

**INFLUENCE OF THE
METTUR IRRIGATION AND HYDRO-
ELECTRIC PROJECT
ON
AGRICULTURE AND AGRO-INDUSTRIES**

(Report of a Pilot Survey into benefits of Mettur Project
conducted under the auspices of the Research Programmes
Committee, Planning Commission, Government of India.)

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PREFACE

This pilot survey was sponsored by the Research Programmes Committee of the Planning Commission and was financed by a grant from it. It was undertaken in the year 1956-57. The completion of the survey and report took about nine months. The survey was concentrated in the Pattukottai Taluk, which comprised of dry lands prior to the implementation of the Project. The important findings which emerged out of the survey are furnished below:—

(1) The cent per cent increase in the yield of paddy has enabled Pattukottai taluk to sustain a much larger population than it did prior to the Project. Between 1931 and 1951, while the average increase in population in Madras State was about 27 per cent, in Pattukottai it was about 44 per cent. In the villages surveyed, there have been instances of increase in the population upto about 370 per cent between 1931 and 1951.

(2) One of the indirect benefits to the agriculturists as the result of the Mettur Canal has been the prevention of floods and saving of fertile lands in the delta from the damages previously caused by the floods.

(3) One of the important benefits which the Project conferred on the agricultural economy of the Tanjore District was that about 3½ lakh acres were freshly brought under irrigation which is an increase of about 44 per cent over the previous area under irrigation. The area under irrigation could be further increased if there was more economic use of water from the canal system by the farmers. The area under paddy rose by about 29 per cent and in Pattukottai Taluk itself by about 211 per cent. As indicated by the surveyed holdings in Pattukottai Taluk, about 89 per cent of the total area has been brought under wetland cultivation, whereas in the non-Project area it is only about 23 per cent.

(4) The area under cultivation itself increased as a result of the Project by about 27 per cent in the Pattukottai Taluk. The cultivated area in the villages under the Project is about 47 per cent of the total area, whereas it is only 27 per cent in the non-Project area. The Project also has made it possible that a significant proportion of the wetland area in Pattukottai taluk can grow two crops of paddy in a year instead of only one prior to the Project. Among the holdings surveyed, about 35 per cent of the wetland area is under double crop compared to only a single crop in all the wetland area in the non-Project zone in the same taluk.

(5) The percentage of population under agricultural employment has also increased as a result of the project. The Pilot survey reveals that about 94 per cent of the population in the canal-fed area have taken to Agriculture as against 88 per cent in the non-Project area.

(6) The crop pattern considerably changed as a result of the project whereas prior to the project, the Pattukottai taluk under the stress of lack of water facilities had to have recourse to growing of

varied crops to suit the changing and uncertain seasonal conditions. This taluk now has become an area of almost mono-culture of paddy. The area under paddy has gone up from about 38 per cent of the total cultivated area in 1931 to about 81 per cent in 1951.

(7) In the holdings surveyed, it was estimated that only about 1 per cent of the total area under paddy grew improved strains and only 8 per cent of the total area under paddy received an effective dose of ammonium sulphate. It was evident that improved agricultural practices have not yet been adopted in the area surveyed to any significant extent and what increase in yield has been obtained since the introduction of the Project has been mainly what water supply by itself can achieve.

(8) From the statistical analysis of data obtained, the average net profit from paddy cultivation has been more than three times the net profit obtained prior to the Project. This gives an indication of the comparative economic prosperity of the farmers in the Project area and the scope for better capital formation and credit-worthiness of the farmer under the Project. In the Pilot survey, out of nearly 600 samples investigated, there was some amount of indebtedness only in about 12 samples. It has, however, revealed that the ultimate savings have not been in a very satisfactory proportion to the returns per acre in the Project area and the average holding is not adequate in area as an economic unit. There were only about 40 families among 600 surveyed which had holdings of more than 18 acres per head while there were 44 families which owned less than half acre per head.

(9) There has been no drive for savings, which could have been sponsored by the authorities and credit facilities through cooperative credit societies have been neither adequate nor efficient. Adequate advantage has not been taken of the electricity from the Project for starting more industries and release of pressure on land which now exists in this area. Only about one per cent of the population is engaged either whole-time or part-time in these rural industries. Only 10 out of the 600 villages surveyed have been electrified. The possibilities for small-scale industries in Pattukottai taluk such as mat-making, cloth-weaving, manufacture of palmyrah jaggery, fishing, salt-manufacture, bee-keeping and poultry-rearing etc., have not been fully exploited.

(10) The lack of proper road communications in almost all the villages surveyed seems to be mainly responsible for the unsatisfactory progress in cultivation techniques in the villages.

The Survey reveals certain pointers for achieving the maximum benefit out of such projects in future planning and development. It is suggested that at the very commencement of the introduction of such projects, a dynamic organisation should be set up for effective multi-purpose developments to achieve the following:—

- (i) To see that every farmer carried out at least the most profitable agricultural practices such as application of green manures and artificial fertilisers, use of high-yielding and disease-resistant strains, and protection of plants against pests and diseases.

(iii)

- (ii) To see that there was some amount of diversified agriculture so as not only to raise the all-round economic strength of the farmer but also to assist in more economic use of water compared to the exorbitantly high amounts of water required for the growing of paddy.
- (iii) Introduction of an active campaign for savings among the farmers and establishment of a more active co-operative movement to make facilities for both savings and credit accessible to each farmer.
- (iv) To see that a drive was made to increase rural, and cottage industries suitable for the area and to remove the excessive pressure on land and to undertake all measures which would increase the size of the average holding to more economic levels than exist at present.
- (v) Improvement of communications and transport in the rural areas for better marketing and transport of agriculturists and agricultural products.
- (vi) An agricultural extension organisation so as to reach every farmer.
- (vii) A co-ordinating agency for a balanced development of the economy of agriculture and prosperity of the agriculturists and agricultural labourers.

The Director was entirely responsible for the general pattern of investigation, organisation and technique of study, analysis etc. followed in this survey. No responsibility rests with the Planning Commission or the Research Programmes Committee for the facts and opinion stated in the report.

I have acknowledged at the end of the report in detail the assistance received in the conduct of the survey from the several institutions, organisations and persons. I take this opportunity to acknowledge my gratitude to them all, particularly the Research Programmes Committee of the Planning Commission who made this survey possible.

S. KRISHNAMURTHI

CHAPTER I

Objectives of the Survey

The Madras State has been one of the States in India which have pioneered in establishment of Hydro-electric and major irrigation schemes, such as the Mettur Project. In recent year after independence, there have been new developments in this field in the Madras State, as a part of the general scheme of development all over India. The Lower Bhavani Project which was completed recently is an example of a project executed after Independence. Crores of rupees are being spent on irrigation and hydro-electric projects with the intention of helping agriculture and agro-industries and of increasing production particularly on the agricultural side. These development projects are also presumed to raise the standard of living of the farmers through intensified farming, increased production and increased wealth. In the case of projects which have been completed in the past, e.g. Mettur Project, it would be worth-while to find out what developments have taken place in agriculture and agro-industries in the zone commanded by these projects. An evaluation of the economic benefits of a project such as the Mettur Project might reveal certain trends and certain facts which could act as pointers to future schemes which are being planned on such a colossal scale in India and indicate modifications which may be necessary in planning.

The pilot survey was intended for studying the influence of the Mettur Project in the directions mentioned above. Tanjore District has generally benefited most as far as agriculture is concerned, due to this project. The Pattukkottai Taluk in the Tanjore District was considered ideal for a pilot survey, since this is the only taluk of the district which was a dry area prior to the advent of the Mettur Scheme and provides now a comparison over the condition existing prior to the project. Hence this taluk was taken up for the Pilot Survey.

The objectives aimed at in the pilot survey were broadly the following:—

It is usually expected that with the provision of assured water supply, it would be possible to intensify cropping in the holdings, resulting in changes in rotation, the general crop pattern and cultivation methods, etc. With the introduction of electricity, the farmer has useful power in his hands, for example, for working of pumps. He is also in a better position to purchase improved implements or machinery, and therefore agricultural practices are also likely to be changed. Information could be obtained on the extent of all these change.

A dry land farmer depends on the whims and fancies of rainfall for his agriculture; and with the cycles of ups and downs in rainfall which are prevalent in India, a dry land farmer's economic position is normally low. One expects that with the advent of water supply, harvests of crops are assured and the farmer is no longer a play thing in the hands of the monsoon. Moreover, pro-

vision of water supply as furnished by the Mettur Scheme, should increase the number of crops that could be grown in the year, and the yields of the individual crops, resulting in better financial returns to the farmers, and increase in their capital and in their credit-worthiness, making them free from debts. Information on this score was considered very useful.

[With the introduction of electricity one would expect some amount of industrialisation of the region primarily based on the agriculture of the region, and one would expect that there would be some agro-industries, as a result. Detailed information on such influences were also intended to be gathered.]

Finally some general data on the Mettur Project itself relevant to the scheme were intended to be collected.

The following is a report on the pilot survey actually conducted.

One of the serious difficulties faced in conducting such short term *ad hoc* schemes is the lack of experienced and qualified personnel who would come forward for short periods of work, and with the scales of salaries of teachers now being given in Universities such as the Annamalai University as sanctioned by the University Grants Commission, it has been difficult to induce teachers to take up temporary work. In fact for this scheme, it was not possible to get a whole time Supervisor on the pay ceiling enforced for the post to take up such work. On account of this circumstance, assistance from an honorary supervisor had to be obtained. Only graduates who had freshly passed out of the University, had to be recruited for the posts of Economic Investigators as in this case also the short period of the scheme and the salary were not attractive enough to get response from experienced men. They are new to such work and it takes sometime before they can fall in line with the types of work allotted to them.

CHAPTER II

The Cauvery-Mettur Project

As the name implies, the project is mainly related to the river Cauvery. This river rises in the Western Ghats near Mercara in Coorg at an elevation of 4,400 feet above sea level, and after a course of nearly 500 miles, enters the Bay of Bengal draining an area of 31,000 square miles en route. The Western Ghats are subject to heavy rainfall during the South-West Monsoon and the highest run-off usually occurs in July or early in August. The Mysore Plateau which drains into the middle reaches of the river is subject to fluctuating rains during the months of August to October. The important tributaries which join the Cauvery in this reach are the *Hemavathi*, the *Lakshmanathirtha* and the *Kabini* which also take their rise in the Western Ghats. After leaving the Mysore Plateau, the Cauvery winds its way through hilly country and the Mettur Dam is constructed in a gorge where the river enters the plains. From this point downwards, the catchment is subject to the North-East monsoon rains, and the high floods due to this monsoon usually occur in November. The *Bhavani*, the *Amaravathi* and the *Noyel* are the chief tributaries joining the river in this reach, though the first two in their upper reaches are under the influence of the South-West monsoon rains as well. The sequence of rainfall conduces to a fairly high flow during the irrigation season from June to January except for a short period of about six weeks when there is a break in the monsoon. While the South-West monsoon supply is copious and dependable, the North-East monsoon supply is irregular and frequently fails. The caprices of this monsoon have frequently affected, sometimes very seriously, the cultivation of the Cauvery delta, and the chief aim of the Cauvery-Mettur system has been to remedy this state of affairs by storing the waters of the surplus floods during the South-West monsoon and distributing them evenly throughout the succeeding irrigation period and to provide new areas lacking water supply with irrigation.

The head of the Cauvery delta is at the Upper Anicut, 10 miles west of Trichinopoly. Here the river bifurcates into two large branches, the northern branch taking the name of Coleroon, and the southern retaining the name of Cauvery. A regulator spans the Coleroon at the Upper Anicut. The Coleroon is really the main channel of the river and carries the bulk of the flood waters to the sea. The Cauvery or southern branch is utilized as the main channel for the supply of irrigation water to the fields of the delta. The Cauvery and the Coleroon again almost join each other some 20 miles below, and the Grand Anicut, the key to the cultivation in the Cauvery delta, is built here on the left bank of the Cauvery. The scouring sluices at this anicut discharge the surplus waters of the Cauvery into the Coleroon. Just below this anicut, the Cauvery bifurcates into two main irrigation rivers, namely the Cauvery and the Vennar, at the heads of each of which a regulator

has been built. The new canal excavated under the project, namely the Grand Anicut Canal, also takes off from the same site. The Cauvery and the Vennar divide and subdivide into innumerable distributaries and together provide means of irrigation for about three-fourths of the area of the Tanjore district. The South-Western portion of the district, of which Pattukkottai taluk forms a part, is the new area served by the project partly by the Grand Anicut Canal and partly by the extension of the already existing Vadavar system.

Irrigation in the Cauvery delta dates from ancient times. Many old works still exist and show that irrigation under some of the old Indian Rulers received considerable attention. The system was, however, more an inundation system than controlled irrigation system. For a century before the advent of British Rule, these works had been badly neglected on account of wars and political changes, and in 1801, when the East India Company took over the Tanjore district, irrigation in the delta was rapidly deteriorating, the channels were silting up, and fields were left uncultivated for want of proper water-supply.

To re-establish satisfactory irrigation conditions was one of the first problems for the British Government. Sand deposits formed the principal obstruction to the free flow of water, and in the first few years, the efforts were mainly directed towards their removal and the provision of scouring sluices. These efforts proved effective only as a temporary measure. The difficulty of water-supply was finally overcome only in 1836 when Sir Arthur Cotton built the Upper Anicut across the Coleroon to divert more water into the Cauvery. To make up for the consequent diminution in supply to the Lower Coleroon irrigation, the Lower Anicut (70 miles below the Grand Anicut) was also built across the Coleroon. But the supply in the Cauvery during floods now became too great to be controlled and began to cause serious damage to the bed and banks of the Cauvery. To check this tendency, a grade wall called the Cauvery Dam was built in 1845 across the Cauvery at the Upper Anicut. Further improvements followed, the most important of these being the construction of the regulators across the Cauvery and the Vennar at the Grand Anicut, the cutting down of the crests of the Upper and Lower Anicuts, the provision of lift shutters at these anicuts capable of holding up two feet extra supply for the benefit of irrigation, and the construction of regulators across the various rivers at the sites of all the important off-takes in the delta.

These improvements made the distribution of water-supply more systematic by placing under complete control whatever quantity of water was available at the Upper Anicut, but there still remained the defect of highly fluctuating supplies with long spells of drought to be got over. The first recorded proposal for damming the Cauvery was made by Sir Arthur Cotton in 1834 for improving the conditions of irrigation in the Tanjore Delta. It was however only in 1924 that the project estimate was approved. A storage reservoir of a size that could help the delta to tide over the spells of drought by storing the surpluses when available was the obvious solution, and the Mettur Dam was the result. The execution of the project had been delayed on account of a long

dispute with the Mysore Government regarding the division of the surplus waters of the Cauvery. It was at that time that Sir C. P. Ramaswami Aiyar assumed charge of his office as the member for irrigation and he took a close personal interest in getting this long standing dispute settled with the Government of Mysore. As soon as a workable agreement was arrived at with Mysore, the project estimate was revised in 1924, and the execution of the scheme was started on 20th July 1925, and the pursuance of the project and the successful completion of the scheme were in a large measure due to the initiative and foresight of Dr. C. P. Ramaswami Aiyar who was at that time a member of Madras Government.

THE METTUR PROJECT

The project provides a lake of sixty square miles, impounding 93,500 million cubic feet of water at Mettur. The Dam is 5300 feet long and contains 54.6 million cubic feet of masonry. The reservoir backs up 33 miles to the foot of the 70 feet high Hogankal falls which become partly submerged. A new canal, the Grand Anicut Canal, with a capacity of 4200 cusecs, was also excavated to supply ultimately an extent of 271,000 acres of new irrigation, and the improved and extended "vadavar" was intended to supply another 30,000 acres of new area. The second crop cultivation was expected to increase by 175,000 acres, 70,000 acres in the old area and 105,000 acres in the new area. When the project fully matured the total cultivation in the delta was expected to be 1,082,000 acres of single crop and 270,000 acres of double crop. The reservoir was expected to supply the requirements of this area of 1,352,000 acres¹.

Incidentally, the reservoir acts as a flood moderator in times of extraordinarily heavy floods, and it has been calculated that had the dam been built prior to the super-flood of 1924, the disastrous effects of the flood would have been flattened out by about 15 per cent by the timely manipulation of the reservoir surplus works. The extent to which the Mettur Reservoir can act as a flood moderator depends upon the water level in the Reservoir at the time of incidence of the flood. Given sufficient warning of the intensity and duration of a high flood, action can be taken to lower the water level in the reservoir by increasing the out-flow through the surplus and high level sluices, thus making room for the absorption of the greater part of the flood when it actually reaches the reservoir. With reservoir level at any lower stage, the moderating effect would of course be considerably greater. Thus it is seen that the reservoir does have a very appreciable moderating effect on floods even under the most unfavourable conditions.

Like most modern works of this nature, the Mettur Dam is adaptable to the present policy of combining irrigation benefits with hydro-electric facilities and a maximum of 49,000 H.P. could

¹. *The Cauvery Mettur Project* by C.G. Barber.

be obtained, the minimum depending on the conditions in each summer. Provision was first made to facilitate the installation of four turbines operating under a maximum head of 150 feet, the requisite intake pipes etc. being fixed in the body of the dam.

COST OF THE SCHEME

While the sanctioned estimate amounted to Rs. 737.08 lakhs, the actual cost of the entire irrigation scheme was calculated to be about Rs. 680 lakhs. A return of 6 percent on the capital outlay was anticipated.*

The following table furnishes particulars of several important reservoirs and clearly shows that the cost per million cubic feet of storage in the case of the Cauvery-Mettur Dam compares very favourably with that of others despite its enormous size.

*'Souvenir' published at the time of opening the Mettur Dam (1935), Government Press, Madras.

Comparative Statement of Dam contents and storage capacities of some of the World's largest Reservoirs¹

Name of the Dam	Cost in lakhs of rupees	Masonry contents		Net capacity M.C. ft.	Cost per M.C. ft. of storage	Period of construction (in years)
		Tons	Million C. ft.			
Assuan (Egypt)	367.50	1,260,000	18.8	37,600	977	4
Tansa (India)	30.80	735,000	11.0	691	4,456	5
Periyar (India)	50.00	333,000	5.0	9,300	538	8
New Croton (America)	212.12	1,550,000	23.1	5,120	4,143	14
Cross River (America)	38.30	289,500	4.3	1,760	2,176	3
Sennar (Africa)	847.00	987,900	14.8	22,560	3,750	7
Krishnarajasagara (India)	250.00	2,000,000	29.9	43,934	569	16
Bundardhara (India)	84.00	800,000	12.0	10,086	833	16
Nizamagar (India)	365.70	..	30.1	25,446	1,437	..
Lloyd Dam (India)	172.00	..	21.5	24,198	711	6
Mettur Dam (India)	*680.00	3,640,000	54.6	93,500	513	6

*Inclusive of all overhead charges.

1. 'Souvenir' published at the time of opening the Mettur Dam (1935), Government Press, Madras.

The present design of the Dam also provides for its height being raised by 10 feet at some distant date to compensate for the silting up of the reservoir bed by providing for an extra capacity of 17,500 M.C. ft.

The main particulars of the Dam are furnished below:—

Particulars of Dam¹

Catchment area	16,300	Square miles.
Width of river at Dam site	1,100	feet
Length of Dam	5,300	"
Greatest height of Dam	214	"
Width of Dam at top	20.5	"
Width of roadway between parapets	16	"
Top of Dam above mean sea-level	801.00	"
Greatest bottom width at deepest portion of Dam	171	"
Maximum depth of storage	165	"
Maximum floods (1924)	456,000	cusecs.
Maximum discharging capacity of surplus works	550,000	"
Maximum waterspread	59.25	Square miles.
Maximum length of reservoir at maximum waterspread	33	miles.
Full reservoir level above mean sea-level	790.00	feet.
Maximum water level above mean sea-level	796.00	"
Capacity of reservoir—Gross	95,660	M.C.ft.
Net (effective)	93,500	"

**Details of Sluices*

	No.	Size	Still
Irrigation sluices High level	8	10½' × 16'	* 720.00
Low level	5	7' × 14'	* 670.00
Hydro-electric turbine pipes 4	4	8'—6" diameter	* 640.00
Surplus sluices	16	60' × 20'	770.00
E. Saddle Escape	..	810' long	791.00

* Designed to work under 65 feet head.

**Designed to work under 160 feet head.

N.B.—All the sluices are designed to be electrically operated with provision also for operation by manual labour.

¹. 'Souvenir' published at the time of opening the Mettur Dam (1935), Government Press, Madras.

Regulation of water is through the surplus sluices during most of the South-West monsoon season, i.e. from June to September, but when water falls below 774 feet, the High Level sluices will be opened for the supply of water to the delta. When water falls below 730 feet, the regulation will be done through the Low Level sluices also.

THE CANAL SYSTEM

The canal system is situated in the Tanjore district. The main canal takes off at the Grand Anicut just above the Cauvery-Vennar regulators of the right side. Work on the Canal system was started in 1926. Owing to some controversy about the exact location of the area which should otherwise have come under the tail end reach of the Grand Anicut Canal, there was some delay in starting the work at the tail end. Finally the canal system was completed in 1934.

Some details regarding the canal are given below:—

Length of Main Canal	106 Miles
Length of branches and distributaries	694 „
Length of field channels	1904 „
Total cost of canal system (estimated)	Rs. 200.0 lakhs
Cost per acre of new irrigation	66 7 0

The water rates per acre for the new area and the old area are furnished below:—*

Description of land	First crop	Second crop	Duffassai crop	Third crop
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
A.—New Area :				
1. Dry lands converted to wet	15 0 0	7 8 0	23 8 0	3 12 0
2. Manavari lands—Rain-fed irrigation— Ryotwari or proprietary	14 0 0	7 0 0	21 0 0	3 8 0
3. Proprietary or minor inam, wet	10 0 0	7 8 0	17 8 0	3 12 0
B. Old Area :				
1. Dry lands converted to wet	10 0 0	7 8 0	17 8 0	3 12 0
2. Manavari lands (Rainfed irrigation) Ryotwari proprietary	9 0 0	7 0 0	16 0 0	3 8 0
3. Proprietary or minor inam wet	7 8 0	7 8 0	15 0 0	3 12 0

(A special feature in the water cess rule is the provision for the levy of a charge on a third crop raised with project water.)

*Cauvery-Mettur Project by C.G. Barber.

THE METTUR HYDRO-ELECTRIC SYSTEM

Much of the following information has been obtained from the Administrative Reports of the Electricity Department, Government of Madras for the years 1938 to 1940, 1953-54 and 1954-55.

The Mettur Hydro-Electric System is the second Hydro-electric scheme undertaken by the Madras Government for the provision of cheap electric power facilities similar to those met with, in progressive countries in other parts of the world. The power house is located at the foot of the Mettur Dam. The water let down for irrigation from the Dam has also been utilized to the best advantage for the generation of hydro-electric power. During the construction of the Dam, four pipes 8.5 feet in diameter were built into the structures and equipped with the necessary valves, gates, screens and other fittings. The function of these pipes was for letting out surplus water from the reservoir during the latter part of the construction period and for power generation afterwards. The total cost of this hydraulic installation was Rs. 10,80,000 and the amount is included in the total cost of the Mettur Hydro-Electric scheme. Each pipe is expected to discharge 16,000 H.P. and is designed to discharge a maximum of 1,250 cusecs for power purposes.

The salient features of the Hydro-electric scheme as it stood in 1954-55 are given below:—

*The salient features (1954-55)**

Generating capacity		40,000 K.W. maximum. 17,000 K.W. minimum.
Source of power		Cauvery river.
Gross head		Varying from 160 ft. to 60 ft. depending on reservoir level.
Discharge pipes		4
Diameter		8 ft. 6 inches.
Elevation of power house		637 ft. above mean sea level
Date of completion		First stage began in 1935 completed in 1937. Second stage began in 1944 completed in 1946.

The following table shows the types and kilowatts of loan connected at the end of 1937-38 i.e. in the first stage (as furnished in the 'Administrative Report' of the Electricity Department, 1938-39 of Government of Madras).

	K.W.
Industrial	855
Licensees	11830
Agricultural	126
Railways	1592
Other purposes	307
TOTAL	14710

*Administrative Report of the Electricity Department, Government of Madras, 1954-55.

The following figures give an approximate idea of the maximum output under varying conditions in 1940:—

	Peak horse power	Base horse power
Mettur alone with no restriction in irrigation	19,000	7,700
Mettur alone with limited restriction in irrigation about twice in 15 years	19,000	13,000
Mettur with Pykara with no restrictions of irrigation	23,000	9,500 to 12,000
Mettur with Madras or/and an auxiliary steam plant	45,000	24,000

In an emergency as much as 60,000 horse power might be generated under certain water conditions.

A normal feature of the scheme is the availability of what is called secondary and tertiary power in contrast to the primary power which will be available for all time. The secondary power will be restricted only in the dry years and tertiary power would be available for eight months in the year.

Four double horizontal Francis turbo-generator set of 16,000 horse power each was installed and three of them are in action and one of them is a spare one. The machines are horizontal and consist of twin over-lung turbines one on each side of the alternator. They contain several new features notably gear driven governors and hydraulic brake drums. The main lines from Mettur to Singarapet and Erode are insulated however for an eventual operation voltage of 1,10,000 and the former was later extended to Madras.

The sub stations are at Erode, Karur, Trichinopoly, Tanjore, Tiruvarur, Nagapattinam, Papanasam and Salem in the southern area and Singarapet, Sirupathur, Ambur, Vadakattipatti, Vellore and Chittoor in the northern area. Electricity is extended to some of the places mainly through Trichinopoly-Srirangam Electric Supply Corporation, the Kumbakonam Electric Supply Corporation and the South Arcot Electricity Distribution Company Limited. All of them are making useful progress on rural distribution in their respective areas. Just after the completion of the scheme in 1938 the places served by this scheme were Chittoor, Vellore, Gudiatam, Ambur, Karur-Kattuputhur, Kalbai, Thalapalayam, Tiruchengode, Idapadi, Tiruvarur, Nedumalam, Nesinjet area, Thengalpalayam, Malayampatti, Singalandapuram, Kasarimongalam, Ellumpalli, Jambai and Olagadam, Namagiripet, Andiyur, Viralikattur, Kattuputhur, Namakkal, Kaveripakkam, Polur, Arni, Krishnagiri, Darmapuri, Pernabattu, Tirupathur, Jalarpet, Arkonam, Pakkala, and Tirupathi. After the completion of the scheme in 1937-38, the power was supplied to some industrial undertakings like Rajendra Mills, Salem Trichinopoly Mills Ltd., Pullicar Mills, Tiruchengode, Dalmia Cement Factory, Trichy, Mettur Industries, Mettur Chemicals and Jewaher Mills, Salem.

The total cost of the complete system in the first stage of its development was Rs. 465.5 lakhs and the districts served by the project in 1938 were North Arcot, South Arcot, Chittoor, Salem, Trichinopoly, Tanjore, Chingleput and Madras. The scheme was attractive. Being both technically and economically sound, it possesses greater revenue potentialities than can be judged by the financial forecast. The financial forecast for the tenth year of operation according to the Government formula or remunerative works results in a gross return of 11.4%. If all interest deficit accumulated during the development period are capitalised and all operating expenses deducted, the net return is 7.9%.

During the second stage i.e. in 1944, some more additional machines and equipments were installed and in 1946 it was completed and the maximum generating capacity was increased to 40,000 K.W. electricity. Even though this Mettur Hydro-electric system aimed at rural electrification, there still remains a lot of expansion to be effected in the villages. Out of 269 villages in Pattukkottai taluk, only ten villages are benefited by electricity. According to the South Madras Electric Supply Corporation, Tiruchirapalli, who are the licensees for the Pattukkottai taluk, the total consumption of electricity by the consumers served by them is 9,05,063 units per year and the total revenue from this taluk is about Rs. 69,000 per year. Only 53 rice and flour mills are using electricity and only 21 pump-sets for various purposes are run by electricity in Pattukkottai taluk.

Data at a Glance

The Dam and Canals

1. Total cost of the Project	Rs. 667 lakhs.
2. Cost of the original estimate	Rs. 737 lakhs.
3. Date on which started	20-7-1923 (Date of creation of Cauvery Mettur Project circle)
4. Date on which completed	21-8-1934 (Date of inauguration).
5. Area of land originally irrigated prior to the project.	8,14,866 acres.
6. Area of land freshly brought under irrigation as a result of the project	3,57,442 acres.
7. Original area contemplated	3,01,000 acres.
8. Taluks served by the project for irrigation in Tanjore District.	Pattukkottai, Arantangi, Orathanad, Southern portion of Tanjore, Papanasam and Western portion of Mannargudi.
9. Cess being collected from the lands under the project	Rs. 10 to 15 per acre.
10. Cess originally collected prior to the project	Rs. 2½ per acre.
11. The head of the Cauvery delta	10 miles west of Trichinopoly.
12. Southern branch of the Cauvery delta	Cauvery river.
13. Northern branch of the Cauvery Delta	Coleroon river.
14. The position of the new area served by the project.	South West portion of the Tanjore District.

15. Catchment area of the Dam	16,300 sq. miles.
16. Length of the dam	5,300 feet.
17. Height of the dam	214 feet.
18. Width of the dam at top	23.5 "
19. Width of the roadway between parapet	16 "
20. Bottom width at the deepest portion of the dam	171 "
21. Maximum depth of storage	165 "
22. Maximum water-spread	59.25 sq. miles.
23. Maximum water-level above mean sea level	796 feet.
24. Capacity of reservoir (gross)	95,660 Million c. ft.
Net (effective)	93,500 "
25. Length of the main canal	106 miles.
26. Length of the branches and distributaries	694 miles.
27. Length of the field channels	1904 miles.
28. Total cost of the canal system Rs.	200 lakhs.

The Electric Project :

	First stage	Second stage
1. Date on which started	1935	1944
2. Date on which completed	1937	1946
3. Electric power originally contemplated	12,500 K.W. in 1st April, 1935.	
4. Electric power generated at the completion of the project	14,710 K.W. I Stage. 40,000 K.W. II Stage.	
5. Districts and taluks served by the project for power supply.	North Arcot, South Arcot, Salem, Trichinopoly and Tanjore & part of Chingleput.	
6. Gross head	Varying from 160 feet to 60 feet depending on reservoir level	
7. Discharge pipes	4 Nos. 8 ft. 6 inches diameter.	
8. Elevation of power house	637 feet above mean sea level.	
	K.W.	
9. Discharge of electricity in 1937-38	Industrial	855
	Licensees	11,830
	Agricultural	126
	Railways	1,592
	Other purposees	307
	TOTAL	14,710

10. The factories which have come into existence as a result of the project.

1. The Mettur Industries Ltd., Mettur.
2. Tirumagal Mills Ltd., Gudiyatham.
3. The Rajeswary Mills Ltd., Gudiyatham.
4. The Karur Mills Ltd., Karur.
5. The Neiveli Mills Ltd., Neiveli.
6. The Dhanalakshmi Oil Mills, Bhavani.
7. The Thirukoyilur Oil Mills, Thirukoyilur.
8. P. K. Arthanari Chetty & Sons, Rasipuram.
9. The Mettur Chemicals & Industries Corporation, Salem.
10. The Indian Metal and Metallurgical Corporation Ltd., Mettur.
11. The Erode Bleaching and Finishing Company, Erode.
12. The Deccan Sugar and Abkari Company Ltd., Pugalur.
13. The Solar Industries and Trade Ltd., Erode.

11. Number of villages served by this project for power distribution in Pattukkottai taluk	10. Nos.
12. Number of rice and flour mills using electricity in Pattukkottai taluk	53 Nos.
13. Number of pump sets using electricity in Pattukkottai taluk for various purposes	21 Nos.
14. Total cost of introducing electricity in Pattukkottai taluk as on date	7,70,000 Rs.
15. Total consumption of electricity by the existing consumers served in Pattukkottai taluk	9,50,063 units.
16. The total revenue by way of energy consumption charges from Pattukkottai taluk	69,000 Rs.

CHAPTER III

Agricultural practices and agricultural economy of Tanjore District with reference to Pattukkottai Taluk

TANJORE DISTRICT

For a proper understanding and appreciation of the influence of the Cauvery Mettur Irrigation system on Agricultural development in Pattukkottai Taluk, it is necessary to have a general idea of the agricultural methods and practices that are followed in the Tanjore District of which Pattukkottai forms an integral part. Tanjore District lies on the east coast of Madras State. On the north, the river Coleroon separates it from the Tiruchirapalli and South Arcot districts. On the west it is bounded by the Tiruchirapalli district, on the south by Palk Strait, and on the east by the Bay of Bengal and the Palk Strait. The district consists of the following six revenue divisions and twelve taluks.

Revenue Divisions	Taluk
Tanjore	Tanjore
Kumbakonam	Kumbakonam Papanasam
Mayuram	Mayuram Sirkali
Nagapattinam	Nagapattinam Nannilam
Mannargudi	Mannargudi Thiruchuraipundi
Pattukkottai	Pattukkottai Arantangi Orthanad.

The total area of the district is 3,738 square miles. The district consists of two natural divisions namely the delta area and the uplands. The delta area consists of what are known as the old delta and the new delta. The old delta represents the area irrigated by the river Cauvery and its tributaries; while the area irrigated by the Grand Anicut canal and its branches of the Cauvery Mettur Project comprises the new delta. The upland area consists of the southern part of the Tanjore taluk, the north-west and south-west portions of the Pattukkottai taluk, and a major portion of the Aranthangi taluk.

Agriculture is the main occupation of the people in the district. The Cauvery and its off-shoots are the principal rivers. The delta of the Cauvery covers more than half the district, its water is

distributed to vast expanses of rich fields, and the cultivation of paddy is carried on to a much greater extent in this than in any other district in Madras State. The total area of paddy cultivated at present according to Census Handbook of 1951 of Tanjore District is 13,50,100 acres as against 10,47,974 acres in 1931 according to the Statistical Atlas of Madras Presidency in 1931. With the advent of the Cauvery Mettur Project, 3,57,442 acres have been freshly brought under irrigation though the contemplated area was 3,01,000 acres. In the conversations held with the Superintending Engineer, River Conservancy Division, Trichinopoly, he was of opinion that the area under irrigation could be further increased to a significant extent, if the farmers were more economical in the use of water and did not resort to over-drawing of water for their wetland paddy, both in frequency and quantity at each watering.

The following table shows the varieties of crops cultivated with extent for the years 1931, 1941 and 1951 in Tanjore District.

Varieties of crops cultivated with extent of area in acres in 1931, 1941 and 1951 in Tanjore District.

Figures for 1951 are from Census Handbook (1951) and those for 1941 and 1931 from the Statistical Atlas of Madras Presidency (1941 and 1931).

Crops	1931	1941	1951
1. Paddy	10,47,974	12,29,172	13,50,100
Cambu	8,279	6,226	5,800
3. Ragi	24,123	19,331	12,100
4. Varagu, Maize and Cholam	82,195	46,473	36,600
5. Redgram	8,617	5,725	6,400
6. Greengram, Blackgram & horsegram	27,605	66,998	95,900
7. Groundnut	67,638	30,920	43,000
8. Gingelly	19,724	13,732	14,000
9. Vegetables and fruit trees	27,136	26,296	6,700
Spices	7,416	8,909	Nil
11. Other varieties like cotton, tobacco and sugarcane	35,613	42,713	2,500
12. Miscellaneous	38,948	14,997	Nil

The table shows the trends in crop-pattern as a result of the Mettur Canal systems. Paddy has been growing in the extent of area, and along with it the pulse (grams) which come into rotation with paddy. The millets have declined in area to a large extent, as also the commercial crops cotton, tobacco and sugarcane. The spices have almost entirely disappeared. There is decline in area in all the other crops also.

CULTIVATION OF PADDY

As emphasised already paddy is the chief crop in Tanjore District. There are three seasons when paddy is grown, viz. *Samba*, *Kuruvai* and *Thaladi*. *Samba* is a six months' crop, *Kuruvai* and *Thaladi* are four months' crop each. If water facilities are available for eight months, *Kuruvai* and *Thaladi* are grown in the same field in succession. The *Kuruvai* crop which is grown in the first season is generally sown in June-July and *Thaladi* in September-October. If water facilities are not available for more than six months, then *Samba* alone is cultivated. *Samba* cultivation begins in August-September and is harvested in January-February. In many places it has become usual to mix *Kuruvai* and *Samba* crops in what is called the *Ottadan* paddy, 'being of an eight months' duration. The amount of *Kuruvai* used in this combination exceeds the *Samba* largely. *Ottadan* is generally sown in the first crop season. The earlier maturing variety is harvested first, leaving the long duration crop to mature subsequently.

The date of the commencement of cultivation varies in different parts of the district. Paddy is generally transplanted. In raising seedlings for transplantation, two methods are followed viz. (i) *Puludinattu* and (ii) *Nirnattu*. In the former, the seed-bed is ploughed without flooding, while in the other, it is well flooded before ploughing. The *Puludinattu* system is much less common than the other, because it is only suited to certain conditions which are not always to be met with.

The seedlings are allowed to remain in the beds for varying periods according to the kind of paddy sown. Generally *Kuruvai* varieties of paddy are transplanted after a lapse of twenty five days and the *Samba* varieties after 40 to 50 days.

Just prior to the on-set of freshes in the river, certain operations are undertaken in the fields. The land is, where necessary, levelled. The fields are at this time well manured either by penning cattle on them or by spreading over them the dung of sheep and cattle, ashes, and town-sweepings and then are watered to the depth of 2 or 3 inches. Then follow five or six ploughings, intervals between which are regulated as below. For the cultivation of single *samba* crop, two or three ploughings are done at intervals of two or three days and then the land is allowed a rest of nearly twenty days after which two or three more ploughings are given in quick succession. The interval of rest is supposed to render the soil fertile; but the practice is not observed in the cultivation of either a *Kuruvai* or *Thaladi* crop. When procurable, green leaves are given as an additional manure, either at any time between the first and the last ploughing or after all the ploughings are over. Then the field is also in many places levelled up by drawing a plank over it just before transplantation.

The time of transplantation varies according to the crop grown and to a certain extent according to the locality, but generally the first crop of *Kuruvai* paddy is transplanted between June fifteenth and August fifteenth and that *Samba* when grown as the only crop on single crop lands, is transplanted between August fifteenth and September fifteenth. The second crop, *Thaladi* which succeeds

Kuruvai is transplanted in October or November. After transplantation the field is kept in a semi dry condition for several days until the crop recovers from the sickly appearance consequent on transplantation and becomes green, and then it is regularly supplied with water. The depth admitted is generally two inches at first and rises with the crop till it is about eight inches. After the formation of the ears, most ryots prefer to leave the field dry. Some think that flooding about two inches of water is beneficial.

Weeding is done by hand. It ranges between one to three times. The first weeding seldom takes place before the fifteenth day after transplantation and the last not later than two months from that time usually. Chemical fertilizers are usually applied to standing crops only as top dressing.

The cultivation of the second crop, where it is practised is generally more superficial. The land is ploughed quickly without flooding the land about three times. Leaf manure is generally applied as a basal application.

OTHER CROPS

Among the crops most widely grown on fields mostly under rain-fed conditions in the non-deltaic area are groundnut, gingelly and varagu. According to the Census Handbook of Tanjore District (1951), groundnut is grown in the non-deltaic tracts of Tanjore and Pattukkottai taluks, in nearly 43,000 acres of which 35,900 acres are unirrigated. Varagu is cultivated in 29,600 acres of which 29,500 acres are unirrigated; gingelly in 14,000 acres of which only 700 acres are irrigated.

Green gram is grown in 68,300 acres of which 67,400 are unirrigated. Other crops cultivated in the non-deltaic area are cholam, sugarcane, blackgram etc. the water for sugarcane being obtained from temporary wells.

THE ECONOMIC EFFICIENCY OF THE IRRIGATION SYSTEM OF THE DELTAIC AREA

The irrigation system of the deltaic areas of Tanjore District presents certain interesting and unique features. The Cauvery irrigation system deserves special mention. Its unique features have not been properly studied and understood by many. Irrigation from the Cauvery in the Tanjore delta is confined to narrow fringes of land adjoining the river, water being taken to the fields by means of channels running parallel to the river. The important irrigation work on the Cauvery at the head of the delta is the Grand Anicut. It is a tribute to the wisdom and skill of the ancient engineers who built this Anicut that it is still functioning at the present day. Below the Grand Anicut, the Cauvery river branches into numerous arms that irrigate between them over a million acres. More recently after the construction of the Mettur Dam in 1933, irrigation has been expanded to certain of the non-deltaic tracts of the Tanjore district. It is significant that though this river has mainly a south-west monsoon supply in which the high flow is confined to less than two months in the year and has had no

reservoir till one was built in 1933. more than eight per cent of the waters of the river had been utilised for irrigation in the Tanjore delta. This feat has been achieved by a successful system under which irrigation and drainage are combined. This goes against certain accepted theories of irrigation but there has been a failure to appreciate the circumstances, under which this combination has taken place in the Tanjore delta. The old channels in the delta had no head sluices—they were of the inundation type. Each channel had been so designed as to be capable of carrying more water than the normal amount necessary for land to be irrigated by it. The result is that when there is plenty of water in the river, these channels take in these waters and distribute them among the various fields under them. Thus instead of the river water being allowed to go to the sea, they are distributed amongst millions of fields in the delta. In the fields themselves, an ingenious system has been devised under which the drainage channel of the upper village is the irrigation source for the lower village. The result is that the waters conserved in the upper village are gradually passed on to the village lower down. In times of flood these channels which take water from the river distribute the risk of flood over the entire delta instead of allowing the waters to be concentrated in any particular spot, and when the river level goes down, the very channels drain the waters gradually back into the river. This system involves a graduation in the period of cultivation from the head of the delta towards the tail-end, i.e. cultivation at the head will start in the beginning of June but by the time the water reaches the tail-end it would be very nearly the middle of August. That is why the double crop lands in the Tanjore delta are situated in the upper reaches. The delta thus utilises the waters of the south-west monsoon brought down by the river in such a way that, not only very little of it is wasted into the sea, but also its use is spread over as long a period as possible till in fact the beginning of September. The lean period in the Tanjore delta is the month of September. From the middle of October the north east monsoon provides the rains necessary for maturing the crop. The old system of irrigation in Tanjore may be epitomised by saying that under this system, every field acts as a reservoir and an insurance against floods.

AREA UNDER IRRIGATION

The area irrigated under the Cauvery delta system is about 8,70,000 acres of first crop and just over one million acres including the second crop.*

The following table shows the comparative areas under irrigation in the years 1931, 1941 and 1951 in Tanjore District:—

*Census Handbook of Tanjore District 1951.

Year	Total area of the district in acres	Area cultivated in acres	Government protected		Minor irrigation	
			First crop	Second crop	Irrigated area in acres	
					First crop	Second crop
1931 ¹	.	.	7,76,499	79,712	38,367	4,246
1941 ¹	.	.	9,29,570	96,826	33,566	3,278
1951 ²	.	.	11,33,941 ²	15,64,100	23,090 ²	

¹. Figures for these years were obtained from the Statistical Atlas of the Madras Presidency of 1931 and 1941.

². The figures for 1951 were obtained from the Census Hand Book of Tanjore District (1951) which gives only consolidated figures.

The value of the crops raised in the area is estimated at about Rs. 11.14 crores. The Government have spent over Rs. 85 lakhs for improving the system since it was taken over from the Tanjore kings. The system yields a return of about ten per cent on the capital outlay after giving credit for about Rs. 38 lakhs to old revenue.¹ The Mettur Reservoir has helped in establishing the supply of water and incidentally has rendered some of the large channels unnecessary. The construction of the reservoir at Mettur has made it possible for ryots to bring an additional 3,57,442 acres² of dry lands under wet cultivation.

According to the latest census returns, the population of the district is 29,82,670, of which the rural population is 24,04,774 and the urban is 5,77,896 and the density of population is 798 per square mile. 81 per cent of the population in this district live in the rural areas. The recorded population has registered an increase of 16.4 per cent during the decade 1941—1951 as against 7.4 per cent in the previous decade³. The increase of population in the district in 1951 over 1931 is 25.01 per cent. The Cauvery Mettur Project came into operation during the decade 1931—1941. Tanjore is a surplus district in the matter of food crops especially paddy and the district has shown clear signs of prosperity in the decade 1941—1951.

PATTUKKOTTAI TALUK

While all that has been said above refers to in general to the Tanjore district as a whole, the following deals in particular with the Pattukkottai Taluk which comes under the Pilot scheme. Among the twelve taluks of Tanjore district, Pattukkottai has been chosen for our enquiry, because it was considered an undeveloped and dry area originally, and a considerable part of the taluk was brought into cultivation only after the completion of the Cauvery Mettur Project. Out of the area of 3738 square miles of Tanjore District, Pattukkottai taluk embraces at present 435 square miles i.e. nearly a ninth of the total area. Out of the population of 29,82,670 (29.8 lakhs) in Tanjore District, Pattukkottai has a population of 2,46,153 after bifurcation of Orathanad taluk from the old Pattukkottai taluk in 1952. Thus roughly 1/12 of the population of Tanjore District is in the present Pattukkottai taluk. So we can say that in size and population, Pattukkottai forms an important area in Tanjore District.

Out of this population of 2,46,153 in Pattukkottai taluk, 90 per cent of the population is rural in character and the rest urban. More than 85 per cent of the population is depending on agriculture and the rest on other sources of income⁴. The taluk is thus predominantly agricultural in character.

¹ Cauvery Mettur Project by C. G. Barber (1940).

² *Ibid.*

³ Census Hand Book of Tanjore District (1951).

⁴ Census Hand Book of Tanjore District (1951).

Pattukkottai taluk is divided into seven *firkas* and each *firka* is composed of several villages ranging from 29 to 50. The total number of villages in the taluk is 269 and almost all the lands come under paddy. Out of these 269 villages, 231 villages are irrigated by the Cauvery Mettur Project and the rest are mainly rainfed supplemented by tanks and wells. The relative importance of various crops that are cultivated in the taluk may be seen from the following figures.

Statement showing the particulars of area cultivated in acres under the various crops in 1931, 1941 and 1951 in Pattukkottai Taluk

The figures for 1931 and 1941 have been taken from the Statistical Atlas of the Madras Presidency of the years 1931 and 1941. The figures for 1951 have been taken from the Census Hand Book of Tanjore District (1951).

Crops	1931 acres	1941 acres	1951 acres
1. Paddy	57,748	1,23,089	1,79,500
2. Cumbu	1,895	822	400
3. Ragi	7,227	5,068	3,300
4. Varagu and Maize	26,071	16,134	12,700
5. Red gram	1,835	1,032	1,500
6. Green gram, black gram, horse gram	252	67	Nil
7. Groundnut	31,126	23,492	21,500
8. Gingelly	7,297	3,517	2,400
9. Spices	1,017	864	Nil
10. Vegetable and fruits	3,243	4,662	1,000
11. Other Industrial varieties	6,638	11,653	Nil
12. Miscellaneous	6,323	596	Nil

From the above table it is clearly seen that after the extension of irrigation facilities to this taluk, the area under paddy has increased tremendously, wiping out the importance of almost all the other crops in existence prior to the project.

Pattukkottai is wholly irrigated by Cauvery Mettur Project. The larger increase of 33 per cent of population in Pattukkottai taluk in the period between 1941 and 1951 reflects the fact that this is a taluk which has been benefited greatly by the extension of irrigation made possible by the Cauvery Mettur project.

The northern and eastern portions of Tanjore District form the delta of the Cauvery which river with its numerous branches interacts and irrigates rather more than half of the whole of the district. This portion comprises the whole of Kumbakonam, Mayuram, Sirkali and Nannilam taluks, and part of Tanjore, Papanasam, Mannargudi, Thiruthuraiipoondi and Nagapattinam taluks. This is known as the old delta. The southern portion of the district lies about fifty feet higher with light soil and comprises the whole of Pattukkottai taluk and Arantangi taluk, southern portion of

Tanjore, Papanasam and western portion of Mannargudi taluks. These constitute the new delta. Pattukkottai which lies in the heart of the new delta has quickly developed into an important agricultural area with sufficient supply of water for cultivation. The river *Pamaniar* irrigates about a dozen villages in the eastern fringe of the taluk. The Grand Anicut canal irrigates the eastern and southern portions of the taluk. The north western part of the taluk and a small portion in the south-west are dry areas with a few minor irrigation tanks, which depend on rainfall for thier water supply. In this connection, the pattern of monthly rainfall at Pattukkottai for 10 years from 1941 to 1950 is given in the following table.

Puttukkottai—Monthly Rainfall

For 10 years from 1941—1950

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Months	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
January	0.49	..	2.90	0.99	0.60	0.87	5.90	3.85	0.41	0.69
February	0.80	..	1.21	2.22	..	..	1.18	..	..	3.98
March	..	..	1.41	3.90	0.54	1.90	3.64	2.02	..	1.8
April	2.16	5.79	0.49	..	2.01	1.08	7.28	0.59	1.63	0.51
May	0.27	1.07	9.65	0.07	..	4.14	1.81	0.59	1.84	1.17
June	..	0.87	2.10	2.21	0.33	1.10	1.17	0.70	0.85	0.48
July	3.08	3.81	1.45	0.47	6.17	0.42	7.29	5.22	5.87	3.01
August	4.41	5.15	2.16	1.83	7.25	2.89	4.83	3.52	5.06	5.67
September	9.15	7.84	4.51	2.80	2.94	2.27	4.51	0.77	3.31	2.13
October	9.11	6.23	15.77	7.82	7.26	4.14	9.72	3.57	6.51	5.40
November	12.99	3.63	2.71	10.42	7.97	15.3	1.00	9.39	4.18	8.78
December	6.12	6.98	2.97	4.43	1.09	15.69	0.18	3.36	0.08	5.85
TOTAL	48.58	41.37	47.33	35.21	35.46	48.72	47.69	33.47	29.74	39.75

In the event of failure of crops under the rainfed tanks, the people migrate to the deltaic areas. Besides this, there are also migrations during the harvest season every year from the neighbouring dry district of Ramnad. There are a number of jungle streams draining the taluk, the chief of which are the *Agniar*, the *Maharajasamudram* and *Kannanar*. As we go west, most of the areas are dry lands and there is need for expansion and extension of the canal to the interior to cover the rain-fed areas. The table below indicates the major and minor irrigation areas.

*Statement showing the Comparative Irrigated Areas in 1931, 1941 and 1951 in Pattukkottai Taluk**

Years	Area in acres	Actually cultivated area in acres	Government projected area		Minor irrigation	
			Irrigated area in acres			
			First crop	Second crop	First crop	Second crop
1931	4,33,520	1,89,215	91,251	2,716	8,262	904
1941	4,54,128	1,74,776	1,17,116	10,035	14,493	2,367
1951	4,46,720	2,22,300	1,28,531		2,384	

According to the above table in 1941 only 1,74,776 (1.7 lakhs) acres were under cultivation whereas in 1951 2,22,300 (2.2 lakhs) acres have been brought under cultivation bringing an extra area of 47,524 acres under cultivation. Thus during the period of 1941 to 1951, the Cauvery Mettur Irrigation Project had made a significant contribution to the development of agriculture in the Pattukkottai Taluk.

Pattukkottai grows mainly food crops. There are dry lands and wet lands. Altogether paddy is grown in 1,72,300 acres (1.7 lakhs) coming under channel irrigation and in 7,200 acres under rainfed tanks. Regarding the dry crops namely groundnut and gingelly, they are entirely rainfed supplemented wherever possible by irrigation from temporary wells. Groundnut is grown in 21,500 acres. Gingelly is grown in 2,400 acres. Varagu and ragi are grown in dry fields. Besides these, rarely, redgram and chillies are also grown in dry fields. These dry crops are almost entirely rainfed.

The patterns and seasons of cultivation of paddy in the Pattukkottai taluk are similar to these obtained in the District. Single crop cultivation is practised in the major portion of the area. Double crop cultivation is followed wherever the water-supply is assured through a longer period. In April to October wherever the single paddy is grown, usually gingelly or groundnut succeeds during summer season after the harvest of paddy. Dry crops are chiefly

*Figures for 1931 and 1941 were obtained from the Statistical Atlas of the Madras Presidency of 1931 and 1941 and those for 1951 from the Census Hand Book of Tanjore district (1951) which gives only consolidated figures for irrigated areas.

found in the western portion of the taluk which does not come under the Cauvery Mettur Project. In this area, gingelly and groundnut are sown, the former in April-May and the latter in September-October. Maize, ragi and varagu are also grown as dry crops. There are several rainfed tanks in this non-project area and whenever there is enough supply of water in the tanks, almost all the cultivators grow paddy in their lands but the supplies in the tanks are often uncertain and in such years no paddy can be grown.

The Agricultural Research Station and the District Agricultural Office help agriculturists by providing them with loan, seeds and manure. Even though the modified Japanese method is propagated, it is not yet popular in this area. In our sampling survey, we came across only one instance of the 'Japanese Method' of rice cultivation. Almost all of them are following the same old method and there is no change in either the implements, the quality of bullock, and use of proper manures and fertilisers etc. As against this, an account of the Pattukkottai Agricultural Research Station in the appendix gives an idea of the possibilities of improved methods of cultivation.

CHAPTER IV

Factual analysis of Agriculture and Rural Industries in the area surveyed

AGRICULTURE

The object of the survey was to study the influence of the Mettur Hydro-electric and Irrigation Project on agriculture and agro-industries in Pattukkottai taluk. Out of 269 villages comprising the taluk, 231 come under the irrigation facilities of the project. Of the latter, 15 villages were selected for the pilot survey. It was expected at the time of starting the investigation that it would be possible to trace the history of the individual holdings under the Cauvery Mettur Project (C.M.P.) area from the time prior to the introduction of the Project so that comparison could be made between the state of the holdings and the owners prior to the introduction of the Project and after its introduction. In actual investigations, it was found that in most of the cases, this was not possible. Hence in the later stages of the enquiry, out of the 38 villages in non-Project (non-C.M.P.) areas, 3 villages were selected for some comparative studies of the conditions existing between the Project and non-project areas. The sampling plan adopted for the C.M.P. villages and holdings is explained under Appendix II. In the case of non-C.M.P. villages and holdings, under the circumstances explained above, the investigations were taken up at the fag end of the period of survey and for rapid completion, convenient villages (8 per cent of samples) and convenient holdings were selected. For lack of time, only 61 holdings (2 per cent of samples) were selected. This could not be helped as inclusion of such holdings was not in the original plan.

Some relevant data concerning the eighteen villages worked out on the basis of data furnished by the Office of the Tehsildar, Pattukkottai are given in the table below*. From table, it is observed that 93·79 per cent of the population in the selected villages of the canal-fed area and 87·86 per cent of the non-project area have taken to agriculture as their primary occupation and depend on land for their livelihood. Out of the total area of 31,973·83 acres of the 15 villages, 14,982·10 acres are cultivated, which constitute 46·84 per cent, whereas in the three villages of the non-project area, out of the total of 13,037·41 acres 3,400·79 acres are cultivated, which comes to 26·08 per cent.

Also from the figures collected from individual holdings in the Pilot Survey, it is found that in the canal irrigated area, of the total area of 1,932·51 acres of the 597 samples taken for the survey, 1,664·89 acres are cultivated. Out of this 962·32 acres come under

*Table on the next page.

Particulars of the Fifteen Villages Selected from the Project Area in Pattukkottai Taluk

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Serial No.	Name of the village	Total area of the villages	Total cultivated area (in acres)	Percentage of the cultivated area	Total population	Agriculturists	Non-agriculturists	Percentage of agriculturists	Cultivated area per head
1	2	3	4	5	6	7	8	9	10
1	Madhukkur (including Mogur)	4739.29	2827.08	59.65	9,383	8,553	830	91.15	0.30
2	Raguramasamudram	316.52	123.06	38.87	291	282	9	96.90	0.42
3	Thokkalikadu	104.92	62.80	59.85	164	159	5	96.95	0.38
4	Thamarankottai	5704.12	2143.21	37.57	7,011	6,395	616	91.21	0.30
5	Rangoliappathottam*	70.63	70.63	Nil	Nil	Nil	Nil	Nil	Nil
6	Vattathikkottai	1285.60	710.00	55.22	730	728	2	99.72	0.97
7	Vilangulam	1988.48	856.00	43.04	1,198	1,117	81	93.24	0.71
8	Pulankollai	274.92	168.89	61.42	188	188	Nil	100.00	0.89
9	Sengamangalam	2170.55	1321.41	60.87	1,086	1,084	2	99.81	1.21
10	Thuvrankuruchi	2970.10	2035.07	68.51	2,670	2,566	104	96.10	0.76
11	Thambikkinnalivankottai Maravakadu	6240.46	1220.95	19.56	1,973	1,004	69	96.50	0.62
12	Nayagathivayal	210.18	88.63	42.16	30	30	Nil	100.00	2.95
13	Idayathi	2798.01	1719.00	61.43	2,808	2,750	58	97.93	0.61
14	Padapanavayal	509.61	333.35	65.41	310	309	1	99.67	1.07

15	Veerinkottai	.	.	.	2596.44	1302.03	50.14	2,413	2,312	100	95.85	0.54
	TOTAL	.	.	.	31979.83	14982.10	46.84	30,254	28,377	1,877	93.79	0.49

*Kengoiapparthottam is a village for revenue purposes but no villagers reside there and the land holders of this village reside in the adjacent village, Surapallam.

Particulars of the three villages selected from the Non-project area in Puttukkottai Taluk

1	Keeramangalam	.	.	.	3865.60	1611.00	41.67	3,658	2,634	1,024	72.01	0.44
2	Kolamangalam	.	.	.	8006.40	750.00	9.36	9,072	8,592	480	94.71	0.08
3	Panangalam	.	.	.	1165.41	1039.79	89.22	1,363	1,157	206	85.03	0.76
	TOTAL	.	.	.	13937.41	3400.79	26.08	14,093	12,383	1710	87.86	0.24

single crop cultivation; 524.40 acres are double crop lands and the rest dry crop lands. In the non-project area, of the total area of 317.03 acres of the 61 samples, 297.45 acres are cultivated. Out of this, 68.12 acres come under paddy cultivation, 207.12 acres come under dry crop cultivation and 22.21 acres are under other varieties and 19.58 are left fallow. These figures reveal certain trends. In the Project area, 89.3 per cent of the total cultivated area has been brought under wet cultivation, whereas in the non-project area only 22.9 per cent of the total cultivated area is under wet cultivation; moreover 35.3 per cent of the wetland area is under double crop system in the Project area. Whereas there is no double crop area among the holdings in the non-project area. This gives an idea of the great increase not only in the area under paddy but also the introduction of a large percentage of area under double crop.

From the statistical calculations, it is found, that more than 50 per cent of the families who have land holdings benefited by the project have brought under irrigation more than 95 per cent of their holdings. But in the non-project area almost all the families are able to use only 50 per cent of their holdings for cultivation of paddy. In fact 40 families out of 61 samples chosen for a comparative study are able to sow paddy only in 27 per cent of their total holdings. This clearly shows again that the introduction of the project in Pattukkottai taluk has considerably increased the acreage under paddy.

POPULATION-TRENDS

The following table shows the population of the fifteen villages selected in the Project area for the years 1931, 1941, and 1951, as obtained from the Census Hand Books of 1931, 1941 and 1951 of Tanjore District.

S.No.	Name of the village	Population			Percentage of increase from 1931 to 1951	Remarks
		1931	1941	1951		
1.	Madhukkur . . .	5545	6391	9383	69.22	The Land Census Register include Mugur and Ramambalpuram villages also under Madhukkur and hence the figures are not for Madhukkur proper.
2.	Reguramasunudram .	181	X	291	62.77	
3.	Thokkalikkadu . .	715	808	164		In 1951, this village was partitioned into two and hence it got reduced in size and hence the reduced population.

1	2	3	4	5	6	7
4. Thamarankottai	.	5060	5721	7011	38.56	
5. Thamb'kkinallavankottai Muravaikadu	.	1691	1669	1973	16.68	
6. Thuvarankuruchi	.	1735	2020	2670	53.89	
7. Rengajanpathottam	.	Nil	Nil	Nil		A revenue village having no population. Owners live in the adjacent village.
8. Sengamangulam	.	799	867	1036	35.92	
9. Padappanarvayal	.	142	X	310	118.32	
10. Nayagathivayal	.	33	X	30		A very small hamlet.
11. Veerayankottai	.	511	X	2412	372.02	
12. Vilungulam	.	650	614	1198	84.31	
13. Palankottai	.	146	X	188	28.79	
14. Idayathi	.	1925	2239	2308	40.75	
15. Vattathikottai	.	496	560	730	47.17	

X Figures not available.

From the above table it is calculated that the increase of population in the surveyed villages of the canal fed area between 1931 and 1951 is 58.62 per cent while the increase of population, for the same period in the Pattukkottai taluk as a whole and in the Tanjore District is 44.21 per cent and 25.01 per cent respectively. The large increase of the population in Pattukkottai Taluk between 1931 and 1951 reflects the fact that this is the taluk which has been mostly benefited by the extension of irrigation made possible by the Cauvery Mettur Project.

IRRIGATION

Out of the 18 villages surveyed, 15 villages are project areas. From the investigations, it is found that before the Cauvery Mettur Project provided irrigation facilities, people of these villages found recourse to jungle streams, wells and tanks for agricultural purposes. Even now this is the case in the non-project areas. The cultivators in the non-project areas depend on rain for cultivation. There are a few tanks in these villages for storing the rain water. They are not maintained properly and there is much water loss by percolation. The rainfall is not always regular and thus irrigation by tanks which depend on rain for storage of water is not certain. Well irrigation is also here and there pursued in these non-project villages, and water is drawn by means of rope and bucket and in some places by bullocks. The depth of the water level of the wells

from the surface in these areas ranges from 50 to 70 feet. The digging of wells is a hazardous venture for them, because they have to spend a fairly large amount to dig the wells till they find adequate quantity of water. The expenditure will depend upon the depth and it usually varies from Rs. 400 to Rs. 600. Instances are not wanting where the agriculturists have been disappointed in their attempts to get water, even though they actually dug deep in four or five places. Even if water has been obtained, it has not provided a perennial or continuous source. In contrast to this, in the villages in the canal fed area, a regular supply of water is provided at least for the major portion of the year through the canals. Water is usually supplied from the canals from the later half of June to the end of January.

But there are certain difficulties even in the canal areas. In the first 2 or 3 months, there is no scarcity of water, but when the level of water goes down in Mettur, difficulty is experienced to water the fields, because the flow of water in the canals is not sufficient. This circumstance is undoubtedly a reason for not pursuing double crop cultivation to a larger extent than exists at present. The farmers at the tail-end of the canal area express about the inadequacy of the water supplied to them, and it is generally felt that the soil in this taluk requires a greater quantity of water for proper cultivation and the present inadequate supply is one of the difficulties in the way of increasing the extension of cultivation. But the contention of the Government seems to be that as the carrying capacity of the Cauvery Mettur Canal at present is 4,200 cusecs,* it would not be possible to ensure a greater supply. It is however desirable that the Government should explore possibilities of increasing the water supply of the canal in the interest of increasing agricultural production in the canal zone of the taluk. In certain villages like Thambikkinallavankottai in the project area under survey, fields are irrigated by jungle streams also. But streams of this nature flowing through these villages cannot be relied upon, as they can supply water only when there are rains. When there are heavy rains, the surplus waters flowing through these jungle streams are now wasted and it would be an asset to the villagers skirting round these jungle streams, if the waters of these streams are properly canalised and diverted. An attempt of this nature, apart from providing the irrigational facilities, would be a blessing to the villagers, in that the havoc caused at the times of inundation could also be considerably reduced. The Pattuvanachi scheme near Thambikkinallavankottai to divert the water of the jungle stream deserves commendation. It is hoped that nearly 800 acres of land can be freshly brought under this scheme. Further attempts akin to this should be launched upon. In the canal-fed areas, for the cultivation of dry crops like groundnut and gingelly, the cultivators dig temporary wells in the fields itself and the depth varies from 6 to 15 feet. In the unirrigated areas of the Project zone, well water is available upto a depth of 10 to 20 feet, and wells can be dug at an expenditure of about Rs. 100 to 300. This increase in the height of the water table in these areas is due to the influence of the Cauvery Mettur Canals.

*Cauvery Mettur Project by C. G. Barter (1940)

CROP PATTERNS AND CULTIVATION PRACTICES

There have been changes in cropping patterns, as a result of the Mettur Irrigation project providing assured irrigation to Pattukkottai, as revealed by the Pilot Survey. Some of these facts have also been mentioned earlier.

The following table, figures for which were calculated from the basic data from the Census Handbooks of 1931 and 1951, also gives some idea of the changed patterns of cropping and changed importance of individual crops:—

Name of crop	Extent of area as percentage of the total cultivated area	
	1931	1951
1. Paddy	38.3	80.8
2. Cambu	1.3	0.2
3. Ragi	4.8	1.5
4. Varagu Maize	17.2	5.6
5. Red gram	1.2	0.7
6. Green gram, black gram and horse gram	0.2	Nil
7. Groundnut	20.7	9.7
8. Gingelly	4.8	1.1
9. Spices	0.7	Nil
10. Vegetable & fruits	2.2	0.4
11. Other industrial varieties	4.4	Nil
12. Miscellaneous	4.2	Nil

The area under paddy in Pattukkottai taluk has jumped from 38.3 per cent of the total cultivated area as it stood prior to the Project to 80.8 per cent as a result of the full benefit of the project.

Also from the actual figures collected from individual holdings in the Project area in the Pilot Survey, it has already been pointed out that 89.3 per cent of the total holdings has been brought under wet cultivation i.e. under paddy, whereas the comparable figure is only 22.9 per cent in the non-project area.

All this reveals the fact that the advent of the Mettur Cauvery Project has made Pattukkottai Taluk almost an area of monoculture of paddy, whereas prior to the project the taluk under the stress of lack of water facilities, had to have recourse to growing of varied crops to suit the changing and uncertain seasonal conditions. The above table shows that the area at least under certain groups of crops has almost disappeared as a consequence to the dominance of paddy.

In paddy cultivation itself, there has been a change as a result of the project. Whereas in the non-project area, there is no acreage where two crops of paddy are taken, it is found that in the holdings surveyed in the project area, 35.3 per cent of the acreage is under double-crop system.

In the project area, wherever the single crop paddy is grown, gingelly or groundnut succeeds paddy through the summer and the residual moisture from the paddy crop is a great help in this matter. This is the main pattern of cropping in contrast to the non-project area which still has recourse to the varied crops mentioned before to maintain its agricultural economy.

One of the features worthy of mention with regard to crop-patterns is the fact that the introduction of more assured water supply has given an incentive almost solely to expansion and intensification of paddy growing and has led to the introduction and establishment of no new commercial or industrial crop in any worthwhile area in Pattukkottai Taluk. Wherever an introduction of a new crop has been attempted, there has not been much headway. The Department of Agriculture attempted to introduce cotton in rice fallows in the Tanjore District. This requires supplementary water source other than the channel during the summer months when the channel supply is stopped. But one of the encouraging features in the Project area is the fact that as a result of the project, there has been a rise in the water-table, the water lying in sandbeds and a comparatively inexpensive method of tapping this water is through the filter-point tube-wells. It is a progressive measure to provide the farmers in the Project areas, with the possibilities of growing a food crop and a ready cash crop. But this attempt at introduction of cotton has not spread to the extent desired and in fact, in none of the villages surveyed, is cotton being grown by the farmers. One of the serious drawbacks to the farmers, whenever a new crop like cotton is introduced, is the lack of ready marketing facilities and of quick conversion of the produce into cash. Whenever such introduction is made, it is desirable that side by side with the introduction of a new crop, facilities for ready marketing are established or sponsored by the Government Department of Agriculture. The Tanjore District Co-operative Cotton Marketing Society has been established at Aduthurai, in Tanjore District, in recent years, but this cannot efficiently serve the interior villages of Pattukkottai Taluk.

There is another commercial crop viz. sugarcane which is getting attention for being grown in the Tanjore District, but this does not come under the purview of the pilot survey in Pattukkottai taluk. A large sugarcane area is being established at Tiruvarur which belongs to Nagapattinam taluk in Tanjore District. This venture is still in the initial stages and the possibilities of sugarcane becoming a widely grown commercial crop in the Deltaic areas of Tanjore District are still to be explored.

It is however certain that paddy will continue to be the prominent crop in the project areas for several reasons, and it is also desirable that this situation continues to exist, from the point of view of supply of staple food to a large population in South India. For one thing, the Deltaic areas under the Project are best fitted for growing of paddy, as the crop requires abundance of water, and hardly there is another area in the South which can match this project area in the amount of water supply. Secondly, paddy is peculiarly a crop which can grow under conditions of swampiness in which no other crop can grow. But still there seem to be areas in the Tanjore

District, where there are possibilities for diversification of agriculture, and where new commercial crops such as sugarcane and cotton can be grown in rotation with paddy, and it is also likely that better manuring and greater cultural operations involved in commercial crops leave beneficial residual effects on cereal crops like paddy, whose yields, as a result are likely to be influenced favourably. The economical strength of the farmers will also be enhanced.

Regarding cultivation practices, the survey indicates not much change or improvement in this respect. The Agricultural Research Station at Pattukkottai is a model for improved methods of farming, but the survey shows that the farms coming under the survey have not taken up to those improved methods in any significant way. There is not much evidence in the surveyed villages of the spread of the improved agricultural implements such as are being used in the Pattukkottai Agricultural Research Station, e.g. the iron plough, the Burmese Setton, the green manure trampler, etc. Even the improved strains of seeds have not spread to the extent desired. From the data obtained from the District Agricultural Officer, Pattukkottai, it is found that during the year 1955, 64,960 lb. of improved strains of paddy were distributed in Pattukkottai taluk. Estimating that at least 30 lb. of seeds were sown per acre of paddy, the calculated area under strains of paddy is 2,165 acres, as against 1,79,500 acres of the total area. This indicates the vast scope for improvement in this direction. Intensive manuring, use of artificial fertilisers, such as Ammonium Sulphate, growing of green manures such as *Sesbania speciosa*, have not come into vogue. There was only one instance in all the holdings surveyed where the "Japanese Method" of rice cultivation was observed to be practised.

The great response of particularly, paddy to intensive manuring and certain cultural practices has been well demonstrated in recent years. The response of paddy particularly to application of ammonium sulphate in the manurial programme has been well known. It is seen from the data kindly furnished by the District Agricultural Officer, Pattukkottai that in the fasli year 1954-55, 14,29,120 lb. of ammonium sulphate were distributed and considering 100 lb. per acre as an effective rate of application, 14,291 acres of paddy are calculated to be covered, which works out to only 8 per cent of the total area under paddy in Pattukkottai taluk and this is at a time when the campaign for ammonium sulphate is said to have been at its peak.

While water was supplied to Pattukkottai taluk through the Project, and while by itself this has largely benefited agricultural production in the taluk, a more dynamic organisation should have been established by the Government from the very commencement of the scheme of supply of water from the project to effectively establish among the farmers under the project improved practices to step up production to even greater extent than increased irrigation facilities could alone accomplish.

LAND TENURE SYSTEM

In the villages that were chosen for the Pilot Survey, the lands invariably belonged to the owner-cultivators and the system of tenure

is ryot-wari in which the farmers enjoy ownership of the land subject to the regular payment of the land revenue assessment fixed by the Government. There was no difference in this pattern of land revenue between the project and non-project areas surveyed.

PRODUCTION COSTS AND NET RETURNS

In this report, the term Net Yield implies the total yield per acre minus the deductions of payments made in kind at the time of harvest. The term 'net returns' denotes the value of the total produce obtained per acre after deducting what has been paid in kind for harvest, or in other words, the value of the 'net yield'. The term 'net profit' is profit which has been calculated deducting from the value of the gross yield, the payment in kind and the cost of production.

In the canal fed area, the average cost of production of paddy per acre, according to the statistical analysis comes to Rs. 121 excluding the payment made in kind at the time of harvesting, and the average value of the net yield per acre works out to Rs. 230 after deducting the payment in kind, and average net profit per acre works out to Rs. 113. The average yield of paddy in the canal-fed area is 39 kalams per acre whereas that in the non-project area is 20 kalams per acre. Similarly from the statistical calculations it is seen that the average cost of production of paddy in the non-project area comes to Rs. 96 per acre and the average value of the net yield per acre works out to Rs. 125 and the average profit is Rs. 37. The cost of production mentioned above includes the cost of labour supplied by the members of the family themselves. The profit is calculated as the balance left behind after the expenditure incurred at different times in the various items of work such as ploughing, cost of manure, and manuring, raising seedlings, etc. But it should be borne in mind that the agriculturists as a whole are financially poor and as such they put in their own labour in the fields beginning from the preparation of the ground to the threshing of the produce and the share of the wage, which otherwise would have been expended is realised by themselves and this goes to the increase in the subsistence level of the agriculturists. Instances are not wanting where crops have failed due to lack of water supply and have often failed in two or three consecutive seasons resulting in miserable financial conditions of the agriculturists in the non-project area. Consequently they contract debts from which it is difficult for them to tide over for at least a few years.

The average cost of production of groundnut as could be seen from the statistical analysis come to Rs. 57 per acre in the canal fed area and Rs. 53 per acre in the non-project area; the value of the net yield per acre is Rs. 128 in the project area and Rs. 86 in the non-project area; and the profit per acre works out to Rs. 71 in the canal fed area and Rs. 33 in the non-project area. The average yield of groundnut in the canal fed area is 26 kalams per acre while in the non-project area, it is 17 kalams per acre.

The above data indicates the substantially increased net returns to the farmer in the Project area as a result of the provision of water supply from the project.

LAND SALES AND INDEBTEDNESS OF CULTIVATORS

It has not been easy to collect information in this regard. Both direct and indirect methods of obtaining information had to be resorted to. Conclusions have had also to be drawn from certain broad data available.

The table below provides some information in this regard, gathered from direct questioning of the farmers in the project area surveyed. It reveals that out of 597 samples surveyed, 126 have been able to purchase additional lands during the last ten years. The table gives the extent of savings in cash, and amount of insurance etc. It is also seen that out of the 597 samples surveyed, in only 11 samples has any indebtedness been recorded and even in these cases, the holdings have been in low lying areas susceptible to frequent flooding or have been otherwise in unfavourable situations, etc.

While this reveals a situation which is encouraging to some extent, particularly that in general in the Project area, the proverbial indebtedness of the farmer has almost disappeared, but still the ultimate savings from what could be gathered are not in a satisfactory proportion to the net returns per acre in the Project area as revealed above under "Production costs and Net Returns".

It is feared that the average holding is still not adequate in the Project area as an economic unit. There is too much pressure on land. This pressure must be removed to the extent possible by greater introduction of industries both large and small using the electricity of the Project. Moreover greater savings drive must be sponsored by the Government, inculcating greater thrift and savings among at least the farmers with better economic holdings.

*Data on capital formation and credit worthiness collected from the samples surveyed (extent of purchase of land, cash savings, insurance, etc.) during the last ten years**

Serial No.	Name of the villages	Number of samples taken	No. of samples whose additional lands have been purchased	Total area of land purchased (in acres)	Value of land purchased (in Rs.)	Area of land sold away in acres	Value of land sold in rupees	Total Debt in rupees	Total savings in cash (Rupees)	Amount of insurance
1	Madhukkur (including Moghur)	104	33	12.05	9,735	3.60	1,564	2,950	3,300	14,000
2	Raguramasamudram	8	4	8.37	9,683	Nil	Nil	Nil	Nil	Nil
3	Thokkalikadu	17	2	3.43	3,800	Nil	Nil	Nil	2,000	Nil
4	Thamarankottai	110	30	8.78	48,150	1.36	1,440	Nil	6,000	Nil
5	Thambikkinnallavankottai Maravakkadu	37	4	7.24	7,050	4.00	4,000	Nil	Nil	Nil
6	Thuvranakurichehi	56	10	9.47	9,900	1.33	1,200	1,300	1,500	Nil
7	Rangojiappathottam	6	1	0.33	200	0.25	140	Nil	Nil	Nil
8	Sengamangalam	46	10	13.38	12,488	4.00	3,500	Nil	Nil	Nil
9	Padappanarvayal	5	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
10	Nayagathivayal	5	1	2.00	2,000	Nil	Nil	Nil	Nil	Nil
11	Veerancottai	53	8	4.78	5,060	2.64	3,260	Nil	Nil	Nil
12	Vilangulam	23	3	4.40	4,400	Nil	Nil	Nil	Nil	Nil
13	Pulankollai	10	2	2.60	2,700	Nil	Nil	Nil	Nil	Nil
14	Idayathi	86	15	15.39	11,910	6.43	3,125	Nil	Nil	Nil
15	Vattathukottai	21	3	8.00	6,300	Nil	Nil	Nil	Nil	Nil
TOTAL		597	126	130.22	1,33,376	23.03	18,229	4,250	12,800	14,000

*Particulars gathered and collected during the field investigation.

Credit facilities should be provided to a larger extent than exist at present. There are co-operative credit societies in ten villages out of the eighteen villages surveyed and consumers' co-operative societies in two villages. In Thambikkinallavankottai and Madhukkur there are palmyra-Jaggery co-operative societies also. The credit societies help the people to get credit from the Co-operative Central Bank. The benefit of the services of these societies have not reached one and all of the agriculturists. In other villages, where there are no credit societies, the agriculturists depend on local money lenders and the rate of interest varies from 10 to 40 per cent. It is time that every agriculturist gets the benefit of credit at reasonable rates of interest through Co-operative Credit Societies.

RURAL INDUSTRIES

Pattukkottai presents more or less the same features as other parts of Tanjore District in respect of small industrial establishments which are scattered and unorganised, and managed by persons whose main interest is agriculture.

The large scale industries in Pattukkottai taluk and the number of persons employed are given below as per the records of the Pattukkottai Taluk Office:—

Taluk	Kind	Number of establish- ments	Number of persons employed
Pattukkottai	Rice mills	19	163

The table below indicates the total number of textile and non-textile establishments and the number of labourers employed in those industries in rural tracts in Pattukkottai taluk, as obtained from the Taluk Office Registers:

Serial No.	Kind of establishment	No. of establishments.	Total No. of		Children employed	Whole time	Part time	Total persons employed
			men	women				
1	2	3	4	5	6	7	8	9
1	Cotton spinning sizing weaving	10	12	12	3	21	6	27
2	Manufacture of rope, twine, string and other related goods like cocoanut straw linseed and hair	131	34	250	30	288	26	314
3	Mat weaving	680	914	742	67	459	1,264	1,723
4	Food industries	5	10	Nil	Nil	10	Nil	10
5	Fishing	190	491	22	42	338	217	555
6	Canning and preservation of fish	6	15	4	Nil	Nil	19	19
7	Other process of grains and pulses	14	9	19	Nil	Nil	28	28
8	Millers of cereals and pulses	13	44	3	Nil	36	11	47
9	Vegetable oil pressers	58	136	28	6	94	76	170
10	Gur manufacture	2	2	2	Nil	Nil	4	4
11	Manufacture of aerated waters	7	28	1	Nil	29	Nil	29
12	Manufacture of tobacco	3	10	Nil	Nil	10	Nil	10
13	Tailors and dress makers	17	46	Nil	1	47	Nil	47

	1	2	3	4	10	Nil	10	Nil	10	Nil	10
14 Cobblers and shoe makers	.	.	.	.	4	10	Nil	Nil	10	Nil	10
15 Blacksmith and iron workers	.	.	.	.	81	186	26	13	177	48	225
16 Workers in bell metal	.	.	.	.	3	6	Nil	Nil	6	Nil	6
17 Assembling and repair of cycles	.	.	.	.	12	28	Nil	1	29	Nil	29
18 Workers in other metals	.	.	.	.	7	13	Nil	2	15	Nil	15
19 Miscellaneous industries	.	.	.	.	1	3	1	Nil	4	Nil	4
20 Jewellery	.	.	.	.	52	119	10	18	116	31	147
21 Cement and cement pipes	.	.	.	.	1	2	Nil	Nil	2	Nil	2
22 Lime burners	.	.	.	.	6	3	1	Nil	4	Nil	4
23 Potteries	.	.	.	.	94	175	148	20	287	56	343
24 Wood materials	.	.	.	.	28	71	25	9	53	52	105
25 Sawyers	.	.	.	.	2	4	Nil	Nil	4	Nil	4
26 Carpenters	.	.	.	.	121	271	33	24	254	74	328
27 Basket makers	.	.	.	.	44	58	61	3	37	85	122
28 Hotels and restaurants	.	.	.	.	143	295	91	13	378	21	399
TOTAL	.	.	.	.	1,735	2,995	1,479	252	2,708	2,018	4,726

Pattukkottai taluk has a rural population of 3,65,463. Of these, as can be seen from the table above, a total of only 4,726 people are engaged either whole time or part time, which works out to 1.3 per cent of the rural population. Pattukkottai taluk has become an area mainly for paddy and the major portion of the paddy area is under single crop. As such rural population in general have occupation only for part of the year and it is a discouraging feature that only about one in a hundred is employed in a rural or cottage industry. The potentialities of use of electricity abundant production of which is a feature of the Mettur Hydro-electric Project have not been explored for greater organisation of rural industries. Among the 269 villages in Pattukkottai taluk, electricity has been introduced to only 10 villages. Nor has been emphasis laid on village industries as means of extending the occupational period of the rural population. With better capital formation on the average as a result of increased agricultural production consequent to the provision of irrigation water through the Project, the average villager is in a better position in this taluk to initiate small industries to occupy the idle season of the year or at least to participate or be employed in small industries. The discouraging position in this respect can be attributed mostly to lack of foresight in planning the multiple purposes of the Project and to enforce an organisation to take care of this situation.

The pilot survey included investigations on the rural industries existing and the possibilities in the future in the 15 villages included in the survey. Below a brief account is given village by village.

Madukkur village is situated in Madukkur firka and the total population is 9,383 of which 830 people are non-agriculturists. There are 105 non-textile establishments and 189 textile establishments. All of them are small scale establishments, the chief of them being oil-pressing, mat making and cloth weaving units and small-scale rice mills. There are fourteen rice mills run by electricity. All other industries are undertaken by hand power. There is scope for weaving and mat making. This is the one of the two villages among those under survey, in which electricity has been introduced.

Reguramasamudram is another village under survey and in the same firka, and has a population of 91. Only 9 people are non-agriculturists and agriculture is the main occupation of the people of the village. Part-time industries like coir making and mat weaving could be organised, because the raw materials are available.

Thuvarankuruchi is situated in Pattukkottai firka having an area of 2,970.10 acres with a population of 2,617 of which 104 are non-agriculturists. There are seven non-textile establishments and nineteen textile establishments. Among them hand weaving, oil pressing etc. are some of the main industries. There is a very large production of cocoanut which has a good market. There is one rice-mill. There is scope for introducing coir making, and oil pressing on account of the abundant cocoanut production in that village. This is the only other village besides Madhukkur where electricity has been introduced. Rangojiappathottam is a hamlet situated in Pattukkottai firka and it is very thinly populated with little or no scope for any supplementary industries.

Thambikkinallavankottai Maravakkadu, Thokkalikkadu and Thamarankottai are situated in Adirampattinam firka. Thambikkinallavankottai Maravakkadu has an area of 6240.46 acres with a population of 1,973 of whom 70 are non-agricultural dependents. There are eight non-textile small scale establishments and 14 textile establishments, and there is also a salt factory as the place is nearer to the sea. There is one rice mill run by oil engine and there are also a few handlooms.

Thamarankottai covering an area of 5704.16 acres has a population of 7,011, of whom 616 are non-agriculturists. There are three rice-mills run by oil engine. The extension of electricity to this area would help the replacement of oil engines by electric power in the rice-mills of that area. There is abundant cocoanut production in this village with great potentialities for coir manufacture and oil pressing industries. There are 39 small scale non-textile establishments and three textile establishments. In our investigation we have come across the good facilities that exist here for the manufacture of coir production, tile making, manufacture of palmyra jaggery, fishing and the manufacture of salt. A few of the industries which are found in the village are in a languishing condition. Bee-keeping, poultry-rearing, pisciculture, rope making, mat making, and weaving are other possible industries. The extension of electricity to this village could open out possibilities of further expansion of existing industries like rice-mills.

Thokkalikadu has an area of 104.92 acres with a population of 164. There is one rice mill run by oil engine. The village is too small for any great scope for rural industrial expansion.

Vilangulam and Pulankollai are situated in Perumagalore firka. Vilangulam has got an area of 1988.48 acres with a population of 1,198 of whom only 81 are non-agricultural dependents. Almost all the people of the village are agriculturists and there are no small industries worth the name. As this village is adjacent to sea, there is scope for exploring the possibilities of fishing, fish preserving and canning industry on a scientific basis, as these industries are carried on in a more or less primitive manner.

Pulankollai is a village situated in the remote corner of the taluk and has an area of 274.92 acres with a population of 188 who are mainly agriculturists and there is not much scope for industrial expansion. But the mirasdars of the village evince considerable interest in the development of certain industries allied to agriculture such as jaggery industry and mat weaving for which there is an abundant supply of raw materials like palmyra trees and korai grass respectively.

Idayathi which is situated in Thiruchittambalam firka has an area of 1,798 acres with a population of 2,808, of whom only 50 persons are non-agriculturists. Though this village comes under the benefit of new irrigation of Cauvery Mettur Project, it is lacking in even the elementary amenities of proper communications or transport. In this respect, this is one of the worst examples, where there is practically no road and most of the year, carts if they go at all have to wade through two miles of water, the channels forming the tract for the carts. In fact, very few of the villages which were surveyed

had any proper road communications. Vilangulam and Pulankottai are good examples of villages, adjacent to each other, whose access by winding dust roads takes about 15 miles from the nearest railway station viz. Peravarni, whereas the foot-path takes only about 6 miles, and even these 15 miles of cart roads would be very difficult to use in times of rain.

Vattathikottai has an area of 1,285.60 acres with a population of 730 and almost all of them are agriculturists. As there is an adequate supply of korai grass in the village, it is worth-while to explore the possibilities of its utilisation for mat making as a subsidiary occupation for the agriculturists.

Sengamangalam and Padappanarvayal are situated in Peravarni firka. Sengamangalm has got an area of 2,170.55 acres with a population of 1,086 and all of them are agriculturists. Pottery and rope-making are practised on a small scale by the agriculturists of the village.

Padappannarvayal has an area of 509.61 acres with a population of 310 and all of them are agriculturists. There is practically no subsidiary occupation.

Veerayankottai and Nayagathivayal are situated in Sethubavachathram firka. Veerayankottai has an area of 2,596.44 acres with a population of 2,412. Nearly 100 of them are non-agriculturists and there are no small industries other than agriculture. But there is scope for coir making, palmyra jaggery making, dairy farming and bee-keeping. As the village is replete with flowering plants it is particularly suitable for bee-keeping. Nayagathivayal has an area of 210.8 acres with a population of 30 and almost all of them are agriculturists. There is no rural industry at all there and it is too small a village also.

A brief account given above of the individual villages under survey also substantiates what was said before viz. that there is need and scope for organising more rural industries in the Pattukkottai taluk. In addition, the transport and communications have to be greatly improved.

The inadequacy of transport facilities in turn affects the marketing facilities. The agriculturists are forced to "distress sales" of the surplus produce through agents. In very few villages, the agriculturists are able to dispose of their surplus produce in a near by town, because of the lack of existence of cartable roads. The straw which is a by-product of the agricultural crops is sold at cheap rates or is used as fodder or for thatching the housing sheds. Lack of transport or communication facilities forms one of the reasons for little progress in cultivation techniques also in these villages.

CHAPTER V

Interpretation of Statistical Data

I. LAND AREA OWNED

We have in our samples land areas owned under two classifications viz. (1) areas which are irrigated by Cauvery Mettur Project (C.M.P.) and (2) areas which are purely rainfed or watered by rainfed tanks (Non-C.M.P. area). To study the effect of these two different sources, 597 samples of areas irrigated by C.M.P. and 61 samples of rainfed areas have been chosen on the method of sampling indicated elsewhere.

A detailed study of the land areas irrigated by C.M.P. leads us to conclude that there are only very few families which have comparatively larger holdings. In fact there are only 40 families which have holdings more than 18 acres per head while there are 44 families which own less than half an acre per head (Table I-A: Appendix I). With no loss of generality, the confidence limits for the average holding of the entire land areas irrigated by C.M.P. can be fixed as $3.3 \pm \frac{57}{\sqrt{597}} = 3.3 \pm 2.3 = 1$ and 5.6 , assuming the

normality of the population.

In the case of the land areas which do not come under C.M.P. there seems to be not much uneven distribution though the maximum occurs corresponding to the value of $X=3$ and the minimum is 3 corresponding to $X=9.5$. The Arithmetic Mean is nearly 5.4 acres and the Standard Deviation is only 4.5 acres (Table I-B). These results may be compared with the corresponding figures of the land areas irrigated by C.M.P. The estimates of the population average land area (not under C.M.P.), may be given to be $5.4 \pm \frac{13.5}{\sqrt{61}} = 5.4 \pm 1.7 = 3.7$ and 7.1 acres.

II. (a) PERCENTAGE OF WETLAND AREA TO TOTAL HOLDINGS

From the Table 2-A, it is found that more than 50 per cent of the families who have lands benefited by C.M.P. have brought under wetland paddy cultivation, 95 per cent. of their holdings. These results from Table 2-A compare favourably with the corresponding figures in the holdings, in non-C.M.P. area.

Almost all the families in the non-C.M.P. area are able to use for wetland cultivation only 50 per cent. of the holdings. In fact, 40 families out of a sample of size 61 chosen for study are able to sow paddy only in 27 per cent. of their total holdings. The Arithmetic Mean of the percentage for these 61 families is only 23 and the Standard Deviation is only 15 (Table 2-B). So the estimates for the population percentage are $23 \pm \frac{45}{\sqrt{61}} = 17.2$ and 28.8 , less than 30

per cent. This again clearly shows that the introduction of C.M.P. in Pattukottai Taluk has considerably increased the acreage under wet cultivation.

III. ECONOMICS OF PRODUCTION OF CROPS

(A) Paddy.

(i) Gross yield per acre in Kalams:

The distribution as can be seen from the Table 6-A is very nearly symmetric about the mean which is 30 kalams, though the range of distribution is small. The Standard Deviation in this case is 10.2. The maximum occurs against 30.

In the case of non-C.M.P. areas, the maximum occurs against 20 and nearly 75 per cent. of the samples have gross yield less than 20 kalams per acre. The average is 20 kalams and the Standard Deviation is 5 (Table 6-B). The corresponding average in the C.M.P. irrigated area is 30 kalams which is nearly double that of non-C.M.P. area. This indicates the effect of the Project in increasing production of lands coming under its benefit.

(ii) Cost of production per acre :

Of the 597 samples chosen from the land-holdings benefited by C.M.P., only one family has not utilised its land for cultivation and hence there are thus 596 samples for a detailed study. In the case of non-C.M.P. land holdings, 7 families are not cultivating paddy in their holding and hence there are 54 families for consideration. Table 3-A clearly indicate that there is concentration in the middle with practically 0 frequencies in the ends sloping uniformly on both sides. The mode occurs for the value of $X=115$ and nearly 400 families have their costs of production less than Rs. 125 per acre. The Arithmetic Mean is Rs. 121 and the Standard Deviation is only Rs. 31. This also indicates that there is a greater concentration in the near-about of the average value of Rs. 121.

In the case of the non-C.M.P. holdings also, where paddy is cultivated, there is concentration in the middle of the table (Table 3-B). The minimum cost of production per acre is Rs. 65 and the maximum is Rs. 145. The average cost of production is Rs. 96 with the Standard Deviation Rs. 17. Comparing the average costs of production in the two classifications of the landholdings, it is found that there is a great disparity. It is clear that comparatively not much money is being spent on the cultivation of paddy in non-C.M.P. areas in comparison with C.M.P. irrigated areas and it is obvious that insufficiency of water to irrigate frequently, the uncertainties of production and the inferior economic condition of the farmers in non-C.M.P. area do not permit of greater investment in the cultivation of paddy.

(iii) Net return per acre:*

In this case also, only 596 samples are considered in the C.M.P. irrigated areas and 54 samples in the non-C.M.P. areas as explained before. A careful study of the Table 4-A shows that greater fre-

* The net-returns denote the value of total produce obtained per acre, after deducting what has been paid in kind for harvest.

quencies of the number of families occur in the middle portion of the entire range with very little frequencies in the ends. Out of 596 families, nearly half the number of families have their net returns in paddy as Rs. 225 per acre which is nearly equal to the average for the whole table. Or in other words, the distribution may be considered to be symmetrical about the average. This is the kind of distribution of samples that can be normally expected from a normal population with a careful unbiased method of sampling. The Arithmetic Mean is Rs. 230 and the Standard Deviation is Rs. 65.

In the case of non-C.M.P. areas, nearly 90 per cent of the families have Rs. 170/- as the value of the net yield per acre. The average is Rs. 125/- while the Standard Deviation is 34 (Table 4-B). As was stated earlier, the corresponding average in the case of C.M.P. irrigated areas is Rs. 230/- which is nearly double. This clearly indicates that the C.M.P. irrigated areas have a much greater yield per acre in the case of paddy. Though this inference is drawn only from the studies of the samples from the two different classifications, yet it can be easily shown from the calculation of the corresponding estimates for the two different populations, that the inference is valid in the populations also. So it can be assertively stated that the C.M.P. has considerably increased the value of the yield of paddy per acre.

(iv) Net profits per acre:

Profits which has been calculated deducting from the value of the gross yield, the payment in kind and the cost of production is tabulated as per Tables 5-A and 5-B for the two types. The total number of samples in the C.M.P. irrigated areas which have profit is 594 against 596 taken into consideration. Two families alone incur loss in the cultivation of paddy. In the case of these two families, their holdings are in very low-lying site, lacking drainage, and frequently susceptible to flooding. There is equitable distribution in profit per acre in the case of C.M.P. irrigated areas. The average is Rs. 113/- and the Standard Deviation Rs. 39/-.

In the case of non-C.M.P. areas, the average profit per acre is Rs. 37/-. The distribution also is uniform with the maximum occurring at Rs. 20/- per acre. The disparity in the profits clearly brings out the good effect that the introduction of the C.M.P. has produced on the earning capacity of the farmer.

(B) Groundnut.

(i) Gross yield per acre:

The distribution in the irrigated areas is uniform in the form of a step from the mode occurring against 23. The maximum is 54. Nearly 50 per cent of the families have the gross yield less than 25 kalam per acre.

The averages for the C.M.P. and the non-C.M.P. areas are 26 and 17 kalams respectively (Tables 10-A and 10-B). Since there is a greater range in the distribution, the Standard Deviations are 8 and 4.5 respectively. The difference in the average gross yields per acre in the irrigated and the non-C.M.P. areas is clearly supplementary in favour of the inference already made that even in the cultivation of groundnut the C.M.P. has an appreciable effect.

(ii) *Cost of production per acre:*

There are only 237 families against 597 who cultivate groundnut while all the families of the samples chosen from the non-C.M.P. areas cultivate groundnut. (Tables 7-A & 7-B).

In the case of C.M.P. irrigated areas the cost of production per acre varies from Rs. 22/- to Rs. 124/- while the range in the case of non-C.M.P. areas is only 48 with bounding limits as 32 and 80. The averages in the two cases are 57 and 53 respectively. There is not much of difference in the cost of production in the two classifications and even the very small difference may be attributed to sampling errors. This only shows that the cost of production of groundnut varied on account of the introduction of the C.M.P.

(iii) *Net returns per acre:*

The averages in the two cases that is C.M.P. and non-C.M.P. are Rs. 128/- per acre and Rs. 86/- per acre respectively. (Tables 8-A & 8-B). This also ensures that even in the cultivation of groundnut, a dry crop areas which are benefited by C.M.P. have a much better yield.

(iv) *Net profits per acre:*

In the case of C.M.P. irrigated areas there is one family out of 237 considered which incurs loss. The remaining 236 are distributed more or less symmetrically about the model value 65. In the case of non-C.M.P. areas, there are two families which incur loss and the distribution has two points of maximum. The distribution is not uniform. This may be due to the cultivators depending purely on rain and the rainfall may not be uniform for all the samples chosen. The average profits in the two cases are Rs. 71/- and Rs. 33/- per acre respectively. This difference is indicative of the desired good effect of the introduction of the C.M.P. in Pattukkottai taluk. It is found even in the case of groundnut C.M.P. has a favourable effect on the profit per acre.

(C) *Other crops (Maize, Ragi and Chilli).*

The above crops are grown generally only in the non-C.M.P. area and not in the C.M.P. area. As such, a comparison of the economics of production of these crops between the two areas has not been possible. However, in the survey, in the non-C.M.P. area, the net

profit obtained from these miscellaneous crops grown in each holding has been worked out. Out of the 51 samples, 3 have worked out at a loss and the other 48 samples are taken into consideration. The average net profit works out to Rs. 47.5 and the standard deviation is Rs. 39.7. (Table 11-B).

It is obvious that the average net profit from the miscellaneous crops is better than groundnut in the non-C.M.P. area under rain-fed conditions, probably because the other crops mentioned above are able to stand uncertainties of rainfall better than groundnut.

As against the average net-profit of Rs. 47.5 obtained by these crops which the farmers are forced to grow in the non-C.M.P. area for lack of water supply to grow other crops like paddy which require more water, in the C.M.P. area, the average net-profit per paddy is Rs. 113, and the average net profit for groundnut is Rs. 71 indicating that the project has enabled the growing of crops which give them better net profits.

CHAPTER VI

Summary and Conclusions

In studying the influence of the Mettur Irrigation and Hydro-electric Project on agriculture and agro-industries in Tanjore District, Pattukkottai Taluk was chosen for a preliminary study and pilot survey, because it was a dry area in the Tanjore District prior to the advent of the Project and thus was useful for further study of subsequent influences as a result of the Project. While the field survey was conducted in the Pattukkottai Taluk for several basic data required, general informations on the project itself and the general conditions in the Tanjore District etc. were also obtained from as many sources as were accessible, so as to give us a broad picture of the influences under study.

The following represents the summary and conclusions arrived at by the survey:—

THE PROJECT

The chief aim of the Cauvery Mettur Irrigation System was to store in the Dam the waters of the surplus floods mainly occurring in the South-western monsoon and distribute them evenly throughout the succeeding irrigation period and to provide new areas lacking water supply with irrigation. The execution of the Project was started on 20th July, 1925 mostly on account of a fillip that was given by Dr. C. P. Ramaswami Aiyar who was at that time the member of the Madras Government. The project provided for a lake of 60 square miles impounding 93,500 million cubic feet of water at Mettur. The dam has a catchment area of 16,300 square miles. The work on the canal system was started in 1926 and was completed in 1934. The main canal is 106 miles long, and the length of the field channels is 1,904 miles. The generating capacity of the hydro-electric scheme is 40,000 K.W. maximum and 17,000 K.W. minimum. The first stage of this scheme began in 1935 and was completed in 1937; the second stage commenced in 1944 and was completed in 1946. The work on the dam and canals was started on 20th July 1925, and was completed on 21st August, 1934. The cost of the original estimate of the project was 727 lakhs of rupees and the actual cost 667 lakhs of rupees. It is estimated that the Government has been receiving a return of more than six per cent on the capital outlay on the project. Considering the hydro-electric system separately, the Government have worked out that in the 10 years of operation, the gross return on the hydro-electric system was 11.4 per cent. This indicates that the investment on this project was a profitable one and it has also been proved that the policy of combining irrigation benefits with the hydro-electric facilities in such projects is a very sound one.

INFLUENCE ON FLOODS

One of the greatest benefits the Mettur reservoir has conferred to the area commanded by the project is to act as a flood moderator in times of extraordinary heavy floods. Given sufficient warning of the intensity and duration of a high flood, action can be taken to lower the water level in the reservoir, by increasing the outflow through the surplus and high level sluices so as to make room for the absorption of the greater part of the flood when it actually comes to the reservoir. Considering the havoc and damages caused to the agriculturists by floods which had occurred in 1924 prior to the Project, one of the indirect benefits to the agriculturists as a result of the Mettur dam and canals is the prevention of floods and saving of fertile lands in the delta from the damages caused by the floods.

INFLUENCE ON AREA UNDER IRRIGATION

One of the primary and important benefits which the Project directly conferred on the agricultural economy of the Tanjore District was that 3,57,442 acres were freshly brought under irrigation. Considering that the area of land originally under irrigation prior to the Project was 8,14,866 acres, the increase in area was 43.9 per cent which is a valuable contribution of the Project to the agricultural prosperity of the Tanjore District. The authorities concerned with the River Conservancy Division are of opinion that the area under irrigation could be further increased, if there was more economic use of the water from the Canal System by the farmers.

INFLUENCE ON AREA UNDER PADDY

One of the immediate results of the provision of irrigation was the conversion of almost all the area that came under irrigation and which were irrigable, into wet land for growing of paddy. The area under paddy in Tanjore District rose from 10,47,974 acres in 1931 prior to the project to ultimately to occupy 13,50,100 acres in 1951 showing an increase of 28.8 per cent. This effect was forcible in the Pattukkottai Taluk which had been mostly a dry area before. The area under paddy in this taluk rose from 57,748 acres in 1931 to 1,79,500 acres in 1951 showing an increase of 210.8 per cent. In the pilot survey itself, among the surveyed holdings, 89.3 per cent of the total area in the Project area has been brought under wet land cultivation, whereas in the non-Project area, it is only 22.9 per cent. The area under paddy in the Pattukkottai Taluk has jumped from 38.3 per cent of the total cultivated area prior to the project to 80.8 per cent within the period 1931 to 1951.

INFLUENCE ON CULTIVATED AREA

The provision of irrigation in Pattukkottai Taluk has also been responsible for increasing the area under cultivation from 1,74,776 acres to 2,22,300 acres within the period between 1931 to 1951 showing an extra area of 47,524 acres or an increase of 27.2 per cent over the original area under cultivation. In the actual survey done in the Pattukkottai Taluk, it was found that the cultivated area in the villages under the Project is 46.8 per cent of the total area, whereas it is only 26.1 per cent in the non-Project area.

INFLUENCE ON INTENSITY OF CROPPING

Not only has the project increased the cultivated area and the area under wet cultivation, it has also made it possible that a significant proportion of the wet land area can grow two crops of paddy in a year instead of only one crop prior to the introduction of the Project. Among the holdings surveyed in the Pattukkottai Taluk, It is found that 353 per cent of the wet land area is under double crop compared to only a single crop in all the wet land area in the non-Project zone.

INFLUENCE ON THE YIELD

In the Pilot survey, it is found from the statistical analysis that the provision of irrigation through the Project has by itself almost doubled the yield of paddy, the average yield being 39 kalams per acre in the canal-fed area and 20 kalams in the non-Project area. A similar increase in other subsidiary crops such as groundnut has also occurred. From the statistical analysis, it is seen that the average yield of groundnut in the canal-fed area is 26 kalams per acre whereas it is 17 kalams per acre in the non-Project area.

INFLUENCE ON FOOD-SUPPLY AND POPULATION

Almost a cent percent increase in the yield of the staple food crop viz., paddy in the Project area as a result of the irrigation facilities has made it possible for the Pattukkottai Taluk to sustain a much larger population than it did prior to the project. The changes of population pattern between 1941, when the effect of the Project was just beginning to be felt in 1951 when a large proportion of the benefit of the project would have already been felt, is a good evidence for the statement made above. While the Madras State during this period registered an increase of 14.4 per cent and the Tanjore District 16.4 per cent, Pattukkottai taluk in comparison registered an increase of 33 per cent, which is more than double the average increase in the Madras State or for that matter in the Tanjore District as a whole. The increase in 1951 compared to 1931 i.e. prior to the project, is also impressive. While the average increase in the Madras State was 27.4 per cent, the increase in Pattukkottai Taluk has been 44.2 per cent. In the pilot survey done, village by village, it is found that there have been instances of increase of population upto 372 per cent between 1931 and 1951. The average increase in this period for the 15 villages surveyed was 58.6 per cent. This proves the fact that in a country like India, the irrigation projects of this kind go a long way to sustain greater population than was originally possible.

INFLUENCE ON AGRICULTURAL EMPLOYMENT

The percentage of population under agricultural employment has also increased as a result of the Project. According to the Pilot Survey, 93.8 per cent of the population in the villages surveyed in the canal-fed area have taken to agriculture as against 87.9 per cent in the non-Project area. The irrigated area of the Pattukkottai Taluk has also come to the succour of the agricultural people of the non-Project area of this taluk and the dry areas of the neighbouring district of Ramanathapuram in the time of distress and famine and

in periods of drought when these people migrate to the project area. This irrigated area has also been responsible for providing regular employment every year during the harvest time to the agricultural labourers from the dry areas mentioned above.

INFLUENCE ON CROP-PATTERNS

There have been no doubt changes in crop patterns in Pattukkottai Taluk as a result of the advent of Cauvery Mettur Project. Whereas, prior to the Project, this taluk under the stress of lack of water facilities had to have recourse to growing of varied crops to suit the changing and uncertain seasonal conditions, this taluk now has become an area of almost monoculture of paddy. Prior to the Project and even now in the non-Project areas, among the crops grown under rain-fed conditions have been groundnut, gingelly, green gram, black gram, horse gram, cambu, cholam, varagu, ragi, maize. Some amount of vegetables and fruits, some industrial varieties of plants and species also used to be grown. According to the data available, while the area under paddy has gone up from 38.3 per cent of the total cultivated area in 1931 to 80.8 per cent in 1951, all other crops have shown decline, while some of the crops such as spices, vegetables, fruits, industrial and miscellaneous crops have almost completely disappeared.

INFLUENCE ON CULTIVATION PRACTICES

As far as the cultivation practices are concerned very little improvement however has been noticed over the age old practices, among the holdings that have been surveyed in the Pattukkottai Taluk. Pattukkottai Agricultural Research Station stands as an example of improved methods of cultivation. It grows green manure crops for application to paddy, uses improved and high yielding strains of paddy, follows modified Japanese method of rice cultivation, uses all labour saving implements such as the Burmese Setun, the green manure trampler, efficient implements such as iron ploughs and triangular harrows. Among the holdings surveyed in Pattukkottai Taluk, there is no practice of green manure crop being grown. Regarding use of improved strains of paddy, it is calculated from the data furnished by the District Agricultural Officer, Pattukkottai that in the year 1955, only 1.2 per cent of the total area under paddy in Pattukkottai Taluk has grown the improved strains. In all the 597 holdings surveyed, there was only one instance of the Japanese Method of rice cultivation, being practiced. It is calculated from the data kindly furnished by the District Agricultural Officer that in the year 1954-55, only 8 per cent of the total area under paddy in Pattukkottai taluk received an effective dose of ammonium sulphate and this was at a time when the campaign for ammonium sulphate is said to have been at its peak. It is well known how green manure application in combination with judicious doses of artificial fertilizers such as ammonium sulphate and the use of the improved strains tremendously increase the yield of paddy. Up-to-date, since the introduction of the Project, what increase in yield has been obtained has been mainly on account of what water supply by itself can achieve. As already indicated, the water supply has been able to more or less double the yield of paddy and this has been possible, because previously the yield had touched almost the minimum level

due to the lack of proper water supply and on account of inefficient attention to the crop due to the economic conditions of the farmer. In recent years, it has been demonstrated that the yields of paddy could be increased manifold, if under conditions of favourable water supply, proper strains are grown and proper manurial programmes, proper cultural operations and proper plant protection measures are undertaken. It is evident that improved agricultural knowledge has not been utilised in the area to any significant extent, ever since the inception of the Project. While the Agricultural Research Station, Pattukkottai no doubt serves as an example of what can be achieved in the Pattukkottai area, there has been a lack of dynamic extension organisation for spreading the improved practices on a mass scale to reach almost every farmer. This has been responsible for keeping the production from rising to much higher levels. It is a pointer that whenever an irrigation project of this kind is started, almost simultaneously with the establishment of an agricultural research station to carry out research to suit and develop the zone, there must be a stronger and larger extension organisation established to reach every holding.

INFLUENCE ON LAND SALES AND INDEBTEDNESS OF CULTIVATORS

From the statistical analysis, it is seen that as against the average net profit of Rs. 37 per acre of paddy grown in the non-Project areas with water from rain-fed tanks, the average net profit per acre of paddy in the Project area is Rs. 113 which is more than three times the former. This gives an indication of the comparative economic prosperity of the farmer in the Project area and the scope for better capital formation and credit worthiness of the farmer under the Project. In the pilot survey, it was noted that out of the 597 samples investigated, there was some amount of indebtedness only in 11 samples, and even in these 11 cases, it was found that the holdings were either unfavourably situated in low lying areas frequently susceptible to floodings, or the lands had been inherently infertile. The survey also revealed that out of the 597 samples, in 126 samples, the land owners had been able to purchase additional land during the last 10 years. But it seems that the ultimate savings have not been in a very satisfactory proportion to the net returns per acre in the Project area as revealed above. The average holding is not adequate in area as an economic unit. From the statistical analysis of the land area owned, it is indicated that there are only a very few families which have comparatively larger holdings. In fact, there are only 40 families among 597 surveyed which have holdings more than 18 acres per head while there are 44 families which own less than half acre per head. Moreover, even in the case of the farmers with fairly economic holdings, no drive in savings had been sponsored by the authorities concerned, in spite of the expectation ever since the project was started that the economic conditions of the farmer and the possibilities of his savings would improve as a result of the Project. It has been found from the survey that credit facilities through co-operative credit societies have been neither adequate nor efficient. The rate of interest charged by private money lenders according to the survey varied from 10 to 40 per cent, and the farmers when they needed to borrow have had to pay exorbitant rates of interest leading to depletion of their savings. It is time that every agriculturist gets the benefit of credit at reasonable rates of interest.

through co-operative organisations. It will also be desirable to release the pressure on land which now exists in this zone by the introduction of more industries large or small using at the same time the electricity from the Hydro-electric system of the Project, so that it might be possible for a distribution of more economic holdings in the area.

INFLUENCE ON RURAL INDUSTRIES

Out of the total rural population of 3,65,463, a total of only 4,726 people are engaged either whole time or part time in rural industries and this works out to 1.3 per cent of the rural population. Pattukkottai taluk has become an area mainly for paddy, and the major portion of the area is under single crop. As such, the rural population in general have occupation only for part of the year and it is discouraging that only about one in a hundred are employed in rural or cottage industries. The potentialities of the use of electricity abundant production of which has a feature of the project have not touched the villages particularly with regard to the establishment of industries large or small in this area. Rural electrification has still not gone far in this area, and it is a question of "starvation amidst plenty", as far as electricity is concerned. Only 10 out of the 269 villages surveyed have been electrified. With better capital formation on the average, possible as a result of increased agricultural production consequent to the provision of irrigation water through the Project, the average villager is in a better position in this taluk to himself undertake some small cottage industry to occupy himself in the idle seasons of the year or atleast participate or be employed in small industries. The discouraging position in this respect can be attributed mostly to the lack of foresight in planning the multi-purposes of the project and enforcing an organisation to take care of developments in this direction.

It is seen from the village to village survey that there are possibilities for small scale industries in Pattukkottai Taluk at present such as mat-making, cloth weaving, rice milling, coir making, manufacture of palmyra jaggery, fishing, salt manufacture, bee-keeping and poultry rearing.

INFLUENCE ON WATER-TABLE

Among the subsidiary but still important benefits of the irrigation project in the Pattukkottai area has been the rise of the water table to reasonable levels in the canal zone so that the farmer is able to tap underground water at cheaper costs for irrigating supplementary crops such as groundnut which is grown after paddy. From the survey it is revealed that whereas the underground water in this canal zone is available from 10 feet below the ground, it is available only at levels below 50 to 60 feet in the non-Project zone, where the cost of digging a well is comparatively high, and, often there have also been failures in obtaining any water at all even if the farmers dig deep.

LACK OF COMMUNICATION AND TRANSPORT

One of the discouraging features observed in the survey is that very few of the villages surveyed have any proper road communications. There are instances in which the footpath from the nearest railway station is only six miles to the village whereas the winding dust road usable by carts only in the non-rainy season takes 15 miles to reach the same village. There are also villages where there is practically no road, and most of the year the carts have to wade through the water channels. Lack of such communications is responsible in turn for lack of better marketing facilities for the agricultural products of the farmer which in turn deprives the farmer of the opportunity of growing profitable commercial crops and selling them at higher prices than he gets from the middle men. This may easily be considered as one of the primary reasons for lack of progress in growing alternative commercial crops to paddy in this area. Besides this, often the agriculturists are forced to distress sales of the surplus produce through the agents. To the lack of the transport or communication facilities can also be attributed the little progress in cultivation techniques in these villages.

RECOMMENDATIONS

The survey has brought out the fact clearly that the Mettur Irrigation and Hydro-electric project has contributed to the prosperity of agriculture in the area under its influence, mainly through the increase of water-supply to the area. But the enormous production of electricity, though it has done valuable service to the urban populations and to the larger industries has had little influence on agriculture. The rural electrification has not progressed as far as it should have, considering its all round possibilities. As far as agriculture and agriculturists are concerned, it is evident that the Government with all its best intentions did not go much beyond the provision of water for irrigation and establishment of an agricultural research station at Pattukkottai which has been standing as an isolated instance of improved agricultural practices amidst a wide zone which retains its old uneconomic and rather inefficient practices. From the very commencement of the introduction of the irrigation benefits of the project, a dynamic organisation should have been set up for effective multi-purpose developments such as

- (1) to see that every farmer carried out at least the most profitable agricultural practices such as application of green manures and artificial fertilisers, use of high yielding and disease resistant strains, and protection of plants against pests and diseases;
- (2) to see that there was some amount of diversified agriculture so as not only to raise the all-round economic strength of the farmer, but also to assist in more economic use of water compared to the exorbitantly high amounts of water required for the growing of paddy to the exclusion of almost all other crops;
- (3) introduction of an active campaign for savings among the farmers and establishment of a more active co-operative movement to make facilities for both savings and credit accessible to each farmer;

- (4) to see that a drive was made to increase rural, cottage, and agro-industries suitable for the area and to remove the excessive pressure on land and to undertake all measures which would increase the size of the average holding to more economic levels than exist at present;
- (5) improvement of communications and transport in the rural areas for better marketing and transport of agriculturists and agricultural products;
- (6) a more intensive and extensive agricultural extension organisation so as to reach every farmer;
- (7) a co-ordinating agency for a balanced development of the economy of agriculture and prosperity of the agriculturists and agricultural labourers.

Considering that this Project has been a remunerative capital investment, bringing in reasonably good annual returns to the government, what is recommended above would not have been beyond the financial capacity of the government even from the very commencement of the scheme. All this points to the necessity that whenever an irrigation or/and hydro-electric project is started, with it should go hand in hand the establishment of a proper multi-purpose organisation for intensive development of agriculture and rural industries and of the economic prosperity of the farmer.

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This investigation could not have been completed but for the co-operation of all the land-owners and villagers coming under the survey.

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APPENDIX I

Statistical Tables

NOTE.—Table 'A' series relate to the Cauvery Mettur Project (C.M.P.) and table 'B' series relate to non-project area (Non-C.M.P.).

TABLE I-A
LAND AREA
(In the Project area)

Land area owned in acres	Mid x	Number of families f	Cum f
0 and under 0.5 . . .	0.25	44	44
0.5 and under 1 . . .	0.75	126	170
1 and under 1.5 . . .	1.25	84	254
1.5 and under 2 . . .	1.75	52	306
2 and under 2.5 . . .	2.25	57	363
2.5 and under 3.5 . . .	3	59	422
3.5 and under 4.5 . . .	4	51	473
4.5 and under 5.5 . . .	5	34	507
5.5 and under 6.5 . . .	6	23	530
6.5 and under 7.5 . . .	7	13	543
7.5 and under 8.5 . . .	8	14	557
8.5 and under 9.5 . . .	9	4	561
9.5 and under 10.5 . . .	10	9	570
10.5 and under 11.5 . . .	11	3	573
11.5 and under 12.5 . . .	12	5	578
12.5 and under 13.5 . . .	13	3	581
13.5 and under 14.5 . . .	14	3	584
14.5 and under 15.5 . . .	15	2	586
15.5 and under 16.5 . . .	16	3	589
16.5 and under 17.5 . . .	17	0	..
17.5 and under 18.5 . . .	18	8	592
18.5 and over . . .	37	5	597
TOTAL		97	

$$h'_1 = \text{Arithmetic Mean} = \frac{\sum fx}{\sum f} = \frac{1938.75}{597} = 3.247$$

$$h'_2 = \frac{\sum fx^2}{\sum f} = \frac{356018.859375}{597} = 596.3464$$

$$h'_3 = \frac{\sum fx^3}{\sum f} = \frac{10609412.66796875}{597} = 17771.2105$$

$$\text{Standard Deviation} = \sigma = \sqrt{h'_2} = \sqrt{18.9081} = 4.35$$

TABLE I-A—*contd.*

ix	ix^2	ix^3	ix^4
11	2.75	0.6875	0.171875
94.5	70.375	53.15625	39.8671875
105	131.25	164.0625	205.078125
91	159.25	278.6875	487.70312
128.25	284.5625	649.265625	1460.84765625
177	531	1593	4779
204	816	3264	13056
170	850	4250	21250
138	828	4968	29808
91	697	4459	31213
112	896	7168	57344
36	324	2916	26244
90	600	9000	90000
33	363	3993	43923
62	720	8640	103680
30	507	6591	85683
42	588	8232	116648
30	450	6750	101250
48	768	12288	196608
..	..	..	..
54	972	17496	314928
185	6845	253265	9370805
1038.75	17647.6875	356018.859375	10609412.66796875

$$h'_1 = \frac{\sum ix^2}{\sum i} = \frac{17647.6875}{597} = 29.5606$$

$$\begin{cases} h'_1 = 18.0081 \\ h'_2 = 376.7825 \\ h'_3 = 11562.3443 \end{cases}$$

TABLE—1-B
LAND AREA
(In the non-project area)

Land area owned in acres	Mid x	Number of families	Cumulative frequency	FX	FX ²
Below 1.5	0.74	6	6	4.44	3.2656
1.5 and under 2.5	2	12	18	24	48
2.5 and under 3.5	3	13	31	39	117
3.5 and under 4.5	4	4	35	16	64
4.5 and under 5.5	5	5	40	25	125
5.5 and under 6.5	6	5	45	30	180
6.5 and under 8.5	7.5	6	51	45	337.5
8.5 and under 10.5	9.5	3	54	28.5	270.75
10.5 and over	16.3	7	61	114.1	1859.83
TOTAL		61		326.04	3005.3656

Arithmetic Mean = 5.345 acres.

Standard deviation = 4.55

TABLE—2-A
IRRIGATED AREA TO TOTAL HOLDINGS
(In the Project area)

Percentage of irrigated area to the total holdings	Mid x	Number of families	Cumula- tive frequency	FX	FX ²
0 and not over 10	0	8	8	0	0
Over 10 and not over 20	15	3	11	45	675
Over 20 and not over 30	25	2	13	50	1250
Over 30 and not over 40	35	12	25	420	14700
Over 40 and not over 50	45	18	43	810	36450
Over 50 and not over 60	55	33	76	1815	99825
Over 60 and not over 70	65	39	115	2535	164775
Over 70 and not over 80	75	57	172	4275	320625
Over 80 and not over 90	85	67	239	5695	484075
Over 90 and not over 96	93	23	262	2139	198927
Over 96 and not over 100	98	335	597	32830	3217340
TOTAL		597		80614	4538642

$$\text{Arithmetic Mean} = \frac{\sum FX}{\sum F} = \frac{80614}{597} = 84.78\%$$

$$\begin{aligned} (\text{Standard deviation}) &= \sqrt{\frac{\sum FX^2}{\sum F} - \left(\frac{\sum FX}{\sum F}\right)^2} \\ &= \sqrt{414.766} \text{; Standard deviation} = 20.37. \end{aligned}$$

TABLE 2-B
WET LAND TO TOTAL HOLDINGS
(In the non-project area)

Percentage of wet land to the total holdings	Mid x	Number of families	Cumula- tive frequency	FX	FX ²
0 and under 6 . . .	3	9	9	27	81
6 and under 12 . . .	9	8	17	72	648
12 and under 18 . . .	15	9	26	135	2025
18 and under 24 . . .	21	9	35	189	3969
24 and under 30 . . .	27	5	40	135	3645
30 and under 36 . . .	33	8	48	264	8712
36 and under 42 . . .	39	7	55	273	10647
42 and under 48 . . .	45	5	60	225	10125
48 and over . . .	70	1	61	70	4900
TOTAL . . .		61		1390	44752

Arithmetic Mean = 22.787%
Standard deviation = 14.64

TABLE
PADDY—
(In the pro

Cost of production per acre in Rupees	Mid x	Number of families	Cum f
0 and under 20 . .	10	7	7
20 and under 40 . .	30	0	..
40 and under 60 . .	50	5	12
60 and under 80 . .	70	26	38
80 and under 90 . .	85	31	69
90 and under 100 . .	95	51	120
100 and under 110 . .	105	99	219
110 and under 120 . .	115	85	304
120 and under 130 . .	125	97	401
130 and under 140 . .	135	55	456
140 and under 150 . .	145	45	501
150 and under 160 . .	155	45	546
160 and under 180 . .	170	27	573
180 and under 200 . .	190	16	589
200 and under 220 . .	210	3	592
220 and under 240 . .	230	2	594
240 and under 260 . .	250	1	595
260 and under 280 . .	270	0	0
280 and under 300 . .	290	1	596
TOTAL .		596	

$$\text{Arithmetic Mean} = h'1 = \frac{\sum fx}{\sum f} = \frac{72100}{596} = \text{Rs. } 120.97$$

$$h'2 = \frac{\sum fx^2}{\sum f} = \frac{9328300}{596} = 15651.51$$

$$h'3 = \frac{\sum fx^3}{\sum fx} = 2148079.7$$

$$h'4 = \frac{\sum fx^4}{\sum fx^3} = \frac{186956417500}{2148079.7} = 313685264.2617$$

$$\text{Standard Deviation} = \sqrt{h_2} = \sqrt{1017.7691} = 31.902$$

3-A

COST OF PRODUCTION

ject area)

fx	fx ²	fx ₃	fx ⁴
70	700	7000	70000
0	0	0	0
250	12500	625000	31250000
1820	127400	8918000	624260000
2635	223975	19037875	1618219375
4845	460275	43726125	4153981875
10395	1091475	114604875	12033511875
9775	1124125	129274375	14866553125
12125	1515625	189453125	23681640625
7425	1002375	135320625	18268284375
6525	946125	137188125	19892278125
6975	1081125	167574375	25974028125
4590	780300	132651000	22550670000
3040	577600	109744000	20851360000
630	132300	27783000	5834430000
460	105800	24334000	5596820000
250	62500	15625000	3906250000
0	0	0	0
290	84100	24389000	7072810000
72100	9328300	1280255500	186956417500

Moments about the mean.

$$h_1 = h'_1 - h'_1{}^2 = 1017.7691$$

$$h_2 = h'_2 - 3h'_1h'_1 - 2h'_1{}^3 = 8477.47$$

$$h_3 = h'_3 - 4h'_1h'_1{}^2 - 6h'_1h'_1{}^2 - 3h'_1{}^4 = 6074192.92$$

TABLE 3-B
COST OF PRODUCTION—PADDY
(In the non-project area)

Cost of production per acre in rupees (paddy)	Mid x	Number of families	Cumula- tive fre- quency	Devia- tion in class units	fd	fd ²
60 and under 70	65	2	2	-4	-8	32
70 and under 80	75	9	11	-3	-27	81
80 and under 90	85	12	23	-2	-24	48
90 and under 100	95	10	33	-1	-10	10
100 and under 110	105	11	44	0	0	0
110 and under 120	115	6	50	1	6	6
120 and under 130	125	2	52	2	4	8
130 and under 140	135	1	53	3	3	9
140 and under 150	145	1	54	4	4	16
TOTAL		54			-52	210

Arithmetic Mean—Rs. 95.37

Standard deviation= 17.21

TABLE - 4-A
PADDY—VALUE OF THE NET YIELD
(In the project area)]

Value of the net yield per acre in Rupees	Mid x	Number of families f	Cum f
Below 100 . . .	21	10	10
100 and under 120 .	110	5	15
120 and under 140 .	130	12	27
140 and under 160 .	150	26	53
160 and under 170 .	165	18	71
170 and under 180 .	175	23	94
180 and under 190 .	185	25	119
190 and under 200 .	195	26	145
200 and under 210 .	205	50	195
210 and under 220 .	215	43	238
220 and under 230 .	225	55	293
230 and under 240 .	235	53	346
240 and under 250 .	245	41	387
250 and under 260 .	255	37	424
260 and under 270 .	265	42	466
270 and under 280 .	275	34	500
280 and under 300 .	290	37	537
300 and under 320 .	310	23	560
320 and under 340 .	330	11	571
340 and under 360 .	350	14	585
360 and under 380 .	370	7	592
380 and under 400 .	390	1	593
400 and over. . .	452	3	596
TOTAL .		596	

$$h'_1 = \text{Arithmetic Mean} = \frac{\sum fx}{\sum f} = \frac{137017}{596} = \text{Rs. } 229.89$$

$$h'_2 = \frac{\sum fx^2}{\sum f} = \frac{34037497}{596} = 57109.99$$

TABLE—4-A—*contd.*

fx	fx^2	fx^3	fx^4
210	4410	92610	1944810
550	60500	6655000	732050000
1560	202800	26364000	3427320000
3900	585000	87750000	13162500000
2970	490050	80638250	13341611250
4025	704375	123265625	21571484375
4625	855625	158290025	29283765625
5070	988650	194786750	37593416250
10250	2101250	430756250	88305031250
5245	1987675	427350125	91880276875
12375	2784375	626484375	140958984375
12455	2926925	657827375	161639433125
10745	2461025	602951125	147723025625
9435	2405925	613510875	156415273125
11130	2949450	781604250	207125126250
9350	2351250	707093750	194450781250
10730	3111700	902393000	261693970000
7130	2210300	685193000	212409830000
3630	1197900	395307000	130451310000
4900	1715000	600250000	210087500000
2590	958300	354571000	131191270000
390	152100	59319000	23134410000
1356	612912	277036224	1252203723248
137017	34037497	8827800209	2401330687433

$$h'_3 = \frac{\sum fx^3}{\sum f} = \frac{8827800209}{596} = 14811745.3$$

$$h'_4 = \frac{\sum fx^4}{\sum f} = \frac{2401330687433}{596} = 4029917260.79$$

Standard deviation = $\sqrt{h_4} = \sqrt{4255.88} = 65.23$

$$\begin{cases} h_3 = 4255.88 \\ h_4 = 276129.83 \\ h_4 = 139792344.44 \end{cases}$$

TABLE 4-B
 VALUE OF THE NET YIELD—PADDY
 (In the non-project area)

Value of the net yield per acre in rupees	Mid x	Number of families	Cumulative fre- quency	Devia- tion in class units	fd	fd ²
60 and under 80 . . .	70	5	5	-3	-15	45
80 and under 100 . . .	90	4	9	-2	-8	16
100 and under 120 . . .	110	16	25	-1	-16	16
120 and under 140 . . .	130	18	43	0	0	0
140 and under 160 . . .	150	4	47	1	4	4
160 and under 180 . . .	170	3	50	2	6	12
180 and under 200 . . .	190	1	51	3	3	9
200 and under 220 . . .	210	2	53	4	8	32
220 and under 240 . . .	230	1	54	5	5	25
TOTAL		54			-13	159

Arithmetic Mean=Rs. 125.185

Standard deviation— 33.98

TABLE—
PADDY—
(In the pro-

Range of profit per acre in rupees	Mid x	Number of families f	Cum f
0 and under 20	10	12	12
20 and under 40	30	7	19
40 and under 60	50	26	45
60 and under 80	70	54	99
80 and under 90	85	43	142
90 and under 100	95	61	203
100 and under 110	105	74	277
110 and under 120	115	77	354
120 and under 130	125	68	422
130 and under 140	135	59	481
140 and under 150	145	42	523
150 and under 160	155	13	536
160 and under 180	170	30	566
180 and under 200	190	18	584
200 and under 220	210	4	588
220 and under 240	230	3	591
240 and under 260	250	1	592
260 and under 280	270	2	594
TOTAL		594	

$$h'_1 = \text{Arithmetic Mean} = \frac{\sum fx}{\sum f} = \frac{66895}{594} = \text{Rs. } 112.62$$

$$h'_2 = \frac{\sum fx^2}{\sum f} = \frac{8425825}{594} = 14184.89$$

$$h'_3 = \frac{\sum fx^3}{\sum f} = \frac{1157267125}{594} = 1948261.153$$

5-A
PROFIT
ject area)

fx	fx^2	fx^3	fx^4
120	1200	12000	120000
210	6300	189000	5670000
1300	65000	3250000	162500000
3780	264600	18522000	1296540000
3655	310675	26407375	2244626875
5795	550525	52299875	4968488125
7770	815850	85664250	8994746250
8855	1018325	117107375	13467348125
8500	10622500	132812500	16601562500
7965	1075275	145162125	19596886875
6090	883050	128042250	18566126260
2015	312325	48410375	7503608125
5100	867000	147390000	25056300000
3420	649800	123462000	23457780000
840	176400	37044000	7779240000
690	158700	36501000	8395230000
250	62500	15625000	3906250000
540	145800	39366000	10628820000
66895	8425825	115727125	172631843125

$$h'_4 = \frac{\sum fx^4}{\sum f} = \frac{172631843125}{594} = 290625998.527$$

Central Moments $\left\{ \begin{array}{l} h_2 = 1506.13 \\ h_3 = 12532.68 \\ h_4 = 9841990.20 \end{array} \right.$

Standard Deviation = $\sqrt{h_2} = \sqrt{1506.13} = 38.8$

TABLE 5-B
PROFIT—PADDY
(In the non-project area)

Profit per acre in rupees	Mid x	Number of families f	Cumula- tive frequency	fx	fx
0 and under 8 . . .	4	1	1	4	16
8 and under 16 . . .	12	7	8	84	1008
16 and under 24 . . .	20	9	17	180	3600
24 and under 32 . . .	28	8	25	224	6272
32 and under 40 . . .	36	7	32	252	9072
40 and under 48 . . .	44	6	38	264	11616
48 and under 56 . . .	52	5	43	260	13520
56 and under 64 . . .	60	..	43	..	..
64 and under 72 . . .	68	3	46	204	13872
72 and over . . .	119	3	49	357	42483
TOTAL .		49		1829	101459

Arithmetic Mean = Rs. 37.327

Standard deviation = 26.02

TABLE—6-A
GROSS YIELD—PADDY
(in the project area)

Gross yield in Kalams per acre	Mid x	Number of families f
Below 16 . . .	2	9
16 and under 20 . . .	18	6
20 and under 24 . . .	22	15
24 and under 28 . . .	26	35
28 and under 32 . . .	30	52
32 and under 36 . . .	34	91
36 and under 40 . . .	38	122
40 and under 44 . . .	42	101
44 and under 48 . . .	46	73
48 and under 52 . . .	50	42
52 and under 56 . . .	54	22
56 and under 60 . . .	58	12
60 and under 64 . . .	62	12
64 and over . . .	73	4
TOTAL		965

Aritnmeric Mean = 39.05 Kalams

Standard Deviation = 10.21

TABLE—6-A.—*contd.*

Cumulative frequency	Σx	Σx^2
9	18	36
15	108	1944
30	330	7260
65	910	23660
117	1560	46800
208	3094	105196
330	4636	176168
431	4242	178164
504	3358	154468
546	2100	105000
568	1188	64152
580	696	40368
592	744	46128
596	292	21316
	23276	970960

TABLE 6-B
GROSS YIELD—PADDY
(In the non-project area)

Gross yield per acre in Kalams	Mid x	Number of families f	Cumula- tive frequency	Devia- tion in class units	id	fd ^a
10 and under 14	12	6	6	-2	-12	24
14 and under 18	16	10	16	-1	-10	10
18 and under 22	20	23	39	0	0	0
22 and under 26	24	9	48	1	9	9
26 and under 30	28	3	51	2	6	12
30 and under 34	32	2	53	3	6	18
34 and under 38	36	0	53	4	..	..
38 and under 42	40	1	54	5	5	25
TOTAL		54			+4	98

Arithmetic Mean = 20.296 Kalams

Standard deviation = 5.38

TABLE
COST OF PRO
(In the

Cost of production per acre in rupees	Mid x	Number of families f
15 and under 25	22	9
25 and under 35	30	34
35 and under 45	40	19
45 and under 55	50	52
55 and under 65	60	52
65 and under 75	70	32
75 and under 85	80	22
85 and under 95	90	9
95 and over	124	8
TOTAL		237

Arithmetic Mean = Rs. 56.96

Standard deviation = 21.26

7-A

DUCTION—GROUNDNUT

project area)

Cumulative frequency	fx	fx ²
9	198	4356
43	1020	30600
62	760	30400
114	2600	130000
166	3120	187200
198	2240	156800
220	1760	140800
229	810	72900
237	992	123008
	13500	876064

TABLE 7-B
COST OF PRODUCTION—GROUNDNUT
(In the non-project area)

Cost of production per acre in rupees	Mid x	Number of families f	Cumula- tive frequency	fx	fx ²
30 and under 34 . . .	32	1	1	32	1024
34 and under 38 . . .	36	3	4	108	3888
38 and under 42 . . .	40	5	9	200	8000
42 and under 46 . . .	44	5	14	220	9680
46 and under 50 . . .	48	5	19	240	11520
50 and under 54 . . .	52	13	32	676	35152
54 and under 58 . . .	56	6	38	336	18816
58 and under 62 . . .	60	10	54	960	57600
62 and under 66 . . .	64	3	57	192	12288
66 and under 70 . . .	68	2	59	136	9248
70 and over . . .	80	2	61	160	12800
TOTAL .		61		3260	180016

Arithmetic Mean = Rs. 53.44

Standard deviation = 9.76

TABLE 8-A
 VALUE OF THE NET YIELD—GROUNDNUT
 (In the project area)

Value of net yield per acre in rupees	Mid x	Number of families
20 and under 40 . . .	30	2
40 and under 60 . . .	50	1
60 and under 80 . . .	70	28
80 and under 100 . . .	90	31
100 and under 120 . . .	110	39
120 and under 140 . . .	130	43
140 and under 160 . . .	150	49
160 and under 180 . . .	170	22
180 and under 200 . . .	199	13
200 and over . . .	223	9
TOTAL .		237

Arithmetic Mean = 127.88

Standard Deviation = 39.55

TABLE 8-A—*cond.*

Cumulative frequency	fx	fx^2
2	60	1800
3	50	2500
31	1960	137200
62	2790	251100
101	4290	471900
144	5590	726700
193	7350	1102500
215	3740	635800
228	2470	469300
237	2007	447561
	30307	4246361

TABLE 8-B
 VALUE OF THE NET YIELD—GROUNDNUT
 (In the non-project area)

Value of the net yield per acre in rupees	Mid x	Number of families f	Cumula- tive frequency	Devia- in class units	fd	fd ²
32 and under 40 .	36	1	1	-7	-7	49
40 and under 48 .	44	4	5	-6	-24	144
48 and under 56 .	52	..	5	-5	..	..
56 and under 64 .	60	5	10	-4	-20	80
64 and under 72 .	68	9	19	-3	-27	81
72 and under 80 .	76	6	25	-2	-12	24
80 and under 88 .	84	2	27	-1	-2	2
88 and under 96 .	92	13	40	0	0	0
96 and under 104 .	100	8	48	1	8	8
104 and under 112 .	108	8	56	2	16	32
112 and under 120 .	116	..	..	3	..	..
120 and under 128 .	124	4	60	4	16	64
128 and under 136 .	132	1	61	5	5	25
TOTAL .		61			-47	509

Arithmetic Mean=Rs. 85.84

Standard Deviation=22.27

TABLE
PROFIT—
(In the pre—

Range of profit per acre in rupees	Mid x	Number of families f
0 and under 20 . . .	10	6
20 and under 40 . . .	30	19
40 and under 60 . . .	50	57
60 and under 80 . . .	70	67
80 and under 100 . . .	90	52
100 and under 120 . . .	110	22
120 and under 140 . . .	130	7
140 and under 160 . . .	150	4
160 and under 180 . . .	170	2
TOTAL .		236

Arithmetic Mean
Standard Deviation

9-A'

GROUNDNUT

ject area)

Cumulative frequency	Deviation in class units	fd	fd ²
6	—3	—18	54
25	—2	—38	76
82	—1	—57	57
149	0	0	0
201	1	52	52
223	2	44	88
230	3	21	63
234	4	16	64
236	5	10	50
		30	504

=Rs. 70.94

=29.21

TABLE 9-B
 PROFIT—GROUNDNUT
 (In the non-project area)

Profit per acre in rupee	Mid x	Number of families f	Cumula- tive frequency	Deviation in class units	fd	fd ²
0 and under 8 .	4	2	2	-5	-10	50
8 and under 16 .	12	11	13	-4	-44	176
16 and under 24 .	20	6	19	-3	-18	54
24 and under 32 .	28	7	26	-2	-14	28
32 and under 40 .	36	10	36	-1	-10	10
40 and under 48 .	44	13	49	0	0	0
48 and under 56 .	52	6	55	1	6	6
56 and under 64 .	60	2	57	2	4	8
64 and under 72 .	68	1	58	3	3	9
72 and under 80 .	76	1	59	4	4	61
TOTAL .		59			-79	357

Arithmetic Mean = Rs. 33.29

Standard Deviation = 16.51

TABLE 10-A
GROUNDNUT—GROSS YIELD
(In the project area)

Gross yield per acre in Kalams	Mid x	Number of families f
4 and under 8 . . .	6	1
8 and under 12 . . .	10	2
12 and under 16 . . .	14	28
16 and under 20 . . .	18	28
20 and under 24 . . .	22	42
24 and under 28 . . .	26	41
28 and under 32 . . .	30	48
32 and under 36 . . .	34	18
36 and under 40 . . .	38	22
40 and under 44 . . .	42	3
44 and under 48 . . .	46	4
48 and under 52 . . .	50	..
52 and under 56 . . .	54	1
TOTAL		238

Arbitrary Mean=30. The deviations are in class units.

$$\text{Arithmetic Mean} = \text{Arbitrary Mean} + \frac{\sum fd}{\sum f} \times \text{Class interval} = 30 + \frac{44 \times 4}{238} = 30 + 4 \cdot 101$$

$$s^2 = (\text{Standard deviation})^2 = \frac{\sum fd^2}{f} - \left[\frac{\sum fd}{\sum f} \times c \right]^2 = \frac{1228}{238} - [4 \cdot 101]^2$$

$$\text{Standard Deviation} = 8 \cdot 108$$

TABLE 10-A—*contd.*

Deviation d	fd	+	fd ²
—6	6		36
—5	10		50
—4	112		448
—3	84		252
—2	84		168
—1	41		41
0	..	..	..
1		11	18
2		44	88
3		9	27
4		16	64
5		0	0
6		6	36
	337	93	1228
	=	=244	

= 25·899 Kalams

= 82·5546—16·8182 = 65·7364

TABLE 10-B
GROSS YIELD—GROUNDNUT
(In the non-project area)

Gross Yield in Kalams per acre	Mid x	Number of families	Cumula- tive frequency	Deviation in class units	fd	fd ²
6 and under 8	7	1	1	-6	-6	36
8 and under 10	9	4	5	-5	-20	100
10 and under 12	11	2	7	-4	-8	32
12 and under 14	13	6	13	-3	-18	54
14 and under 16	15	11	24	-2	-22	44
16 and under 18	17	3	27	-1	-3	3
18 and under 20	19	15	42	0	0	0
20 and under 22	21	13	55	1	13	13
22 and under 24	23	1	56	2	2	4
24 and under 26	25	4	60	3	12	36
26 and under 28	27	1	61	4	4	16
TOTAL		61			-46	338

Arithmetic Mean = 17.49 Kalams

Standard Deviation = 4.46

TABLE—II-B
 PROFIT—OTHER CROPS (MAIZE, RAGI, ETC.)
 (In the non-project area)

Profit per acre in rupees	Mid x	Number of families f	Cumula- tive frequency	Deviation in class units	fd	fd ²
0 and under 20 .	10	11	11	—2	—22	44
20 and under 40 .	30	17	28	—1	—17	17
40 and under 60 .	50	8	36	0	0	0
60 and under 80 .	70	4	40	1	4	4
80 and under 100 .	90	3	43	2	6	12
100 and under 120 .	110	1	44	3	3	9
120 and under 140 .	130	2	46	4	8	32
140 and under 160 .	150	..	..	5	..	..
160 and under 180 .	170	2	48	6	12	72
TOTAL .		48			—6	190

Arithmet Mean =Rs. 47·5

Standard Deviation =39·71

APPENDIX II

Selection of villages—Method followed

The Table below shows the names of the fifteen villages in the seven firkas, which have been chosen for further enquiry. These fifteen villages are chosen from the seven firkas. The number of villages from each firka being proportionate to the total areas of villages benefited by the scheme. Thus the number of villages fixed in the seven firkas are 2, 3, 2, 2, 2, 2, and 2. The selection of villages in each firkas was not done by the usual Random Numbers method since 2 or 3 villages had to be chosen from 30 to 35 villages in each firka. Villages with the maximum and the minimum areas have been selected having the purpose of the enquiry in view. In only one firka, three villages have been selected. This has been done by including the villages with the maximum and minimum areas as in the case of other villages and the village with a maximum population as the third village. This particular method will ensure equal representation in the sample. Further, for the enquiry on hand, this method seems to be a better method, than the method of random numbers.

List of villages selected in Pattukottai Taluk

	Name of the Village	Population	Area in acres
1. 24/18	Raguramasamudram	291	316.52
2. 32/25	Madukkur (N, S & Mogur)	9383	4739.29
3. 4/34	Tokalikkadu	164	104.92
4. 17/46	Tamarankottai	7011	5704.12
5. 7/37	Tambikkinallavankottai Maravaikadu	1973	6240.46
6. 11/65	Tuvarankuruchchi	2670	2970.10
7. 31/84	Rangajiyapaththortam	Included in another village	70.63
8. 22/108	Sengamangalam	1086	2170.55
9. 33/118	Padappanavayal	310	509.61
10. 45/163	Viriyancottai	2412	2596.44
11. 39/157	Nayagathivayal	30	210.18
12. 7/173	Vilangulam	1198	1988.48
13. 18/181	Pulankollai	188	274.92
14. 1/195	Idaiyathi	2808	2798.01
15. 9/201	Vattathikottai	730	1285.60

Raifed Villages Selected

Name of the Village	Population	Area in ACTS
1. Pannangulam	1363	1165.41
2. Keeramangalam	3658	3865.60
3. Kolamangalam	9072	8006.40

Method of selection of holders from the villages for further enquiry

In the first stage of sampling, fifteen villages from seven firkas were chosen based upon the areas under cultivation and the population. The holdings (individual) in each village were enumerated. The fifteen villages did not have the same number of holdings in each village. The number of holders the villages varied from 50 to 1138. Though the method of Random Numbers was used to select 10% sample, the same numbering system was not followed for all the village since the number of holders varied from village to village. So, an unbiased method was followed. The details are given below.

The first village "Raghurama Samuilam" contained 70 holders and seven] had to be chosen. For random samplings, a new group numbering system was adopted. The holders were given numbers in serial order 1 to 70. Since "for digit" random numbers was used, No. 1 of the serial order corresponded to any No. between 1 and 120 of the random Nos. 2 corresponded to 121 to 240, 3 to 241 to 360 and so on. Thus the serial No. 70 corresponded to 8281 to 8400. Random numbers table 33 (digits 26 to 24) from Fisher and Yates was referred and seven holders were chosen. Repetition was not allowed e.g., the Random Nos. were in the group 481 to 600, 1681 to 1800, 3121 to 3240 4001 to 4320, 3241 to 3360, 4681 to 4800 and 7681 to 7800. The corresponding serial Nos. of the holder were 5, 15, 27, 36, 28, 40 and 65. The holders with these serial Nos. were taken for further enquiries. This method was adopted in the selection of the holder in the other village. Different groups numbering systems were followed for different villages.

The second village contained 1040 holders. So the group system was :

Serial No.	Random Nos.
1	1 to 6
2	7 to 12
3	13 to 18 and so on.

The third village contained 170 holders and so on. The Random No. groups and the corresponding serial No. of the holder with respect to the different villages are given in the form of a table.

Village No.	No. of Holder	Serial No.	Corresponding Random Nos. group
1	70	1 Corresponds to	1 to 120
		2 "	121 to 240
2	1040	1 "	1 to 6
		2 "	7 to 12 & so on

Village No.	No. of Holder	Serial No.	Corresponding Random Nos. group
3	173	1 Corresponds to	1 to 50
		2 "	51 to 100 & so on
4	1138	1 "	1 to 6
		2 "	7 to 12 & so on
5	382	1 "	1 to 25
		2 "	26 to 50 & so on
6	660	1 "	1 to 15
		2 "	16 to 30
7	60	1 "	1 to 150
		2 "	151 to 300
8	462	1 "	1 to 15
		2 "	16 to 30
9	60	1 "	1 to 150
		2 "	151 to 300 & so on
10	537	1 "	1 to 15
		2 "	16 to 30 & so on
11	50	1 "	1 to 200
		2 "	201 to 400 & so on
12	230	1 "	1 to 40
		2 "	41 to 80 & so on
13	101	1 "	1 to 100
		2 "	101 to 200 & so on
14	871	1 "	1 to 10
		2 "	11 to 20
15	212	1 "	1 to 40
		2 "	41 to 80

Thus 10% of the total number of holders constitute the sample for detailed investigation. Though the process was tiring and irksome, this method appeared to be the best for adopting Random sampling numbers to select samples.

APPENDIX III

The Pattukkottai Agricultural Research Station

The Agricultural Research Station at Pattukkottai is situated a mile away from the town and the area of the farm is 38.88 acres. Originally, 5.16 acres were dry lands, 5.35 acres were garden lands, 21 acres wet lands and the garden lands have since been converted into wet lands which now amount to 26.35 acres. Out of this area, 16 acres are treated as double crop lands and the rest are used as single crop lands. 3.16 acres of dry lands come under groundnut, 2 acres under nursery to raise coconut seedlings, and in addition, an area of 2 acres is under fruit trees.

All these lands are irrigated by Mettur Canal which supplies water from June to January. There are also small wells, water from which is not adequate for paddy cultivation but which provides supplementary irrigation to the rain-fed crops of groundnut, cotton, green manure, and gingelly.

The crop patterns and the cropping seasons at the agricultural station are more or less the same as in the rest of the Pattukkottai taluk coming under the Mettur Project. But there are certain improved practices in vogue at this Research Station which includes the growing of green manure crops regularly to provide manure for the paddy crops and adoption of the modified Japanese Method of rice cultivation. Besides these among improved bullock drawn implements in use are *Burmese Settun* for puddling in wet lands and green manure trampler for incorporating green manure in wet lands. Iron plough and triangular harrows are used in dry lands.

With regard to labour establishment, there are ten permanent labourers drawing a salary of Rs. 32/- per mensem to assist in regular cultivation on the farm. There is a mistry drawing a salary of Rs. 40/- per month. In addition to these farm workers, labourers on daily wages are employed during seasons whenever required.

There are five pairs of bullock used for cultivation purposes and one Sindhi bull for service.

Regarding production in paddy in the year 1954-55, the *Samba* harvest recorded an average of about 3000 lb. per acre and the *Kuruvai* 2000 lb. per acre and *Thaladi* 2000 lb. per acre. But the maximum yield so far reached in this model farm was 3600 lb. per acre in *Samba*, 3600 lb. in *Kuruvai* and 2000 lb. *Thaladi*. *Thaladi* is usually a poor yielding crop. The seed rates on the farm range between 30 and 40 lb. per acre for paddy. The farm raises its own seed requirement and also the seeds required for distribution in the surrounding area. In fact most of the produce of the field is converted and processed into seeds and they are supplied at a fixed price to the farmers of Pattukkottai taluk through the Agri-

cultural Office. The straw in the fields is used as fodder for the bullocks and if there is any available surplus it is sold in the market.

With regard to manuring, usually green manure is applied upto a maximum of 10,000 lb. per acre. Along with this, ammonium sulphate is used at a rate of 150 lb. per acre and superphosphate at 100 lb. per acre. The farm follows the practice of growing the green manure crop *Sesbania speciosa* on the bunds of the Kuruvai plots to be used for the succeeding paddy crop.

PERSONNEL OF THE SURVEY

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Statistical Consultant :

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Tabulator :

Sri C. Balakrishna, B.A. (Hons.).

RESEARCH PROGRAMMES COMMITTEE

List of Reports—'published', 'in Press' and 'approved for publication'

I. PUBLISHED

1. Investigation into the working of the Bombay Tenancy Act, 1948, by V. M. Dandekar and G. J. Khudanpur. Available from the Gokhale Institute of Politics & Economics, Poona.
2. An Inquiry into the working of the Bombay Tenancy and Agricultural Lands Act, 1948 (as amended upto 1953) in Gujarat (excluding Baroda District) by M. B. Desai. Available from the Indian Society of Agricultural Economics, Bombay.
3. Economic and Social Effects of Jagirdari Abolition and Land Reforms in Hyderabad, by A. M. Khusro of Osmania University, Hyderabad. Available from Atma Ram & Sons, Kashmere Gate, Delhi-6.
4. An Inquiry into the Effects of the Working of Tenancy Legislation in the Baroda District of Bombay State by V. Y. Kolhatkar and S. B. Mahabal, M.S. University of Baroda, Baroda. Available from the Author.
5. Problems of Small Farmers (an enquiry into the problems of low income farmers in Kodinar Taluka) by C. H. Shah. Available from the Indian Society of Agricultural Economics, Bombay.
6. Studies in Economics of Farm Management in U.P. for 1954-55 by G. D. Agrawal, Agricultural College, Kanpur. Available from the Directorate of Economics & Statistics, Ministry of Food and Agriculture, New Delhi.
7. Studies in Economics of Farm Management in West Bengal for 1954-55 by K. C. Basak and B. K. Choudhury, Indian Central Jute Committee, Calcutta. Available from the Directorate of Economics & Statistics, Ministry of Food & Agriculture, New Delhi.
8. Studies in Economics of Farm Management in Bombay for 1954-55 by P. N. Driver and D. K. Desai, Agricultural College, Poona. Available from the Directorate of Economics & Statistics, Ministry of Food & Agriculture, New Delhi.
9. Studies in Economics of Farm Management in Punjab for 1954-55 by Ajaib Singh, Agricultural College, Ludhiana. Available from the Directorate of Economics & Statistics, Ministry of Food and Agriculture, New Delhi.

10. Studies in Economics of Farm Management in Madras for 1954-55 by (late) C. W. B. Zacharias, Madras University. Available from the Directorate of Economics & Statistics, Ministry of Food & Agriculture, New Delhi.
11. A Socio-Economic Survey of Hyderabad-Secunderabad City Area by S. Kesava Iyengar. Available from the Indian Institute of Economics, Hyderabad.
12. A Socio-Economic Survey of Baroda City by H. C. Malkani, M.S. University of Baroda, Baroda. Available from the Author.
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