxed paper cartons will be required in large quantities for packing frozen prawns. The freezing units already in operation are procuring these cartons from remote centres like Madras, whereas this could be easily manufactured locally. It is therefore felt that carton manufacturing should be taken up locally both in the districts of South Arcot and Thanjavur. Poultry farms in Cuddalore area also are potential consumers of cartons, if their scale of operations rise to a fairly high level. The distilleries at Mundiampakkom and Nellikkuppam also will need paper cartons for packaging. All these together offer scope for a couple of carton making units particularly in South Arcot. A medium sized unit to produce about 20 to 25 thousand cartons per day is discussed in this report.

2.0 Method of Production

Indigenous paper board manufactured by all leading paper manufacturers is used for carton making. The board is fed into the paper cutting machines where sheets are cut accurately into the desired sizes. These are passed through bending and cutting machines first and then into punching and creasing machines where the desired shapes are obtained. An automatic printing machine is also provided to print necessary labels.

3.0 Raw materials

Indigenous paper board is the only main raw material. Staple pins, printing ink, glue etc. may be required in small quantities.

4.0 Plant and machinery

Plant consistsof the following machinery:

1. Automatic cylinder printing machines
2. Punching machine
3. Bonding and creasing machine
4. Rapid paper cutting machine
5. Deluxe printing machine
6. Sundry items.

M/s. Indo-European Machinery Co. is supplying this machinery on a package basis and their machines are known by the name 'PECO' machines. The analysis in this report is based on the quotations supplied by them.

5.0 Investment:

Capacity : 20-25 thousand cartons per day

Total Investment		Rs.
(a) Fixed capital		
i. Land - 50 cents @ Rs.200/- per cent	..	10,000
ii. Building - 160 sq.m. @ Rs.250/- sq m.	...	40,000
iii. Plant and machinery - erected cost	..	1,50,000
		2,00,000
(b) Working capital	..	1,50,000
(c) Total investment	..	3,50,000

Borrowed capital - Rs.2,62,500
Equity capital - Rs. 87,500
Rs.3,50,000

6.0 **Annual Expenditure**

			Rs.
a)	**Raw materials** 300 Tonnes paper board @ Rs.3,000/tonne		9,00,000
b)	**Utilities**		10,000
	i. Power - 200 x 300 kWh @ Rs.0.15/unit	Rs.9,000	
	ii. Water	1,000	
		10,000	
c)	Consumables and packing		10,000
d)	Salaries and wages		50,000
e)	Maintenance @ 3% on plant cost		4,500
f)	Depreciation @ 10% on plant cost and 5% on building		17,000
g)	Interest on borrowed capital @ 9%		23,625
h)	Overheads		25,000
	Total		10,40,125

7.0 **Profitability**

Sales realisation @ Rs.3,750/- per tonne of product	11,25,000
Surplus before taxes	84,875

8.0 **Return on Investment**

Return on equity capital	..	97%
Return on total capital	..	24%

9.0 **Employment**

Manager	-	1
Stenographer	-	1
Clerks	-	2
Labour		
Operators	-	2
Skilled workers	-	4
Semi-skilled workers		4
		14

10.0 **Location**

One paper carton unit can be proposed to be located either at Cuddalore or Porto Novo.

TARTARIC ACID FROM TAMARIND LEAVES

1.0 **Introduction**

Tartaric acid finds extensive use in the food and pharmaceutical industries. Present requirements of this chemical are being met by imports. The figures during the past years show that the import per year was in the range of nearly 300 to 350 tonnes valued at around Rs.2 million. Regional Research Laboratory, Jorhat, Assam has developed a process for manufacture of tartaric acid from tamarind leaves. The conventional process for manufacture of tartaric acid makes use of the bye-products from the wine industry. The process developed by the Regional Research Laboratory is ideally suited to Indian conditions. The districts of South Arcot and Thanjavur have a high concentration of tamarind trees. These are planted as shady trees all along the main roads. The leaves from these trees which are under public possession could be advantageously made use of in this project. Collection of fresh leaves is cumbersome job and therefore the zone for collection has to be fairly limited. With this in view, it is proposed that two plants each of 10 tonnes per annum capacity may be installed at both South Arcot and Thanjavur districts.

2.0 **Marketability**

Tartaric acid is an intermediate chemical in the food and pharmaceutical industry. Selling can be arranged directly to the customers or through chemical distributors or both.

3.0 Process description

The process consists of initially digesting tamarind leaves under controlled conditions. The next step is precipitatation of the acid as calcium tartarate, which is subsequently acidified with sulphuric acid. Calcium sulphate will be removed and the solution is subsequently concentrated to crystallise tartaric acid. It is further purified and decolorised.

4.0 Raw materials

The major raw material is tamarind leaves. The quantity to be collected per day would be about half a tonne. Other raw materials include sulphuric acid, lime and certain decolourising chemicals, which are available indigenously.

5.0 Plant and Machinery

Main items of the plant are the following:

1. Stainless steel digester	..	3 nos.
2. Plate and frame filter	..	1 no.
3. Neutralisation tank	..	1 no.
4. Wooden storage tank	..	6 nos.
5. Vacuum filter	..	1 no.
6. Tray drier	..	1 no.
7. Baby boiler	..	1 no.
8. Stainless steel pumps	..	2 nos.

6.0 Investment analysis

Capacity: Annual production of tartaric acid - 10 tonnes.

Investment

		Rs.
i. Land - 50 cents @ Rs.200/- per cent	..	10,000
ii. Building - 20 m x 10 m @ Rs.250/sq.m.	..	50,000
iii. Erected plant cost	..	2,00,000
Total	..	2,60,000

			Rs.
(b) Working capital			15,000
Total investment			2,75,000
Equity capital	-	Rs. 68,750	
Loan capital	-	Rs. 2,06,250	
		Rs. 2,75,000	

7.0 Annual cost of production

Annual production - 10 tonnes of finished products.

(a) Raw materials		
i. Tamarind leaves 130 tonnes @ Rs.300/- per tonne		39,000
ii. Lime, sulphuric acid and other chemicals		20,000
(b) Utilities		14,800
i. Fuel oil 30 tonnes @ Rs.360/te.	10,800	
ii. Power - 19,200 kWh	3,000	
iii. Water 300 x 9000 litres	1,000	
(c) Operating supplies		200
(d) Maintenance @ 2% on plant cost		4,000
(e) Salaries and wages @ Rs.2500/month		30,000
(f) Depreciation @ 10% on plant and 5% on bldg.		22,500
(g) Interest on borrowed capital @ 10%		20,625
(h) Packing		6,000
(i) Overheads		15,000
Total		1,71,925

8.0 Sales realisation

Sales realisation from 10,000 kilos of product @ Rs.20/- per kg. ex-works	2,00,000
Net surplus	28,075

9.0 Return on Investment

Gross profit before taxes	28,075
Gross profit as a percentage of equity capital =	41%
Gross profit as a percentage of total investment =	10%

10.0 Direct Employment

Manager-cum-chemist	-	1
Accounts Clerk	-	1
Typist	-	1
Peon	-	1
Operators	-	2
Unskilled workers	-	4

11.0 Indirect Employment

Opportunities for indirect employment would arise by way of collection of leaves and transporting the same to the factory site.

12.0 Location

Tindivanam in South Arcot is a possible area for locating the plant.

ELECTROPLATING UNIT

1.0 Introduction

Electroplating has a very significant position as a service industry. Large-scale industrialisation brings in its train, the need for a variety of services to be locally available. From this point of view, it has been found desirable to recommend at least one electroplating unit each in the districts of South Arcot and Thanjavur. These units are to be planned in a modern way suitable to handle even large articles like transport bus parts. The proposed units would be in a position to cater to the requirements of transport workshops, cycle manufacturers, scooter and moped manufacturers and many other units presently under implementation in various parts of the State.

2.0 Process description

The technology involved is very simple and consists in preparing suitable electrolytic baths for various types of coatings and dipping the articles after surface preparation in the bath for a sufficiently long time with an applied voltage for electro deposition. It is important that surface is properly cleaned with the aid of chemical prior to electro deposition. Normally steel components are bright nickel plated prior to bright chromium plating and sometimes copper is also plated as an undercoat to nickel. The proposed unit has facilities for copper, nickel and chromium plating.

3.0 Raw materials

The raw materials mainly include; copper, nickel and chromium salts. There are also cleaning compounds containing certain additives which are available in the market under various trade names, which can be used for surface cleaning.

4.0 Plant and Machinery

Main items of equipment are the following:

1. Pre and post treatment tanks suitably lined and with appropriate dimensions fitted with wooden frame insulators, pipes and connections.
2. 2 nos. - of copper plating equipment of size 2400 x 900 mm with suitable lining, agitation coil, wooden frame insulators, set of anode/cathode, copper pipes and connections, heaters, rotary air pump and rectifier 8V/750 A.
3. Nickel plating equipment of size 2400 x 900 mm with wooden frame insulators, anode/cathode connections, agitation coil, filter and rectifier 8 V/500 A.
4. Chrome plating equipment size 2400 x 900 mm with wooden frame insulators, set of anode/cathode, copper pipes and connections, heaters, fume exhaust, and rectifier 7.5 V/1000 A.

5.0 Investment Analysis

Capacity : Electroplating surface area per day
= Approximately 5 sq. metres.
(40-45 pieces per 8 hours shift)

Approximate annual output = 1500 sq. metres of plated surface.

Investment	Rs.
(a) Fixed capital	
(i) Land - 25 cents @ Rs.200/- per cent	5,000
(ii) Built up area - 2 nos. sheds each of size 16 M x 10 M @ Rs.250/- per sq. metre	80,000
(iii) Erected plant cost	1,50,000
Total	2,35,000

		Rs.
	(b) Working capital	25,000
	Total investment	2,60,000
	Equity capital - Rs. 65,000	
	Loan capital - Rs. 1,95,000	
	2,60,000	

6.0 Annual Working Results

Output : 1500 sq. metres of plated area

	Rs.
(1) Cost of chemicals etc.	40,000
(2) Power (60000 kWh)	9,000
(3) Salaries and wages	90,000
(4) Maintenance @ 2% on plant cost	3,000
(5) Depreciation @ 10% on plant cost and 5% on building	19,000
(6) Interest @ 9% on borrowed capital	17,550
(7) Overheads	20,000
	1,98,550
Selling and administrative expenses including third party commission, promotion expenditure etc.	50,000
Total	2,48,550
say Rs.	2,50,000

7.0 Profitability

Gross realisation @ Rs.200/- per sq. metre 3,00,000

Surplus 50,000

8.0 Return onInvestment

Gross surplus as a percent of total investment = 19%

Gross surplus as a percent of equity capital = 77%

9.0 Direct Employment

Managerial - 2

Skilled and Unskilled - 10

10.0 Location

Cuddalore, Neyveli or Vadalur can be the possible locations for an electroplating unit.

TWO HECTARE DAIRY FARM PROJECT

1.0 Introduction

The high yielding agricultural technology has already yielded spectacular results in grain production in our country. The emphasis is now gradually extending over to other agricultural enterprises like dairy farming which can give a boost to the income of small land holders also. Dairy farming can be very profitable in small holdings with high yielding animals and intensivefodder cultivation. A large number of small dairy farms are recommended for both districts of South Arcot and Thanjavur with a view to benefit a large number of people and more dispersed areas. Since these districts are predominantly agricultural areas, farmers can be easily prodded to take to dairy farming and there should be scope for a large participation in this activity. Therefore as a significant measure towards the improvement of the economy of these two districts, we recommend a large number of two hectare dairy farms to be started at all strategic centres. It is generally believed that the cattle population in these districts is very much deficient in calcium. In order to counteract such deficiency food concentrates with extra amount of calcium may be prescribed for the proposed dairy farms. A typical two hectare project is discussed below, based on data furnished by the National Dairy Research Institute, Bangalore.

2.0 Land

Two hectares of well drained and levelland is required.

Land is divided into eight plots of 1/4 hectare each. Each plot of 1/4 hectare is surrounded by a raised boundary with irrigation channels. A surface

well should be dug in the centre of the plot to provide irrigation water to the fodder plots. Water is lifted by an electric pump fitted at ground level in a small shed.

3.0 Livestock

Twenty young cross-bred cows, between 3-4 years of age in first or second lactation recently calved and yielding about 15-20 litres of milk per day in the peak period should be bought from some of the breeding centres. Livestock breeders' association of Bangalore is supplying such animals. In Coimbatore also there is a breeding centre. The cross-bred cows will yield on an average of about 2500 litres of milk in a lactation of about 300 days.

4.0 Housing

The cattle shed shall be built at the edge or centre of the two hectare cultivated area. The cattle housing can be very simple, as the region concerned does not have extreme climates. It should facilitate proper air movement, but protect the cattle from rains. For a herd of 20 cows and two bullocks the loose housing system shall consist of a shed 40 x 15 ft. Along the 40 ft. length, on one side, shall be a 2½ ft. wide feed manger with 5 ft. wall on the outside which acts as one of the boundaries. All along the feed trough there shall be a 10 inches wide water trough to provide clean drinking water to the livestock. The remaining 12 ft. of the 15 ft. wide shed shall be paved with brick sloping away from the manger. There shall be

an open paved area of 40 x 35 ft. surrounded by 5 ft. walls, with one gate for the animals. The roof of the covered shed can be put on brick pillars holding wooden rafters and asbestos roof sheets.

5.0 Fodder Production

Green fodder is most essential for high yielding animals to maintain their health and milk yield. Cultivation of fodder can be on a rotational basis. One hectare shall be devoted to rotation, maize + cowpea followed by maize + cowpea + teesinte followed by berseem + mustard. The other hectare shall be given to the rotation, maize + cowpea followed by maize + cowpea, followed by again maize + cowpea, followed by oats + mustard. Once in every seven days, a quarter hectare of land will be prepared for the sowing of subsequent crop. The above scheme will involve harvesting a plot of land 1/6 to 1/7 of quarter hectare each day, chaffed and fed to provide adequate green fodder for the cows and bullocks per day.

6.0 Concentrate supplement

On an average a cross-bred cow giving 8 kg. of milk will need additional nutrients in the form of 1-2 kg. of concentrate mixture, over and above the green fodder. Thus for 20 cows there will be a requirement of 20-40 kg. of concentrate mixture per day. The variation will be depending on the seasons and the type of fodder. Total concentrate mixture requirement for 20 cows and two bullocks for one year will be slightly less than 140 quintals.

7.0 Miscellaneous requirements

A number of minor items like buckets, milking pails, milk cans, wheel barrows etc. are required. Fodder cultivation requires an electric pump and motor, chaff cutter and other agricultural implements. All these together will cost only about Rs.10,000/-

8.0 Labour

Four daily paid labour can handle the operations in the dairy farm. The owner may function as the Manager and supervisor of the farm.

9.0 Economics of the Project

		Rs.
I. Capital Expenditure		
A. Livestock		
Cost of 20 cows @ Rs.3,000/- each		60,000
B. Building, sheds, wall and pump house		20,000
C. Other miscellaneous items		10,000
		90,000
II. Recurring Expenditure		
(1) Cost of seeds and fertilisers		4,000
(2) Cost of concentrates 140 quintals @ Rs.100/- per quintal		14,000
(3) Labour		7,200
(4) Depreciation		12,000
i. Livestock @ 15%	9,000	
ii. Building @ 10%	2,000	
iii. Other items @ 10%	1,000	
	12,000	
(5) Miscellaneous expenditure		2,000
(6) Interest on investment @ 10%		9,000
Total		48,200

III. Annual Income

Average lactation per cow is 2500 litres with calving interval of 15 months. For every 15 months 20 cows will yield 50,000 litres of milk. Therefore for 12 months yield of milk shall be 40,000 litres.

40,000 litres of milk @ Rs.1.40 per litre .. Rs. 56,000

Net Return .. Rs. 7,800

TRIPHENYL AND TRICRESYL PHOSPHATES

1.0 Introduction

1.1 Triphenyl Phosphate is an important plasticizer used in photo-film industries. The requirement of M/s. Hindustan Photo Films alone is about 200 tonnes per annum, which is completely imported. Closely related tricresyl phosphate is produced by the same method excepting that the raw material is cresol instead of phenol. The use of this also is in the photo film industry and the demand totals to about 300 tonnes per annum at present.

1.2 Neyveli Lignite Corporation has many bye-products, out of which multivalent phenol and cresol mixtures figure prominently. A profitable utilisation of these by-product would be possible by setting up an industrial unit to manufacture triphenyl phosphate and tricresyl phosphate in the vicinity of Neyveli. Hindustan Photo Films, the main consumer of these products also is located in Nilgiris District of Tamil Nadu, which also is within easy reach.

2.0 Process description

2.1 Tricresyl phosphate is produced by reacting cresol mixture with phosphorous oxychloride. The reaction gives 80-85% yield of tricresyl phosphate. In a similar way triphenyl phosphate is produced by substituting cresol mixture with phenol. Conditions of reaction slightly vary, but the equipment are mostly same. Therefore the process has good amount of flexibility.

2.2 Regional Research Laboratory, Jorhat, Assam has developed a process for the above and is available for licensing with the National Research and Development Corporation. This report is

based on the data developed by the Regional Research Laboratory, Jorhat.

3.0 Raw materials

Phenol and cresol are produced by Neyveli Lignite Corporation and could be procured from them. Phosphorus Oxychloride is manufactured by some Indian firms like Excel Industries, Bombay and Atul Products, Bulsar.

4.0 Plant and Machinery

The plant is very simple and consists of a few tanks, agitators, pumps, motors etc. only.

5.0 Investment analysis

Basis: 30 tonnes of Triphenyl Phosphate per annum.

	Rs.
(a) Fixed Capital	
(i) Land 25 cents @ Rs.200/- per cent	5,000
(ii) Building 16 m x 6 m shed @ Rs.250/sq.m.	25,000
(iii) Erected plant cost	1,20,000
	1,50,000
(b) Working capital	75,000
(c) Total capital investment	2,25,000

Equity capital .. Rs. 75,000
Borrowed capital .. Rs. 1,50,000

6.0 Annual cost of production

(1) Raw materials	2,54,000
(2) Utilities	6,000
(3) Salaries and Wages	30,000
(4) Maintenance	3,600
(5) Depreciation	13,250
(6) Interest	15,000
(7) Overheads	10,000
Total	3,31,850

7.0 **Profitability**

	Rs.
Sales realisation - 30 tonnes @ Rs.15/- per kg.	4,50,000
Less sales expenses	25,000
Surplus before taxes	93,150

(Price of Rs.15/- assumed, whereas imported product costs around Rs.24/- per kg.).

Note:

The process for tricresyl phosphate is the same except that phenol costing Rs.4/- per kg. is replaced by cresol costing Rs.2.80 per kg. The cost of production of tricresyl phosphate will be about Rs.1.50 cheaper than that of triphenyl phosphate.

8.0 **Employment**

This unit would provide in all employment for six workmen, a Manager and three office staff.

9.0 **Location**

By virtue of the raw material availability, Neyveli itself is recommended for location of this industry.

BISCUIT MAKING PLANT

1.0 Introduction

Consumption of biscuits is growing rapidly in our country. According to a recent estimate, an urban population of about five lakhs would consume on an average of 1 tonne of biscuit per day. The rural market also absorbs a sizable quantity of biscuits, though not the sophisticated and costly variety. There is not much of manufacturing of biscuits in the organised sector as far as South Arcot and Thanjavur districts are concerned. Therefore a factory scale biscuit plant has good scope to be set up in South Arcot district.

2.0 Process description

Manufacturing process consists of the following operations.

(i) Raw materials except flour are preparatorily mixed in a cream mixer. Materials used at this stage are sugar, shortening, salt, glucose, starch, skim milk etc. according tothe kind of biscuit.

(ii) Materials pre-mixed as above are further mixed with flour.

(iii) The mixed dough is put into the rotary moulding machine for making biscuit design and sent to an oven for baking.

(iv) Biscuit is baked on a wire-mesh belt running in an electrically heated oven. Time of baking is controlled by adjusting the speed of the wire-mesh belt.

(v) After baking the biscuits are cooled on a cooling conveyor connected to the oven.

(vi) The biscuits are graded and packed manually.

3.0 Raw materials

Raw materials required for making biscuits are flour, sugar shortening salt, ammonium carbonate, glucose, skim milk an flavouring agents. All these ~~xrx~~ raw materials are availab indigenously.

4.0 Plant and Machinery

Important items of machinery and equipment required for setting up a biscuit plant are wire-mesh belt oven, rotary cream mixer, dough mixer, conveyor etc.

5.0 Capital Investment Analysis:

Capacity - Production per day - 920 Kg per 8 hour shift (i.e. 275 tonnes per year)

		Rs
(a) Fixed Capital		
i) Land - 50 cents @ Rs 200/cent		10,000
ii) Building - 500 m^2 @ Rs 250/m^2		1,25,000
iii) Plant and Machinery (erected cost)		4,00,000
		5,35,000
(b) Working capital		2,00,000
(c) Total Investment		7,35,000
Equity capital	Rs 1,85,000	
Loan capital	Rs 5,50,000	

6.0 Annual Expenditure

(a) Raw materials	Rs
i) Flour - 220 tonnes @ Rs 800/tonne	1,76,000
ii) Sugar -42 tonnes @ Rs 1,800/tonne	75,500
iii) Shortening 42 tonnes @ Rs 4,000/tonne	1,68,000
iv) Glucose 8 tonnes @ Rs 4,000/tonne	32,000
v) Skim milk 12 tonnes Rs 2,500/tonne	30,000
vi) Flavours, perfoumes, etc.	1,00,000

		Rs.
	(b) Utilities	45,000
	i) Power - 115 x 6 x 300 hw Rs.41,000 ii) Water Rs. 4,000	
	(c) Salaries and wages	75,000
	(d) Packing @ 50 paise per kg. of biscuit	1,37,500
	(e) Maintenance @ 5% on the plant cost	20,000
	(f) Depreciation @ 10% on plant and 5% on bldg.	46,250
	(g) Interest @ 9% on borrowed capital	49,500
	(h) Overheads	80,000
	Total annual expenditure	10,34,750

7.0 Sales Realisation

	Rs.
Sales realisation at ex-factory price of Rs.4.50 per kg. of biscuit	12,38,000
Gross margin	2,03,250
Gross margin as a percentage of equity capital before taxes	11%

8.0 Employment

The above unit would provide employment for 25 persons. A Food Technologist-cum-Manager along with 4 skilled operators and 18 workers would be adequate to run the unit. The packing section can absorb some female workers. In addition to the direct employment in the factory, the sales net-work would offer full and part time employment to some more people.

9.0 Location

This plant may be set up at Chidambaram or Villupuram as proper infrastructural facilities are available in these locations.

WATER FILTER CANDLES AND FILTER FLASKS

1.0 Introduction

Drinking water, obtained either from wells or from public supply is not completely safe from bacterial and other contamination. It is very much desirable to process the water in each house before it is used for drinking purposes. One of the conventional methods of domestic water treatment is to filter it through beds of gravel and charcoal to remove suspended impurities followed by boiling to kill the bacteria. This process can be conveniently substituted by the use of domestic water filter candle and this is becoming popular due to its compactness and efficiency. In the rural and urban areas of Tamil Nadu, filter candles can be easily popularised and marketed with some amount of propaganda and active selling efforts. This scheme is suggested with a view to introduce a new product which can find acceptance in both the rural and urban markets of Tamil Nadu. The unit can be profitably located at Vridhachalam since this is a centre for clay based industry.

2.0 Process description

There are three types of filters that can be manufactured in the unit, viz. filter candle, portable filter flask, Indian cartridge water filter.

(a) Filter candle: Suitable grade of clay, a binder clay, ion exchanger and bacteria inhibitor are ground separately and passed through sieves to obtain the required particle size. Appropriate quantities of these substances are then blended and mixed with an aqueous solution of pure size modifier to obtain a slurry of proper consistency.

Candles are then prepared from this slurry in specially designed moulds, left for drying overnight and then heated in a furnace at controlled temperature for specified period where light buff coloured candles are obtained.

(b) Portable filter flask: Suitable size cartridge is fitted into a small two compartment flask. Such types of portable filter flask caters to the need of tourists, army etc.

(c) Instant cartridge water filter: The instant cartridge water filter has been designed to get sparkling clean water from the water tap directly. This cartridge has an advantage of increased water through put and may be specially useful in kitchens etc. where water is to be used for cooking purposes. The process for the above items, has been developed by the Regional Research Laboratory, Jorhat and is available for utilisation through National Research Development Corporation. This report is based on the process developed by R.R.L., Jorhat, Assam.

3.0 Investment Analysis

Basis : 50 filter candles per day
50 filter flasks per day
50 cartridge filters per day

300 working days in an year - Single shift working.

Investment	Rs.
(a) Fixed Capital	
i) Land - 50 cents @ Rs.200/cent	10,000
ii) Building - factory shed - 20 m x 8 m @ Rs.250/sq.m.	40,000
iii) Machinery and equipment	60,000
	1,10,000

			Rs.
	(b) Working Capital		70,000
	(c) Total Investment		1,80,000
	Equity capital	Rs. 50,000	
	Borrowed capital	Rs. 1,30,000	

4.0 Annual cost of production

			Rs.
(1)	Raw materials		1,95,000
	(a) Clay, pore modifier, ion exchanger etc.	Rs. 60,000	
	(b) Flasks 15000 nos. @ Rs.6/-	Rs. 90,000	
	(c) Cartridge 15000 nos. @ Rs.3/-	Rs. 45,000	
(2)	Utilities		5,000
(3)	Labour and supervision		25,000
(4)	Packing cost		12,000
(5)	Maintenance		1,500
(6)	Depreciation		7,500
(7)	Interest		13,000
(8)	Overheads		5,000
	Total		2,64,000

5.0 Profitability

	Rs.
Sales Realisation	
i) 15,000 filter candles @ Rs.5/- per candle	75,000
ii) 15,000 flasks @ Rs.10/- per flask	1,50,000
iii) 15,000 cartridges @ Rs.12/- per cartridge	1,80,000
Total	4,05,000
Gross Profit	1,41,000

High level of profitability in terms of capital invested shows that the unit can run profitably even at a lower output per day. Therefore, a lot of flexibility exists to vary the production commensurate with the demand.

6.0 Location This could be located at Vridhachalam in South Arcot District.

MANUFACTURE OF COLLAPSIBLE TUBES

1.0 Introduction

Importance of the role of packaging in modern industry needs no emphasis. In a highly competitive market, other things being equal, appearance of a product often sways buyer preferences. Also many of the perishable products need to be marketed in small quantities, so that the requirement of the buyer for a reasonable span of time is met with. These two factors along with the advent of cheap packaging materials have ushered in the era of collapsible tubes. The 1969 Directory of the Indian Institute of Packaging lists only nine units in the whole country of which eight are located at Bombay and one in Calcutta. Judging from their varied application, the collapsible tube industry seems poised to play a more active role in the industrialisation of the country in the years to come. It has become a part and parcel of the industrial scene so much so that its presence could be taken as a fair indication of the advance of consumer oriented industry in an area. This is evidenced by the mushrooming of these units in and around the metropolises. Thus there is good case for setting up a unit for manufacturing collapsible tubes in Tamil Nadu. The proposed unit will have a capacity of 18,000 tubes per shift of eight hours. The complete plant is supplied by some of the foreign firms, one of whom is represented by M/s. Industrial Plants and Equipment Company, Bombay.

2.0 Process layout

The starting material is aluminium slugs, specially manufactured in the country by M/s. Indian Aluminium Company Ltd. Calcutta. These slugs are extruded into tubes. Tubes are trimmed and threads cut on the nozzle. They are then lacquered, printed, dried and capped, all work being done on machines. The current proposal is only for a semi-automatic plant. Further automation, entailing additional investment, may be taken up when demand picks up. The plant is comprised of the following machines:-

1. Horizontal extrusion press
2. Greasing and tumbling barrel
3. Tube trimming machine
4. Tube annealing oven
5. Internal lacquering machine
6. Polymerising oven
7. Tube coating machine
8. Offset printing machine
9. Tube drying oven
10. Capping machine

3.0 Employment

The plant will employ the following personnel:

Manager	1
Clerks	2
Operators	20
Helpers	4
	27

.0 Location

This unit does not make any demands on its location. Considering the obvious advantages of proximity to the market, it is suggested that it may be located at Tindivanam which is only about 120 km. from Madras and falls on the Madras - Trichy route.

.0 Investment Analysis

Annual Production .. 16.2 million nos.

Investment	Rs.
Erected plant cost	33,37,000
Land	50,000
Working Capital	8,58,000
Total Investment	42,45,000

Equity Capital .. Rs.14,00,000
Loan Capital .. Rs.28,45,000

.0 Annual Cost of Production

	Rs.
Raw materials	
i) Aluminium pellets - 720 tonnes - @ Rs.7,000/te.	50,40,000
ii) Plastic caps - 162,00,000 nos. @ Rs.0.05/piece	8,10,000
Staff and Labour	72,000
Utilities	
Power 504,000 Kwh	76,000
Maintenance @ 3% on erected plant cost	1,00,000
Depreciation	
i) @ 10% on machinery	3,29,000
ii) @ 5% on buildings	3,000
Interest on loan capital @ 9%	2,36,000
Miscellaneous	3,00,000
Total	69,66,000

7.0 **Profitability**

Selling Price .. Rs. 0.50 per tube

	Rs.
Annual sales receipts	81,00,000
Annual expenditure	69,66,000
Gross profit	11,34,000

Return on Investment = $\frac{\text{Rs.}11,34,000}{\text{Rs.}42,45,000} \times 100 = 26.8\%$

Return on Equity = $\frac{\text{Rs.}11,34,000}{\text{Rs.}14,00,000} \times 100 = 81\%$

RECOVERY OF ZINC, CARBON ELECTRODE AND MANGANESE DIOXIDE FROM USED DRY CELLS

1.0 Introduction

Millions of dry cells consumed in the State are thrown away as waste at present after use. These cells contain valuable materials, such as zinc metal, manganese dioxide and carbon electrodes. These can be recovered by a simple process which does not involve much capital investment. It would be worthwhile to set up one unit each in Thanjavur and South Arcot districts for this purpose. It is advisable to undertake this venture as a cottage unit with no separate facility for land building etc.

2.0 Process description

Regional Research Laboratory, Jorhat, Assam, has developed a simple process for the recovery of metallic zinc, carbon electrode and manganese dioxide from used dry cells. The process consists of opening up the cells, thoroughly washing the metal and electrode off the impurities and recovering the metallic zinc by melting and subsequont quenching in water or casting. The process is unique in that about 95% of the zinc with a purity of 99.5% is recovered.

3.0 Process Economics

(a) Capacity : 1,000 cells/day

(b) Production : Zinc 10 kg. per day
Carbon Electrodes: 1,000 nos. per day.
Manganese dioxide: 40 kg. per day.

	Rs.
(c) Fixed Capital	15,000
(d) Working Capital (for 2 months)	5,000
Total capital	20,000

4.0 Annual Expenditure

	Rs.
(a) Raw materials - 3 lakh cells at 7 paise each	21,000
(b) Utilities	2,000
(c) Salaries and wages - 6 persons @ Rs.250 p.m.	18,000
(d) Packing cost	500
(e) Maintenance @ 3% on machinery cost	300
(f) Depreciation @ 10% on fixed capital	1,500
(g) Interest on loan capital (i.e.) Rs.10,000/- @ 9%	900
(h) Overheads	1,000
Total	45,200

5.0 Annual Returns

Sales realisation	
Zinc - 3,000 kg. @ Rs.12/- per kg.	36,000
Carbon Electrodes - 3 lakhs @ Rs.0.01 per piece	3,000
Manganese dioxide - 12,000 kgs. @ Rs.1.50 per kg.	18,000
Total	57,000
Less royalty @ 2½%	1,425
Less sales expenditure @ 5%	2,850
Net realisation	52,725
Profit	7,525
Profit as percentage of equity	11½%

6.0 Employment

This unit would be a cottage scale unit which can employ only six people.

7.0 Location

One unit each is recommended for the towns of Villupuram and Thanjavur.

CORRUGATED BOARD AND BOX MAKING PLANT

1.0 Introduction

Corrugated boards and boxes are increasingly utilised as a light weight packing material for many mercantile products. The fish freezing and packing industry developing along the coastal areas would consume a large number of corrugated boxes every day. The distilleries and breweries coming up in various parts of Tamil Nadu would throw up a large demand for corrugated boxes. Wooden boxes are increasingly being replaced by paper boxes by virtue of its light weight and facility for printing advertisements. In view of such expansion in demand for corrugated boxes in the State, there is ample scope for a unit to be set up in South Arcot for manufacture of this item.

2.0 Process description

2.1 Kraft paper is fed into the corrugating machine from which corrugated board is discharged. This is taken out in rolls and a liner is pasted over it in the pasting machine and sheets are cut according to the required size.

2.2 The boards are printed with the customer's blocks and is sent to the box making section. In the box making section, groves and slots are made on the sheets and necessary corner cuttings are made in the machine. Stapling of the edges is done on the stitching machine. Boxes can now be prepared by the customers by closing the flaps.

3.0 Plant and Machinery

Important items of machinery in the plant are a corrugating machine, pasting machine, cutting machine, rotary creasing and slotting machine, corner cutters, stitching, bending machine etc.

4.0 Raw materials

The main raw material is kraft paper. Other supplies include gum, printing inks, staples etc. All these are available indigenously.

5.0 Capital Investment Analysis

Capacity : 1 tonne of Kraft paper per shift

		Rs.
(a) Fixed Capital		
i) Land - 50 cents @ Rs.500/- per cent		25,000
ii) Building - 400 sq.m. @ Rs.250/- sq.m.		1,00,000
iii) Machinery		2,25,000
Total		3,50,000
(b) Working Capital		1,00,000
(c) Total Investment		4,50,000
Equity capital	.. Rs. 90,000	
Borrowed capital	.. Rs. 3,60,000	

6.0 Annual Expenditure

	Rs.
(a) Raw materials:	
i) Kraft paper - 300 tonnes @ Rs.3000/te.	9,00,000
ii) Operating supplies	50,000
(b) Utilities	
Power 40 kW x 8 x 330 x 15/100	16,000
(c) Salaries and wages - 15 persons @ Rs.250/- per monsem	45,000
(d) Maintenance @ 5% of erected plant cost	11,250

		Rs.
	(e) Depreciation @ 10% on plant and 5% on building	27,500
	(f) Interest @ 9% on borrowed capital	32,400
	(g) Overheads	50,000
	Total annual expenditure	11,32,150

7.0 Profitability

	Rs.
Sales realisation @ Rs.4.50 per kilo of finished product (Rs.4.5 per kilo is assumed as an average price of the boxes of various sizes)	13,50,000
Gross margin	2,17,850
Less sales expenditure @ 5% of the sales realisation	67,500
Net margin	1,50,350
Net margin as a percentage of equity	166%

8.0 Marketability

The selling price of Rs.4.50 assumed in the above calculation is much less than the rates quoted at present. Sales expenditure at the rate of 5% of the realisation has been substracted from the gross margin. Therefore, the net margin can be taken as a very safe figure, at the rated level of production.

9.0 Employment

This unit would provide employment for about 15 people including a Manager. All machine operators should be skilled persons.

10.0 Location

This unit may be located at Cuddalore with a view to meeting demand from the fish processing units and the brewery under construction in Pondicherry. This can also cater to the needs of the distilleries situated at Mundiyambakkam and Nellikuppam.

UTILISATION OF BY-PRODUCTS OF NEYVELI LIGNITE CORPORATION

.0 Neyveli Lignite Corporation situated at Neyveli, South Arcot District, is one of the largest Public Sector Undertakings of India and was formed to exploit lignite deposits of the region. While part of the lignite mined is used for power generation, the remainder goes to make domestic coke and fertiliser. In these operations, quite a few valuable by-products are formed, most of which are, at present, not processed further. Most of these by-products come from the Briquetting and Carbonisation section where the raw lignite is carbonised and briquetted to produce Leco - carbonised lignite briquetts. The following are the valuable by-products produced:-

1. Phenols
2. C-cresol
3. M.P. Cresol
4. Xylenol
5. Charfines
6. Neyveli Clay
7. Neutral Oil
8. Tar
9. Spent iron oxide
10. Magnesium Ammonium Ascenate
11. Fly ash

The products from 1 to 6 are sold to outside parties and are in good demand. Out of these products, phenol, cresols, xylenols and M.P. phenols are obtained from the middle oil and the gas liquor produced during the low temperature carbonisation of lignite. These products

are used as vital raw materials for many other chemical industries.

2.0 Some of the industries that can be started based on these byproducts are listed below:-

1. Bisphenol - A from Phenol
2. 2,4 - Diphenoxy acetic acid (2,4-D type) Weedicide .....from phenol
3. Salicylic acid from phenol
4. 2, Methyl, 4 Chloro, Phenoxy acetic acid (M.C.P.A.) type Weedicide from Ortho-cresol.
5. Activated charcoal from charfines
6. Activated earth from Neyveli clay.

Processes for the manufacture of the above products are available. While there is no doubt regarding their technical feasibility and economic viability, the immediate prospects for setting up plant for the above products are bleak as the continuous availability of raw materials are uncertain due to curtailed production in the B & C plant and a number of limitation in the availability of lignite according to the officers of NLC. However, it is understood that once the Corporation reaches the target of 6.5 million tonnes of lignite product (at the end of the proposed expansion of the mines, probably during 1977-80) they will be in a position to supply the above by-products.

3.0 The by-products, neutral oil and tar are used internally in the process steam plant. The electrolytically precipitated tar from B & C plant is a potential raw material for other industries. The following products have been developed as a result of work in the Central Laboratory of NLC.

3.1 Road Binder

A particular grade of road tar has been isolated from this tar by-product by the solvent extraction of the lignite tar using N. Hexane giving residual asphalts and N. Hexane insolubles. The N.Hexane solubes consist of paraffin wax (7-13%) and hydro carbon oils. It has been reported that detailed tests on the road binder have been made in collaboration with Highways Research Station, Madras and found good.

3.2 Wax from Neyveli Lignite Tar:

The Hexane solubles freed of the solvent is distilled to get the paraffin rich oil and a pitch. The paraffin rich cut is treated with acetone and chilled to get the waxes. The waxes thus recovered will be useful in the manufacture of candles, boot polish and water proof papers. The residual oil could be used as a furnace oil.

3.3 Blown Tar:

Air blowing of lignite tar at a temperature of 250° C. with or without catalysts yields a pitch with increased hardness, sp. gravity and higher softening. This pitch is being used as a base in the manufacture of anti-corrosive bituminous black paint after incorporating with suitable drier. One unit has been set up in the B & C plant for the manufacture of the paint on large scale. This plant could meet the internal demand for anti-corrosive paint and also sell to the extent of 10 tonnes per month.

3.4 Acid polymerised Tar Binder

Lignite tar when treated with H_2SO_4 yields a polymerise

product having a good binding property. The binding quality of the product has also been tested by the Central Laboratory, NLC and found to be satisfactory. The polymerised product when admixed with charfines and briquetted at an applied pressure of 510 kg/cm^2 and baked for 4 hours at 250° C. developed a strength of 100 kg/cm^2. The maximum binder concentrate used was 20%.

3.5 **Neutral Oil**

The neutral oil obtained after dephenolisation of middle oil is a mixture of aromatics, olifinic saturated and naphthane hydrocarbon and is a source for the recovery of heterogenous bases. The bases are recovered by extraction with 10% H_2SO_4. The acid layer is neutralised and the crude bases are extracted in benzene and distilled to recover the bases from the solvent. The analysis of the bases reveals that 60% of the total is comprising of picolins which are very useful in the manufacture of drugs. The sulphonation of aromatics and olifines in the oil yields a surface active compound, and the residual oil containing saturates and naphthenics generally conforms to specification for Aviation grades, jet fuels as laid down by U.S. Bureau of Mines.

The products described above have only been produced in laboratory scale and their commercial possibility will have to be explored by setting up pilot plants wherever necessary.

4.0 **Products from Phenol**

A wide range of products could be produced from phenol which is one of the byproducts from the B & C Plant. The following are a few of them:

a) Manufacture of Bisphenol-A.
b) Manufacture of Phenolic resins and moulding powders
c) Manufacture of salicylic acid
d) Manufacture of Pentachloro Phenol
e) Manufacture of Weedicides
f) Manufacture of photographic chemicals, detorgents, synthetic tannin etc.

4.1 **Manufacture of Bisphenol-A.**

The raw material required for the manufacture of Bisphonol-A are:-

i) Phenol
ii) Acetone
iii) Hydrochloric Acid
iv) A catalyser and
v) A solvent in small quantities.

Process Continuous stream of acetone is mixed with excess phenol followed by saturation of hydrochloric acid gas. The reaction mixture is distilled to remove phenol and HCl which are recirculated. The crude Bisphenol-A thus obtained contains some isomers which are removed by distillation. The hot distillate is then mixed with solvent under pressure and passed through a crystalliser. High purity Bisphenol-A is separated as crystals which is centrifuged out, dried and packed. The process technology can be obtained from Mitsui & Co., Japan or Scientific Design & Co., of U.S.A.

Uses This chemical is an important intermediate for the manufacture of Epoxy and Polycarbonate Resins which have a bright future in India.

Present Status It is reported that this is being produced in Bombay in small quantities but the production is not sufficient to meet the anticipated demand. The demand estimates of resins produced from Bisphenol-A for 1973-74 are reported to be as follows:-

Epoxy Resins	.. 1200 TPA
Poly Carbonates Poly Acetals etc.	.. 1000 TPA

The growth of demand for these resins are expected to increase in the coming year as well. Hence there is very good scope for setting up units for the production of Bisphenol-A in the Neyveli area depending on the availability of Phenol from the Neyveli Complex.

4.2 Manufacture of Salicylic Acid

The raw materials required for the manufacture of salicylic acid are:

i) Phenol
ii) Caustic Soda
iii) Carbon-di-oxide
iv) Sulphuric Acid.

Process Phenol is reacted with equimolar amount of hot aqueous caustic soda. The resulting solution is heated to about 130° C. and evaporated to dryness in a stirred autoclave. When the temperature is reduced to 100° C. dry CO_2 is introduced into the autoclave. After the desired level of CO_2 absorption is achieved

the charge is heated for several hours. The crude product obtained is distilled in equal amount of water and then filtered. Salicylic acid is precipitated by reacting the filterate with H_2SO_4. The precipitated salicylic acid is centrifuged and dried to give the technical grade product.

Uses The acid is used almost exclusively as a medicine and as an intermediate in the manufacture of medicines and pharmaceuticals such asaspirin (acetyl salicylic acid by the action of acetic anhydride on salicylic acid) and methyl salicylate (synthetic oil of winter green). It also finds application in the manufacture of some dyes and some resins, dusting powders, lotions and antiseptic ointments.

Present status

The production / demand figures of salicylic acid and its derivatives in India are as follows:-

Item	Capacity licensed as on 1.4.1968	Capacity installed as on 1.4.1968	Tonnes/year Target for 1973-74
	(tonnes/year)		
Sodium Salicylate	405	379	800
Aspirin	560	740	1000
Salicylic Acid	N.A.	N.A.	1870

Source: E.I.L. Report on "Utilisation of By-products of Neyveli Lignite Corporation".

4.3 Manufacture of Weedicides (2,4 - Dichloro Phenol)

Phenol can also be used for the manufacture of weedicides like 2,4 Dichloro phenol by direct chlorination under controlled conditions so that the reaction does not go beyond dichloro stage. Hydrochloric acid is obtained

as a by-product. Then the chlorinated sample is tested for degree of chlorination. It is then reacted with a 50% caustic soda solution to give the sodium salt of dichloro phenol used in the manufacture of 2,4-D. This type of weedicide is catching up in India only now and expected to rise fast. This has remarkable ability to kill broad leaf plants selectively without damage to crops. It is reported that this has sufficient residual life in soil to be useful for pre-emergence broad leaf weed control. This is commonly applied in the form of sodium salt, amine salt, ester formulations. It is reported that there is a gap of about 1750 TPA. Further all the approved capacity has not been installed as yet and there is every likelihood of the gap becoming wider in the year to come if part of the approved capacity is not implemented.

5.0 Products from O-Cresol

Ortho-cresol which is also another important by-product of Neyveli Lignite Corporation, can be the raw material for the manufacture of (a) Resins (b) Phenol phenate and (c) Chloro compound and weedicides. O-cresol can be processed to give 2-Methyl - 4-Chloro Phenoxy - Acetic Acid (MCPA) which is used as weedicide extensively. Further it is also considered to be a safer weedicide than the 2-4-D weedicide earlier discussed. This is used in weed control in grains. There appears to be scope for establishing capacities for the production of 2000 tonnes per year of 2.4-D or MCPA type weedicide. Therefore depending on the availability of O-cresol from Neyveli, a weedicide manufacturing unit can be set up in Neyveli.

Another by-product available from the Neyveli Complex is Xylenol. This is a starting material for the manufacture of Rosins, Disinfectants etc. Xylenols from B & C plant are defficient in meta isomer. Hence PCMX, DCMX and such products could not be obtained in good yields. Xylenols can be chlorinated directly with gaseous chlorine to yield dichloro-xylenols (mixed). The yield is about 90%. This product has been found suitable for formulation of high RWC black phenyls. It is reported that the laboratory-scale operations have been scaled up and that a scheme is also ready for setting up a unit for the production of 1 to 5 tonne per month. Further trial sales also are reported to have been made and the grade to be found acceptable by black phenyl manufacturers.

6.0 Products from multivalent Phenols:
Multivalent Phenol, a by-product in the B & C Plant, yields on fractional distillation.
(i) a rich catechol cut (ii) high boiling cut and (iii) Pitch. The catechol finds many applications in pharmaceutical, photographic and leather industries.

6.1 Pyro-catechol The catechol rich cut has been further processed in the laboratory to give pyrocatechol (technical grade) which is used in the manufacture of rubber chemicals like para-tert. butyl catechol etc.

6.2 Syntan 'Syntan' (synthetic tanning agent) is a chemical useful in the leather industry. The Central Leather Research Institute, Adayar, has developed a process for the manufacture of 'Syntans' from M.V. Phenol.

6.3 Writing inks Multivalent phenols can also be used in the manufacture of writing inks, substituting for gallic and tannic acids. The M.V. phenols react with iron salts to give dark coloured permanent stains on paper similar to Ferro-Tarno gallat. Using this property permanent writing and fountain inks have been prepared and are being used in the Neyveli Lignite Corporation. Use of M.V. phenol for manufacture of inks would help avoiding import of tannic and gallic acids.

The M.V. phenol residual pitch is a glossy brittle solid with a softening point 98-99° C. It is soluble in alcoholic, ketonic and ester solvents. It is insoluble in hydro carbon solvents. This can be used for the manufacture of insulating varnish and in moulding powder formulations.

Activated Carbons from Carbonaceous Wastes

Manufacture of granular active carbon

The winkler ash, which is a waste product from fertiliser plant contain about 70-80% of combustibles and has a size 0.5-3 m.m. This can be used for the manufacture of activated carbon. This finds use in the decolorisation of vegetable oils, sugar, chemical and pharmaceutical solvents and in water treatment and is also used in removing undesirable odours and for the recovery of solvents in chemical processing and for gas purification. It is mainly classified as the decolorising type and the gas adsorbant type. It is reported that the Central Laboratory, NLC, has developed a process to convert this into granular active carbon, suitable for use in water treatment plants. Powdered active carbon developed

from winkler ash has been reported suitable for use in oil and vanaspathi industry. High quality, decolorising carbon with low ash content, desired pH high absorption and decolorising values have been reported to be developed from winkler dust. Possibilities of manufacturing several grades to suit specific requirements of chemical, pharmaceutical and food industry (e.g. Glucose etc.) are also envisaged.

8.0 Production of activated earth from mines over-burden

Selected over burden in the lignite mines contains about 40% clayey material. This clay can be utilised to evolve activated earths for use as a pesticidal agent and as a decolorising agent. The Central Laboratory, NLC, appears to have already produced a Bio-active clay. It is reported that based on 5 tonne/day of the finished material, the production cost will be around Rs.450/- per tonne on an investment of about Rs.5.6 lakhs. It is possible to fabricate all the equipments needed indigenously.

9.0 Arsenic Trio-oxide from Magnesium Ammonium Arsenate

Magnesium Ammonium Arsenate is a waste product from the fertiliser plant. A process has been successfully developed in the Central Laboratory for the manufacture of Arsenic Trioxide from the waste Magnesium Ammonium Arsenate by reducing it with Sulphur-di-oxide. The recovery of Arsenic Trio-oxide is reported to be around 80%. Arsenic-tri-oxide is used in the gas purification plant. This is an imported chemical and its manufacture from a waste product will save foreign exchange to a considerable extent. This can be used in the manufacture of insecticides also.

10.0 Fly-ash utilisation

It is reported that over one lakh tonnes of fly-ash came out every year as a dry fine powder being the residue left after burning pulverised lignite as fuel in the boilers of the Thermal Power Station. Fly-ash is porzzalanic in character.

(i) Fly ash can be used in replacement of cement:
upto 20% in plain cement concrete
upto 30% in plastering
upto 40% in masonry work and building blocks

It is reported that it has been used as a partial replacement of cement in the construction of dams viz. in Idikki, Kakki Dam Projects of Kerala Electricity Board.

(ii) In the sub-grade work in road formation in Neyveli and between Ramoswaram and Dhanushkodi on an experimental basis.

(iii) In the manufacture of building blocks

(iv) In the manufacture of insulation bricks

(v) In the manufacture of distemper as a base replacing white cement.

(vi) In the manufacture of a cleaning compound utilising alkaline characterists etc.

10.1 Port land Pozzolane Cement

Fly ash, it is reported, can be used upto 25% in inter-grinding with clinker to produce portland pozzolane cement conforming to I.S. Specification 1764/1962. Neyveli Lignite Corporation is reported to have supplied about one lakh tonnes of fly ash to M/s, India Cements and M/s. Dalmia Cements for the manufacture of Pozzolane portland cement.

10.2 Building Bricks

It is understood that fly-ash insulation bricks manufactured at Neyveli are found to be quite good in performance and considerably cheaper than commercially available insulation bricks. About 25,000 nos. of these have been reported to be used in the erection of the 100 M.W. units as well as during maintenance on the older units. It is also learnt that the entire maintenance requirements of insulation bricks of the project will be met by local manufacture.

Method of manufacture: Selectively sieved fly-ash is mixed with good quality quick lime and aluminium powder and then cast into insulation bricks which after curing are suitable for use as an intermediate backing bricks for refractories in furnaces.

10.3 Cleaning compound

A general purpose cleaning and polishing powder has also been developed from fly-ash (process under patent).

10.4 Distemper

Dry distemper powder in different colours have been developed. (process under patent).

10.5 Other uses

10.5.1 In addition to the above products that could be made from fly-ash, it is used for the following purposes:

In Agriculture: Fly ash can be used as an effective soil conditioner in certain soils to improve moisture retention and as a filler in fertiliser mixtures.

10.5.2 It can also be used in construction of roads, pavement etc. Fly ash and 'Fly-ash-Alum' mixtures are found to be useful in treatment of tensid water.

11.0 Utilisation of 'Nekolin'.

Nekolin, a high quality china clay, produced in the clay washing plant of NLC is extensively used in the manufacture of electrical insulators, sanitary-ware, insecticides, rubber-casts, textiles, paper ceramic tiles, ultramarine blue, pencils, crokery, filler in fertiliser and medicicines, detergents in soaps etc.

NEYVELI LIGNITE CORPORATION LIMITED

BRIQUETTING AND CARBONISATION PLANT

YIELD OF BY-PRODUCTS IN B & C PLANT

Sl. No.	Product	Yield for 1970-71 tonnes	Maximum yield at 100% capacity - Tonnes per year
1.	Tar	16900	33800
2.	Neutral Oil	1780	3550
3.	Carbolic acid	670	1335
4.	Meta para cresol	380	749
5.	Ortho cresol	94	187
6.	Xylenol	36	71
7.	Multivalent Phenol	190	380
*8.	Fraction 220° C.	5500	11000
9.	Charfines	51500	103000

* (This being mixed with tar from Carboniser).

3.0 DEVELOPMENT POSSIBILITIES

3.1.0 Perspective

The approach towards the evolution of a sector-wise plan for the economic development of a backward district varies depending upon the nature and magnitude of the problems faced by the district's economy. But, basically, the theory of a balanced sectoral growth has to be the focal point of planning the district development. The major factor that guides the evolution of the strategies for development will be the maximum utilisation of the resources that could be generated within the district. The industrial programmes emanating from the approach will be in the nature of 'processing industries'. To make available resources in sufficient quantities to feed these industries, resource development programmes have to be launched. Most of these programmes pertain to the agricultural sector. The economic advantage of this strategy is that while agricultural development takes place, the scope for industrial development is enhanced. As a result, the sectoral balancing system comes into operation without undermining the existing structure of the economy all of a sudden.

3.2.0 Agricultural Development

3.2.1 Agriculture is the mainstay of the economy of the South Arcot district. Hence, the economic development of the district has an agricultural bias and no

overall progress will be possible unless significant development is achieved in this sector. South Arcot is a surplus district in foodgrains production. A large portion of its cultivated area is irrigated, and there is widespread use of fertilisers and pesticides. Cultivation practices are satisfactory. As a result of these favourable factors, the average yields of important crops are slightly higher or at par with the State average. Since the district is blessed with all endowments of nature, the only strategy required is proper utilisation of the favourable factors by the various agencies functioning in the agricultural sector to achieve massive yields from the different crops grown. At present, the major agro-based industry of the district is manufacture of sugar and allied products. There are four sugar factories situated in Vridhachalam, Kallakurichi, Cuddalore and Villupuram taluks. Rice mills and oil mills are the smaller agro-based industries functioning in various places. Further industrialisation can be thought of only by improving the existing yields and introducing new commercial crops to provide sufficient raw material for new industries.

3.2.2 The multiple cropping programme is already functioning in South Arcot district with the object of increasing agricultural production making use of the existing land and irrigation resources to the fullest extent possible. The scheme is now in the critical stages

and its success depends upon the enthusiasm shown by the cultivators. It has to be pointed out in this case that mere fixation of physical target is not enough. What is needed is a demonstration of various components of a sound and realistic multiple cropping programme in terms of organisation, physical inputs, financial resources, technical support and infrastructure like marketing, processing, storage, transportation and communication facilities. The recommended new cropping pattern for South Arcot is given in the chapter 'A programme for improvements to existing crops and introduction of new crops'. It is expected that the regulated markets in the district can help the disposal of the produce of the new crops to be introduced in the district. The major recommendations for a new cropping pattern for South Arcot covers jute cultivation in Porto Novo, Melbhuvangiri and Kurinjipadi blocks, tapioca cultivation in Kallakurichi taluk, sisal plantations in forest lands of Gingee and Thirukoilur taluks, sericulture in Kalrayan hills of Kallakurichi taluk, sunflower cultivation in (i) rice fallows in Chidambaram and Cuddalore taluks (ii) as a dry crop in groundnut areas of Vridhachalam and Kallakurichi taluks. Other general programmes suggested are digging borewells, deepening existing wells and installing pumpsets. Intensive propaganda will have to be made to motivate the farmers to avail the loan facilities provided for irrigation purposes and thus improve crop yields through better irrigation.

Quality seeds, fertilisers, pesticides, plant protection equipment and agricultural machinery for hire should be made available for the farmer in time from well organised Agro-Service Centres. To begin with, one Agro-Service Centre for every Panchayat Union and every Municipality is recommended by the study team. The estimated outlay for implementing the agricultural development programmes will be around Rs.300 lakhs as fixed capital and Rs.1676 lakhs as working capital. These programmes will provide employment opportunities for about 1254 persons in the skilled and professional category and 1,01,610 in the unskilled and semi-skilled catogory of workers.

3.3.0 Fisheries Development

The object of fishery development programmes should be to aim at a progressive increase in the catch of fish which will necessarily have its forward and backward linkages like port development, mechanisation, processing, canning etc. which in turn gives rise to employment opportunities and income generation in the district. Considerable scope exists for the development of marine fisheries in South Arcot district. Any programme for fisheries development in the district should begin with developing fishing harbours with adequate facility for landing and berthing of fishing vessels and supply of essential requirements including repair and maintenance facilities for the economic and efficient operation of fishing vessels. Porto Novo

has abundant scope to be developed into a fisheries complex. This could be done by developing Porto Novo as an excellent fishing harbour with all related infrastructural facilities like boat building yard, repair workshops, ice plants and cold storage facilities. Such a scheme will induce many entrepreneurs to set up fish processing and canning industries around the port. The area around Cuddalore is considered a high productivity area for shrimp of large size grade, rock lobsters, perches and breams. Lobsters have very good export potential and therefore detailed investigation should be carried out for the commercial exploitation of these resources. It has been revealed that oyster culture and collection of pearl and chanks have abundant scope all along the east coast. A programme for research and exploitation of these marine wealth could be organised on Cuddalore coast. The fish based industrial possibilities suggested in South Arcot district are (a) processing shark fins and extraction of shark fin rays (b) fish maws (c) speciality products from fish and prawn (d) manufacture of Chitosan from prawn shell waste (e) soup powder from trash fish (f) shark flesh as fillets (g) fish ensilage manufacture and (h) fish meal plant. The total estimated cost of the suggested programmes for fisheries development in the district works out to about Rs.245 lakhs. The employment potential for these projects will be around 1,455 skilled and 2,010 unskilled workers.

3.4.0 Animal Husbandry:

Dairy development on scientific lines is a pressing need for South Arcot district, where it stands in sharp contrast to the well developed agricultural sector. Although dairy development programmes do not create any significant increase in direct employment opportunities, they do help in reducing the degree of unemployment situation among the rural population. Moreover, some of the animal husbandry activities such as piggery and poultry farming need less investment to start with and are quick to yield returns. Higher production in this sector will also provide scope for setting up a variety of industries in the district. The most practical programme for cattle development in this district would be a scheme of mass upgrading according to which the local bulls are to be replaced with bulls of some outside breed, suited to local needs and conditions. No effective breeding programme will bring the desired result unless arrangements are made for providing adequate quantities of nutritious foods. Two cattle feed units are suggested for the district besides the development of many green fodder farms. Rearing of special varieties of chicken for meat has got immense possibilities in this district and therefore, it is suggested that one Broiler Farm with a capacity for rearing 500-1000 birds be set up in Villupuram. Apart from the development of the existing farm at Chinnasalem, one more large-scale livestock farm is recommended to be established at Kurinjipadi. This

Farm may be organised on the pattern of the Orathanad Farm in Thanjavur district. Establishment of a Pasteurisation Plant at Cuddalore with a capacity of 20,000 litres should be taken up on priority basis. Simultaneously, the working of the Milk Co-operative also should be activised. Other recommendations in this sector are the establishment of poultry dressing plant, slaughter house, pasteurisation plant, cold storage plant, feed compounding units and semen banks. The total estimated cost for these programmes will be around Rs.128 lakhs, which will create employment opportunities for about 280 skilled and 810 unskilled workers.

3.5.0 Infrastructure

The primary pre-requsite for the economic upbringing of a backward region is the infrastructural facilities. The establishment of a sound infrastructure weakens the obstacles to development while acting as the backbone of the growing economy of the district. Hence there arises an urgency for expanding and improving the facilities for transport, communication, irrigation, education, banking, trade and commerce in the district. The most urgent development in the case of railways in South Arcot district is the conversion of the present metre-gauge lines to broad-gauge. The road network in the district suffers from a number of serious drawbacks such as inadequate capacity, level crossings on railways, low degree of accessibility, narrow culverts and bridges, unsatisfactory geometrics on certain stretches etc. Those

impediments to traffic have to be removed to enable free flow of goods in the district. Other improvements required are the development of roads as express ways, arterials, local roads or urban roads and upgrading of the levels of existing service appreciably to meet the increasing demands and the organisation of a trunk and feeder system to obtain maximum operational efficiency. Development of Cuddalore and Porto Novo as fishing harbours should be given top priority. In the context of infrastructural development schemes for the district, a massive public works programme is recommended. This programme will also have the objective of providing additional employment opportunities to rural manpower. The focus of the programme will have to be community action and overall social benefit. The range of works in this programme should confine to development of infrastructure like construction or improvement of roads, land reclamation works, drainage, water conservation and irrigation works, maintenance of irrigation canals, soil conservation etc. The proper implementation of such a programme will increase the scope for employment in the district while constructing a sound base for industrialisation. The massive employment generation and the consequent purchasing power in the rural sector will result in the demand for a number of consumer goods. This will lead to the development of rural marketing in the district. This will have its due effect on the process of income generation in the district.

3.6.0 Industrial Development

As indicated before, South Arcot already has a frame-work for industrial development. Methods for accelerating the process of industrialisation have to be devised in formulating a future strategy. Some of the existing features of the district have to be taken into account in this regard. The district has a few conspicuous industrial centres. These could be groomed for further development. South Arcot forms an ancillary extension centre for Madras City. For reasons of industrial dispersion, feeder units to the major industries in and around Madras can be located in a backward area like South Arcot. Again, strengthening of Neyveli complex could spearhead the development of this district. Therefore, the key to the industrial strategy lies in the best use of the many favourable factors available in the district.

3.6.1 Industrial Growth Centres

A leading trend in rural economic development is based on the promotion of growth centres, where potential is available. This would be quite suited to South Arcot, since certain towns are already established either as marketing or processing centres. Many of these centres enjoy good infrastructural facilities also. Cuddalore has fostered a variety of industries. Engineering fabrication, fertiliser formulation, sugar and of late, marine products are centred in and around

Cuddalore. A large scale fertiliser plant is ideally suitable to be established at Cuddalore. A glass bottle plant and fibre board unit are among industries suggested in this report for location at Cuddalore. Marine products industry can be developed to a very high level. A variety of consumer industries also can be promoted in Cuddalore. In short, Cuddalore could thus become the industrial headquarters of the region at large. Another potential centre in the district is Villupuram where the oil industry is concentrated. An oil complex could be established at Villupuram. A factory for manufacturing protein isolate from groundnut cake could be set up along with the oil complex. Engineering industry also could be promoted at Villupuram advantageously. Vridhachalam is another promising centre with a cluster of ceramic industries. Further diversification and expansion of ceramic products can be profitably undertaken at Vridhachalam. Clay and mineral based industries can be thought of for location in this area. Panruti is known for cashew processing industry. There is vast potential for expanding this industry. Cashew nut shell oil extraction and manufacture of surface coatings could be undertaken there. Tin containers also could be profitably manufactured in Panruti. In a similar way, Kallakurichi-Thirukoilur belt can be earmarked for sugar industry. A new sugar mill at Thirukoilur will boost the development of the area. Porto Novo offers scope for developing sea food and allied industries like boat building, sea weed culture etc. A modern

fishing harbour also could be established at Porto Novo. Another important centre is Neyveli with its big industrial complex. Industries based on Neyveli by-products can be located in the Neyveli-Vadalur belt which could be developed as a small-scale industries centre. Such an approach with accent on growth centres can be expected to yield quick and appreciable results in the industrial development of South Arcot.

3.6.2 Feeder Centre for Madras

Madras City and its suburbs are very rapidly expanding. The large and medium industries in Madras would need some feeder centres from where their ancillary and raw material needs will have to be met. In many items, South Arcot can hope to meet these demands by setting up small-scale industries. This may be possible only in selected items. But with the expansion of Manali-Kalpakam Complex etc. a number of miscellaneous products needed by large industries can be manufactured in South Arcot. This will help dispersion of industries and relieve congestion in urban areas.

3.6.3 Agro-based industries

Special mention may be made about agro-based industries in the district. These include rice milling, sugar, oil milling, vanaspati etc. These have been covered in appropriate chapters. But, it may be noted that rural development largely hinges on small processing units which would buy local raw materials, process it

and sell the product to outside markets. Tapioca cultivation may be popularised so that starch manufacture can be undertaken in a decentralized way. Fibre cultivation and extraction may be promoted in suitable areas. Sericulture also deserves mention in this respect.

3.6.4 Large Industries

The first priority in the large scale sector should go to the revamping of Neyveli Lignite Corporation. A second mine cut with modern mining equipments is a primary necessity in the large interests of the State. More thermal power and more fuel are absolute necessities of the State and hence the greatest priority has to be accorded in launching the expansion of NLC. Another major project to be launched in the district is a major fertiliser plant. High analysis fertiliser is in great shortage in the country. Additional capacities in large scale is planned for Fifth Plan. In this context, Cuddalore offers all facilities for establishing a major fertiliser factory. Urgent steps towards planning of this project may be undertaken. A refractory project at Vridhachalam holds out good prospects. The fibre board and specialty paper project, the glass bottle unit, etc. are also prospective units which may be implemented immediately.

3.6.5 Mobilisation of Resources

As outlined above, the primary effort required in South Arcot has to be in giving a quantitative thrust

to the process of industrialisation. Mobilising human and material resources in a scientific way is the first task in this effort. Proper organisation and management for the best use of resources are absolutely needed. A suitable scheme of action has to be worked out at the district level for implementing the industrial development programmes. The task of implementation should be then assigned to appropriate agencies. A massive effort in this direction is bound to bring about significant achievements in the development of the district's economy.

----:;oOo:;----