

4.4 Implementation Plan

4.4.1 Scope of Works

(1) Objectives

As shown in Fig.4.2.1, the final objective of the Project is to improve the farmers' living standards in rural areas through the rehabilitation and improvement of minor irrigation tanks. And the development plans of each component have to be established so as to improve agricultural productivity by supporting and reinforcing the present organizations for better farming practices, operation and maintenance, water management, etc.

(2) Civil works

Requirement and work volume of rehabilitation and improvement of irrigation efficiency will be determined tank by tank through the feasibility and justification study which will be prepared prior to commitment of works. The following civil works will be included for the Project:

1) Rehabilitation of supply channel

It is proposed to rehabilitate the supply channels to their original capacity by removing silt deposit, standardize the channel cross section, and relevant structures such as intake facilities, channel crossing structures.

2) Rehabilitation and improvement of tank bund

The bund crest elevation and width will be restored to the required standards and slope surface will be reshaped and strengthened by stone revetment, wherever necessary.

3) Rehabilitation or reinstallation of head sluices

The present plug and rod control system will be replaced with gates or shutters for the efficient control of intake discharge. Inlet and outlet structures together with barrels will be rehabilitated or reinstalled. The proper bund protection works near the sluices will be provided.

4) Rehabilitation or extension of surplus arrangement

Wherever necessary, the extension of surplus weir discharge capacity will be made. Paved by-washes at the full tank level will be provided

5) Improvement of distribution system

In order to assure the efficient water distribution, measurement devices will be installed at the head of main channel. The most of main and branch channels commanding more than 10 ha of cultivation field will be lined to reduce the conveyance losses. Checks and diversion boxes with gates will be installed. The field channel will be reshaped to the standards/requirement.

6) Community wells

As a supplemental water sources in the ayacut and emergency use for the important growth period of crop cultivation such as preparation of nursery before monsoon start.

7) Improvement of rural infrastructures

For the easy access for the agricultural production and operation and maintenance of tank irrigation facilities, the village/O&M road will be constructed wherever necessary.

In order to facilitate the institutional development activities on the operation of WUAs, local farmers and other inhabitants, multi-purpose community centers will be installed whenever necessary.

8) Building of Project office

In order to assure the efficient implementation of the Project, project office buildings will be installed at the regional and central level.

(3) Agricultural Development

As a part of the technical agricultural extension, experimental demonstration farms will be established for the verification of appropriate crop production, crop diversification, and economical evaluation.

(4) Institutional Strengthening

1) Farmers participation and community organizer system

Farmers' participation is the most important aspect in the Project implementation from the identification stage up to turnover of the O&M to the WUA. It is necessary to motivate farmers and create the farmers a sense of property so that they consider themselves owners of tank. Farmers must have both privileges and responsibilities. Privileges include the right to be consulted on making decisions about canals and on-farm development. Responsibilities include financial and maintenance responsibilities. For these purposes, Community Organizer system is introduced

recently in the EC Project. The system succeeded in many EC tank modernization to formulate a by-law WUA. The system will be extended and to be recognized institutionally as a part of the Government function for the Tank Rehabilitation Project

2) Farmers and government field staff training

Efficient O&M training for the farmers will be conducted on the irrigation water management, operation sluices and irrigation practices using the course available in IMTI under the coordination of the Project. Also farmers will receive the training at the regional experimental demonstration farms on cultivation method, crop diversification, post-harvest etc.

While the PWD staff training/workshop will be conducted in domestic or overseas institutions on the water management, tank operation and computer application.

3) Monitoring & evaluation

In the EC Project, the Center for Water Resources of Anna University conducts the monitoring and evaluation of the tank modernization. They uncovered the several effects of tank modernization and gave advise to the implementation agencies. The similar activities shall be extended in the Project.

(5) Procurement of office equipment and inspection vehicles

Office equipment such as copy machine, fax, computer, etc. for the Project office and field office of the Project including office furniture will be procured. Also inspection vehicles and/or motorcycle for the inspector will be purchased for the smooth implementation of the Project.

4.4.2 Project Implementation Method

(1) Executing Agency

The executing agency will be Water Resources Organization (WRO) of the Public Works Department of Tamil Nadu State Government, under the Ministry of Water Resources, Government of India. The WRO organization for the Project is proposed as shown in Fig. 4.4.1.

The Project will be executed under a Steering Committee; its primary task will be reviewing the Project's progress and discussing long-term strategic and policy issues. It would consist of representatives from the Directorate of Agriculture, the Department of Agricultural Engineering, the Department of Environment and Forestry and the Department of Rural Development of the State Government and Ministry of Water Resources and the Department of Economic Affairs of Government of India. The chairman of the Steering Committee would be the Secretary for PWD

(Fig. 4.4.2).

(2) Organization for Project Implementation

1) Project Management Unit

The Project Management Unit (PMU) under the Chief Engineer, DRCS in the PWD-WRO, will be responsible for overall coordination and implementation of the Project

2) Consultant

The consultant shall be employed by the Executing Agency selected under an international competitive bidding (ICB) based on the guidelines of the lending agency for the Project. The consulting services to be provided would consist of: 1) providing assistance to PWD staff to formulate the guidelines for preparation of feasibility studies and detailed design, preparation of tender documents, evaluation of tenders, supervision of the construction works by suggesting appropriate methodology and training; 2) monitoring the Project progress, etc.

(3) Operation and Maintenance

After completion of the tank rehabilitation/improvement, the operation of irrigation and tank will be handed over to legally established WUA. On the other hand, the major maintenance works will be under the responsibility of the PWD-WRO until the correspondent legislation is completed; after completion, the responsibility will also be handed over to the WUA which will be financed through the water fees collected from the beneficiaries (farmers) (Fig. 4.4.3)

4.4.3 Implementation Procedure and Schedule

(1) Implementation Procedure

The implementation procedure for each tank is considered as follows:

- a) public announcement of proposal of tank rehabilitation to the farmers together with tank category;
- b) selection of tank by the district level committee;
- c) determination of hydrological characteristics and approximation of irrigable area by the PWD's field office staff based on the guidelines;
- d) preliminary estimation of construction costs by the PWD's field office staff;
- e) social screening and determination of requirement of community organizer and dispatching of community organizer by the PWD;
- f) provision of feasibility study including topographic mapping based on the

- existing village maps by the PWD field offices;
- g) detailed design and preparation of tender document by the PWD field office staff based on the guidelines;
 - h) tendering civil works under a national/local competitive bidding (NCB/LCB) carried out by the PWD based on the guidelines;
 - i) construction by contractor under the supervision of the PWD field engineers based on the guidelines;
 - j) preparation of operation and maintenance manual;
 - k) final inspection by the PWD and the consultant and hand-over to farmers

(2) Procurement Procedure

Civil works of the rehabilitation will be conducted by selected national/local contractors. The contractors under the Project will supply all required equipment, material and labor by themselves instead of being the government the supplier as in the EC Project. The tender lot will be formulated for adjacent or similar Project tanks in the region so that large scale contractors can jointly participate in the tendering; this fact is expected to improve the quality and punctuality of the construction works. Contractors will be encouraged to employ farmers or agricultural laborers in the Project tank area.

(3) Implementation Schedule

Assuming the introduction of financial assistance of an international institution or foreign country for the Project implementation, the overall schedule of the Project is estimated to be as the one as shown in Fig. 4.4.4.

4.4.4 Prioritization of Tank Categories for Implementation

(1) Necessity of Phasing Implementation

Considering the data shown below, it is estimated that about 2100 PWD rainfed tanks in the Project Area will be rehabilitated within 13 years or by the year of 2010. This target year is set up assuming the presence of foreign financial assistance:

The data taken into consideration is as follows:

- Through the EC Projects, about 600 tanks within 7 years between 1984 and 1995 (annual progress of about 85 tanks) were improved; thus, it 25 years were required for the whole Project tanks. Now, considering the work conditions, distribution of work sites, previous experience of the PWD and limited disbursement of the grant funds, a more efficient implementation can be expected for the Project. Then, with the introduction of new devices for the preparatory stage such as computerized Feasibility Report Generator, which has been recently

formulated for the EC Project, and the provision of a guideline/manual, it can be estimated that 13 years will be required for the total tanks considering the introduction of assistance foreign funds;

- Average cost per tank is estimated at Rs.3 million and the annual state budget for the minor irrigation during the 7th and 8th five year plans are at Rs.201 million and Rs.500 million (Rs.160million for EC Project), respectively. If the entire State budget for minor irrigation project allocated to the Project is utilized at Rs.500 million per year, it would take more than 13 years for tank rehabilitation.

An implementation period of more than 10 years for the Project is too long for the international lending agencies. Thus, the phasing of the Project shall be studied. Considering a period of 5 years for each phase, and preparatory works or pre-construction works under the loan, if so required, the Project, which originally would require 13 years for rehabilitation works, can be divided into two or three phases.

(2) Prioritization of Tank Categories for the Implementation

The prioritization of Project tanks aims at making a proper order for the rehabilitation programme for a smooth step-by-step implementation. From this background, it should be remarked that the prioritization for tank rehabilitation has two coincident basic factors, the rehabilitation works for the 10 Pilot Tanks as representative tanks for each category for the feasibility study and the works for all remaining tanks of the whole programme. In principle, both frameworks are covered by the unified categorization of irrigation tanks based on four basic factors: 1) hydrology; 2) cost volume; 3) beneficial impact; and 4) efficient O&M of each tank unit.

In general, the process of prioritization of tanks for rehabilitation works shall be made in two steps: 1) the division of categorized tanks in rehabilitation-phases; and 2) the classification of scheduled tank-groups for rehabilitation-works in each phase. Besides, the technical aspects on works should be considered as well.

1) Division of Rehabilitation Phases

Due to a very large number of more than 2,000 tanks to be rehabilitated, it is necessary to break down the whole programme into several appropriate phases for an effective procedure with the related works based on the basic principle of rehabilitating a maximum number of tanks within a minimum period of time. This principle requires considering the number of tanks for each category to be allocated in each phase. The first phase will be made for the tank categories with a top priority based on their urgent needs of water for agricultural production and technical feasibility for executing rehabilitation works. The middle phase(s) is (are) for the second priority in consideration of the top priority. The last phase, therefore, will be made for balancing the remaining part of the whole programme.

Also the regional distribution shall be considered for the availability of manpower, material supply capacity, regional equity, etc. Therefore, concentration of rehabilitation works in one region shall be avoided for the selection.

By this procedure, the rehabilitation programme would be made in three phases with 600-800 units of tanks for each phase to be carried out in a period of five years.

2) Classification of Tank-Groups in Each Phase for Scheduling Rehabilitation Works

Each phase is globally made for 600-800 tanks units of a same category for rehabilitation works in a period of five years. For a scrutinized schedule for these works in each individual year of each phase, it is necessary to sub-group the tanks in each phase for making a proper implementation schedule year by year.

As a matter of fact, due to the basic concept of minimizing execution time, there are two basic principles proposed for a smooth application. First, in each phase, locations of better access and physical conditions for works-execution will be implemented first. Second, at each location, tanks for the economically under privileged i.e. higher numbers of small and marginal farms will be attached as a higher priority.

The identification for sub-grouping tanks on physical conditions will be made on related physical maps. Meanwhile, the identification for prioritizing tanks at each location will be based on the present socio-economic conditions of taluks or villages related to each tank. This identification will be supported by data on agricultural production provided by related local agricultural officers. Due to substantial changes of socio-economic conditions at each period, this identification would be performed when executing the works at each location.

3) Consideration on Technical Aspects of Works

Regarding the technical aspects of rehabilitation works for irrigation tanks, their ultimate objective is the effectiveness in harmonizing three aspects of collecting, maintaining and discharging water for a better agricultural production throughout the year. In order to achieve these purposes, works for tank-rehabilitation will be made in categorized work items. However, due to different agro-climatic conditions, particularly in the hydrological aspects between the North and the South Study Areas, physical structures of each work item will be designed in consideration of its specific local conditions. Besides, due to the specific physical conditions of each location, related technical aspects, therefore, should be considered for a smooth implementation of works on the basis of case by case.

Taking into account the above mentioned considerations, in order to assure the

technical aspects within the framework of the rehabilitation programme, related principles of works-execution will be considered accordingly.

4) Prioritization

Through the feasibility study of 10 pilot tanks (details are shown in Volume III), it has been found that there are no similar tanks and individual tanks have particular characteristics. As a consequence, each one has a different EIRR as shown below:

Tank Category	Name of Tank	Ayacut (ha)	No. of Farm	Average Farm Holding (ha)	Present Cultivation Ratio (%)	Rehabilitation Cost Financial (Rs/ha)	Economic Incremental Benefit (Rs/ha)	EIRR Basic Condition
NR-1	Echur	58.68	166	0.35	80%	42,996	12,407	22.8%
NR-2	Cherukkanur	91.26	268	0.34	91%	45,803	9,661	15.9%
NR-2	Polambakkam	94.59	139	0.68	84%	38,683	14,516	29.6%
NR-3	Vadakkupattu	417.21	355	1.18	89%	42,312	5,507	7.4%
NR-4	Enadur	574.67	448	1.28	56%	29,244	4,793	11.7%
SR-1	Siruvila	49.25	106	0.46	100%	55,350	7,901	8.7%
SR-1	A. Ramalingapuram	76.53	49	1.56	86%	72,128	14,288	14.7%
SP-1	Pandikanmoi	41.88	110	0.38	97%	62,989	11,027	12.3%
SP-2	Kurumbi	52.67	112	0.47	99%	40,877	21,386	40.1%
SP-4	Sengangulam	99.23	313	0.32	50%	31,906	8,029	19.7%
Average						46,229	10,951	18.3%

From the above table, it is possible to identify the following tendencies:

[Northern Study Area]

- the smaller scale of tanks have the higher economic priority
- tanks having a present cultivation ratio of less than 75% show smaller economic priority
- tanks having small average farm holding area in their ayacut show higher economic priority

[Southern Study Area]

- larger-scale tanks have the higher economic priority
- tanks having a present cultivation ratio of less than 75% show a higher economic priority
- tanks having small average farm holding area in their ayacut show a higher economic priority

These tendencies are caused by the regional availability of water resources, climatic conditions, etc.

Based on the economic efficiency, ratio of marginal and small farmers in the ayacut, regional distribution of tanks (Northern and Southern Regions), and the target tanks of the EC Project (100 to 200 ha), the priority of implementation of

the Project is decided as follows:

Number of Tanks and Command Area by Phases				
Phase	Category	No. of Tanks	Average Area(ha)	Total Area(ha)
Phase-1	NR-1	262	49.41	12,945
	50% of NR-2	145	80.77	11,712
	SP-4	220	82.32	18,110
	SP-3	157	171.58	26,938
	Subtotal	784	88.91	69,706
Phase-2	50% of NR-2	144	80.77	11,631
	NR-3	248	255.68	63,409
	SP-2	238	69.73	16,596
	50% of SP-1	120	46.68	5,602
	Subtotal	750	129.65	97,237
Phase-3	NR-4	223	124.62	27,790
	SR-1	216	62.09	13,411
	50% of SP-1	120	46.68	5,602
	Subtotal	559	83.73	46,803
Total	Total	2,093	102.1	213,746

4.5 Project Justification

4.5.1 Basic Justification for the Project Framework

Basically, the Project is formulated to support and enhance agricultural production in Tamil Nadu. The agricultural sector is the predominant economic sector in this state, employing about 60% of its labour-force and using 45 % of its total land area; on the other hand, it shares only 35 % of the State Net Production. Moreover, the trend of recent development in the agriculture sector has been considered stagnant, especially in the last two National Plans. Of the total cultivated area of about 6 million hectares in this State, the area cultivated with paddy has ranged between 2.4 - 2.9 million hectares or 40 - 45 % of the total area for the last two decades. Despite the fact that the State only accounts for 35 % of the total gross cropped area only, it contributes to up to 70 % of the total food grain production in Tamil Nadu; it implies that grain production occupies an important position within the agricultural development and socio-economic stabilization process for this State.

With its basic potential in human and natural resources, and the issue of food security in this State for a population presently estimated at about 56 millions with an annual growth of about 2 %, the agriculture sector, therefore, is now being focused on its development capability to raise the production and living conditions in the rural India by solving basic constraints in the development of this sector.

Taking into account the present basic conditions for agricultural production activities, irrigation water has been considered as the most basic factor determining the development of this sector. According to some estimations, the area presently subjected to irrigation in Tamil Nadu ranges from 2.3 to 2.8 million hectares. However, in fact, the more accurate estimated irrigated area is far below from this figure. On the ratio of

irrigation sources, wells represent 40%; surface irrigation, 33%; and tanks, 27%. Recently, the ratio for tanks has been gradually decreasing due to a decrease in total storage capacity mainly as a result of the deterioration of the rain-fed tanks.

From the present situation of irrigation conditions, a low cropping intensity of 118 % has been observed. Meanwhile, from past experiences under secure irrigation, the yield of paddy is estimated to be up to 5 - 6 tons per hectare, representing major revenues for paddy-cropping farmers, especially for marginal and small farmers who cultivate paddy for their own consumption.

Since rice is the staple food in Tamil Nadu where all farmers in this State have cultivated this crop for their own consumption but under unstable irrigation water conditions, the modernization of rainfed tanks for assuring this source of irrigation water will definitely support the development of agriculture and state economy as well. at least on the basic issues of foodgrain production and improvements of rural living conditions.

As aforementioned, the total surface water resources available in the State are estimated at 34,000 million m³(MCM) at present of which 97 % are already developed for an annual water resource per capita of 600 m³, which is considered to be very low in comparison with the national average of 4,000 m³ per capita. In this section, the efficient storage and use of the presently available water sources, especially the rainfall precipitation in the whole State will be investigated.

Considering all the factors mentioned above, the Project for the modernization of about 2,500 rainfed tanks in 5 districts of the State (2 districts - Tiruvallur and Kanchipuram - in the Northern Region and 3 districts - Ramanathapuram, Sivagangai and Virudunagar - in the Southern Region) has an important effect and tremendous impacts to the aspects of socio-economic development in this State.

The following table shows the basic data comparing the prevailing conditions between the Project Area and the State.

	Area (km ²)	Population ('000)	Population Density (/km ²)	Cropped Area ('000ha)	Irrigated Area ('000ha)	Rainfed Tank (Unit)	Total Tank (Unit)
The State	130,210	55,600	427	5,730	2,500	5,276	39,202
Northern Study Area	7,837	4,654	592	370	186	1,186	3,745
Southern Study Area	12,606	3,784	300	530	112	1,433	10,208
Project Area Total (%)	20,463 (15.7)	8,431 (15.1)	411	900 (15.7)	297 (11.9)	2,619 (49.6)	13,953 (35.6)

From the above figures, the Project Area includes almost 49 % of total rainfed tanks in the whole State. Since the average command area for a rainfed tank is 102 ha (in case of full irrigation with available water), the total command area by all rainfed tanks in the Project area would be around 270,000 ha or about 90 % of the total presently irrigated area in the Project area (297,000 ha). In fact, the irrigated portions in the subjected command areas have been observed to be far below that level, especially in the South, and according to

the Season and Crop Report 1992-93 from DOA, the average shares of net irrigated areas by sources showed that 62 % of the sources is represented by tanks, 36.5 % by groundwater sources and 1.5 % by canals. This shows a basic insufficiency of irrigation by tanks due to lack of water.

At present, the potential of groundwater capacity for covering further irrigation needs has not yet been exactly measured. Meanwhile, the functioning of existing rainfed tanks have been observed to be gradually deteriorating, implying urgent needs for their modernization in order to effectively collect the annual rainfall precipitation in their corresponding catchment areas and provide it for agricultural production purposes.

In the Project Area, as an average, the ratio of irrigated area versus cropped area is low (297:900 or 33 %), compared to the one for the State (2,500:5,730 or 43.5 %); this is more apparent especially in the South Study Area (112:530 or 21 %) where annual rainfall precipitation has generally been found to be scarce. This situation implies also the need of a joint use of all available water sources for the agricultural development in case of insufficient water from irrigation tanks in order to increase cropping areas and obtain higher yields.

Besides, the Project aims at additional benefits coming from new cropping patterns introducing more cash-crops in the Project and value-added programmes to be intensively carried out along with other basic programmes for improving rural life.

With the totally combined application of all mentioned Project, the Project could prove its vitality in terms of becoming a basic national project for India itself and a basic human needs (BHN) project in reference to the issue of poverty alleviation in Tamil Nadu.

4.5.2 Evaluation Methodology

The Project aims at: (1) raising the agricultural production through the improvement of irrigation and farming system, and, thus, (2) improving the living conditions of small, marginal and landless farmers in the Project area.

Basically, these two objectives are considered to be very important for the socio-economic development of Tamil Nadu, as well as for all India where more than 60 % of the population's livelihood depends upon agriculture and either small or marginal or landless farmers represent more than 70 % of the total.

The Project, therefore, encompasses the basic characteristics of a national project for solving the crucial problem of rural poverty in India. As a matter of fact, the economic analysis with economic prices based on a national point of view was basically carried out first, after the general justification of the Project framework. Also, a sensitivity analysis based on three cases: (1) 10% increase of Project costs; (2) 10% decrease of Project benefits; and (3) Three-year delay of Project benefits were made to cope with these possible risks. Apart from these analyses, the financial analysis on farm budget of typical

marginal and small farmers were performed as well .

The framework of evaluation for the Project implementation was carried out following the order shown below:

- 1) General justification
- 2) Economic analysis
- 3) Sensitivity analysis
- 4) Financial analysis
- 5) Environmental assessment
- 6) Gender
- 7) Overall evaluation

With this framework, the Project was evaluated on the basis of a typical project for increasing the agricultural production and, at the same time, generating farm income for landless, marginal and small farmers to be applied in other similar areas of Tamil Nadu. A reasonably positive EIRR conforming with basic improvements on social conditions and environmental conservation impacts, as well as technical and financial feasibility, however, will be accordingly required.

4.5.3 Project Costs and Benefits

The Project comprises both "hard" and "soft" components. "Hard" components comprises civil works and installation of facilities; "soft" components comprises institutional development-programmes for smooth implementation of the Project to achieve its objectives. The economic benefits will come from raising the incremental agricultural benefits and other farm incomes through various institutional and value-added programmes carried out by the Experimental Demonstration Farm and farmers' organisations . Costs of the Project, in principle, include both costs related to these "hard" and "soft" components.

The number of tanks and registered command area in the Project Area are estimated as follows:

Districts	Tank Inventory List		Data Not Available	Number of EC Tanks	Study Tanks (estimated)	
	Number of Tanks	Average Command Area (ha)**			Number of Tanks	Command Area (ha)
Northern Study Area	1,214	116.36	85	107	1,022	127,488
Southern Study Area	1,214	97.85	12	131	1,071	86,258
Study Area Total	2,428	106.30	97	238	2,093	213,746

Source : * prepared by PWD in May 1997

(1) Project Costs

Project costs for each pilot tank are estimated as shown below:

(Unit : Rs X 1,000)

Tank Category	Name of Tank	Ayacut (ha)	Tank Rehabilitation Civil Works	GOIN & Other Expenses	Contingencies	Total Cost	Average Cost (Rs/ha)
NR-1	Echur	58.68	1,717	582	224	2,523	42,996
NR-2	Cherukkanur	91.26	2,848	962	370	4,180	45,803
NR-2	Polambakkam	94.59	2,493	852	324	3,669	38,788
NR-3	Vadakkupattu	417.21	12,023	4,067	1,563	17,653	42,312
NR-4	Enadur	574.67	11,449	3,869	1,488	16,806	29,245
SP-1	Siruvafai	49.25	1,857	627	242	2,726	55,350
SR-1	A. Ramalingapuram	76.53	3,759	1,272	489	5,520	72,129
SP-1	Pandikanmoi	41.88	1,797	607	234	2,638	62,989
SP-2	Kurumbi	52.67	1,466	496	191	2,153	40,877
SP-4	Sengangulam	99.23	2,156	729	281	3,166	31,906
Average (Total)		(1,555.97)				(61,034)	39,226

Components of major civil works are shown as follows:

(Unit : Rs.X1000)

Tank Category	Name of Tank	Tank Bund Improvement	Sluice Improvement	Surplus & Supply Channel Improvement	Channel Lining and On-farm Development	Community Wells & Others	Total Construction Cost
NR-1	Echur	13	196	113	1,265	130	1,717
NR-2	Cherukkanur	4	212	1,229	1,273	130	2,848
NR-2	Polambakkam	232	220	36	1,875	130	2,493
NR-3	Vadakkupattu	149	327	552	10,865	130	12,023
NR-4	Enadur	620	374	0	10,325	130	11,449
SP-1	Siruvafai	144	565	133	485	530	1,857
SR-1	A. Ramalingapuram	1,869	126	0	1,234	530	3,759
SP-1	Pandikanmoi	131	145	0	991	530	1,797
SP-2	Kurumbi	52	144	0	740	530	1,466
SP-4	Sengangulam	378	398	0	850	530	2,156
Average Rs. X1000		359	271	206	2,990	330	4,157
Average (Rs./ha)		2,309	1,740	1,326	19,218	2,121	26,713

Based on the unit cost of construction of 10 pilot tanks, the total Project cost is estimated as follows:

Item	Cost
Tank Rehabilitation Costs	
Tank Bund Improvement	494 million Rs.
Sluice Improvement	372 million Rs.
Surplus Improvement	279 million Rs.
Supply Channel Improvement	5 million Rs.
Channel Lining & On-farm Development	4,108 million Rs.
Building for Farmers Association	178 million Rs.
Community Well Construction Costs	
5 Demo. Farms & Community Centers	354 million Rs.
Construction of Project Office	57 million Rs.
Total Initial Cost for Civil Works	6,127 million Rs.
Procurement of Inspection Vehicles and Motor Cycle	153 million Rs.
GOIN Establishment & Other Administrative Cost	1,931 million Rs.
Training & Study Visits for Farmers and Project Staff	214 million Rs.
Engineering Service-Fees	100 million Rs.
Total Initial Investment Cost	8,519 million Rs.

(Note : cost escalation, contingencies and compensations are not included)

This initial investment cost was evenly allocated for the first 5 years of each phase of implementation. Besides, an annual cost for O&M. of Rs.445 million (5 % of the investment cost) was applied through the project life (30 years). For the replacement cost to be applied for civil works related to tanks and well only, 60 % of their initial investment costs are evenly applied in the 15th and 16th years of the Project life in each phase. For other facilities, only minor replacements are required to be included in the annual O&M. cost.

All these above costs are estimated for preliminary purposes, based on market prices prevailing in 1997 without including taxes in India, contingencies, compensation measures and land acquisition costs. In the process of financial procurement, these portions should be considered accordingly. For the economic analysis with economic prices, a Standard Conversion Factor (SCF) of 0.80 generally applied in India is applied to the corresponding market prices in this analysis.

(2) Project Benefits

The Project covers substantially 2,097 tanks for a total command area estimated at around 218,500 ha. There are about 312,000 farm holders sharing the total command area with an average holding area of 0.7 ha. Assuming each holding farm has 4.5 members, the number of beneficiaries of the Project would be around 1.4 million persons or about 30 % of the total rural population in the Project Area.

The major project-benefits will come from farm revenues consisting of incremental crop benefits and value-added benefits from post-harvest treatments.

For the incremental crop benefits, the total command area of 10 pilot tanks are summarized as follows:

Incremental Economic Benefits								
Tank Category	Name of Tank	Ayacut (ha)	NPV without Project (Rs.X1000)	NPV with Project (Rs.X1000)	Incremental Benefit (Rs.X1000)	Value Added (Rs.X1000)	Total Incremental Benefit (Rs.X1000)	Average Total Incremental Benefit (Rs./ha)
NR-1	Echur	58.68	961.6	1,609.2	647.6	80.5	728.1	12,408
NR-2	Cherukkanur	91.26	2,734.3	3,443.8	709.5	172.2	881.7	9,661
NR-2	Potambakkam	94.59	1,030.4	2,289.0	1,258.6	114.5	1,373.1	14,516
NR-3	Vadakkupattu	417.21	9,420.8	11,158.9	1,738.1	557.9	2,296.0	5,503
NR-4	Enadur	574.67	5,008.0	7,392.8	2,384.8	369.6	2,754.4	4,793
SR-1	A. Ramalingapuram	76.53	770.5	1,775.2	1,004.7	88.8	1,093.5	14,288
SP-1	Siruvafai	49.25	663.7	1,002.7	339.0	50.1	389.1	7,901
SP-1	Pandikanmoi	41.88	172.9	604.5	431.6	30.2	461.8	11,027
SP-2	Kurumbi	52.67	1,041.0	2,064.2	1,023.2	103.2	1,126.4	21,386
SP-4	Sengangulam	99.23	1,032.4	1,742.0	709.6	87.1	796.7	8,029
Average					1,024.7	165.4	1,190.1	10,951

Note : For the annual value-added benefits from post-harvest treatments, 5 % of the net annual production value would be considered to be the result of treatments such as storage for off-season prices, primary processing etc. from related institutional programmes.

Based on the average incremental benefit of each pilot tank, the Project incremental benefits are estimated.

4.5.4 Economic Analysis of the Project

The economic analysis judges the project viability in terms of direct contribution to the national economy. For this economic analysis, the EIRR is estimated.

From the annual disbursement of project costs and benefits, the basic Economic Internal Rate of Return (EIRR) was estimated as shown in Table 4.5.1. The EIRR was estimated to be 18.8 %.

This figure implies the economic viability of the Project for the basic case.

4.5.5 Sensitivity Analysis of the Project

For the sensitivity analysis in the aforementioned 3 cases, the EIRRs are estimated as shown in Table 4.5.2 to 4.5.4. The estimated EIRRs are as follows:

- | | |
|---|---------------|
| 1) Increase of Project cost at 10 % | EIRR: 17.0 %. |
| 2) Reduction of Project benefit at 10% | EIRR: 16.8 % |
| 3) Delay of Project benefit (3 years) | EIRR: 12.3 % |

In the sensitivity analysis of these 3 cases, the EIRRs show a decrease compared with the basic case, in which the lowest (12.3 %) is for the risk case of benefit-delay for a period of 3 years.

In these 3 cases of risks, however, the Project proves that the feasibility of the Project is sustainable for its implementation.

From the economic analysis, the figures of EIRRs are all positive. Besides, agriculture is the major industry in Tamil Nadu as well as India, the implementation of the Project will contribute to an effective utilization of available natural and human resources, and improving the living conditions related to the basic social problem of rural poverty shared by landless, marginal and small farmers.

4.5.6 Financial Analysis of Average Farm Budgets

In the financial evaluation for mainly analyzing the farm budgets for the categories of small and marginal farms in both cases of "without project" and "with project", the farm budgets of these farm categories are proved to be largely improved with an remarkable increase of the original incomes (1.3 times to 4.1 times or Rs. 3,367 to Rs.27,561), as shown below.

Tank Category	Name of Tank	Ayacut (ha)	No. of Farm	Average Farm Holding (ha)	NPV without Project (Rs.)	NPV with Project (Rs.)	Value Added (Rs.)	Incremental Benefit (Rs.)
NR-1	Echur	58.68	166	0.35	4,798	9,875	494	5,571
NR-2	Cherukkanur	91.26	268	0.34	10,260	13,812	691	4,242
NR-2	Polambakkam	94.59	139	0.68	6,553	19,727	986	14,160
NR-3	Vadakkupattu	417.21	355	1.18	26,404	34,415	1,721	9,732
NR-4	Enadur	574.67	448	1.28	10,278	19,621	981	10,324
SP-1	Siruvai	49.25	106	0.46	3,627	8,187	409	4,969
SR-1	A. Ramalingapuram	76.53	49	1.56	8,951	34,773	1,739	27,561
SP-1	Pandikanmoi	41.88	110	0.38	-677	4,391	220	5,288
SP-2	Kurumbi	52.67	112	0.47	8,004	19,608	980	12,585
SP-4	Sengangulam	99.23	313	0.32	2,479	5,568	278	3,367
Average(Total)		(1,555.97)	(2,066)	0.75	(80,678)	(169,977)	8,499	9,780

The living conditions of the landless farmers also would be improved to some extent as more job opportunities would be obtained from the medium and big farms who are also beneficiaries of the Project.

On the aspect of financial procurement for implementing the Project, for which its objectives were clearly justified in terms of improving the basic socio-economic aspects in this State, the Government of India and Tamil Nadu as well as the envisaged implementing agency, PWD, are recommended to take proper actions on this aspect for implementing the Project at an early stage.

4.5.7 Environmental Assessment

(1) Environmental Evaluation

From the results of the environmental impact assessment for the Pilot Tank Areas, it can be said that basically the Project will not induce any significant direct negative environmental impacts excepting groundwater component at some areas. A summary of likely environmental impact in 10 Pilot Tank Areas is presented in Table 4.5.5.

The groundwater development in the areas where high saline groundwater and/or likely sea water intrusion are observed may induce significant impacts on soils. In such areas groundwater development is not recommended. Thus, the groundwater development needs careful planning regarding water quality, water table, scale of development and selection of crops.

In addition to the above, some minor impacts may be induced such as increase of conflict/friction on water sharing, increase of agrochemical use, outbreak of mosquito-related diseases and destroying peacocks nests in the southern area. However, these minor impacts can be avoided through appropriate development procedures and countermeasures.

Post-project monitoring and supporting services are required for groundwater

development, agrochemical use, water-users association (WUA) and outbreak of mosquito-related diseases. Such monitoring and support services shall be conducted by relevant government agencies utilizing existing organizational structures and staff.

(2) Environmental Clearance

As for the environmental policies and ordinances in India, the Government of India enacted the Environment (Protection) Act of 1986 under the Constitution and the Environment (Protection) Rules of 1986. According to the Notification on Environmental Impact Assessment of Development Projects of 1994, all the projects listed under Schedule-I are required to obtain environmental clearance from the Central Government.

For the irrigation sector, among the projects under Schedule-I, all river valley projects including hydropower, major irrigation and their combination including flood control, where the investment is Rs. 500 million or above, only need environmental clearance from the Central Government.

According to the Environment and Forests Department (EFD) and the Tamil Nadu Pollution Control Board (TNPCB), the Project does not require environmental clearance from the Central Government, as far as the Project is going to be implemented in the existing minor irrigation tanks.

4.5.8 Women in Development (WID)

The following effects are expected to be induced to the women of marginal farm families in the villages by modernizing the tank irrigation system.

- Women in the Study Area are mainly employed in hard works of agricultural practices such as sowing/planting, weeding and harvesting, and their wage rates are set rather low. If marginal farmers' income is improved, they will be able to buy draught animals such as cows, etc. As a result, some of the women's work load in agricultural works will be done using those animals; in the case for some farmers, improvement of income may allow women to be free from such hard farm labor. Women will be able to have opportunity to get employed in the other works where salary may be higher.
- Women will be able to become more educated in the aspects of family planning, literacy, health and nutrition, etc. through the various activities carried out by the women and youth clubs under farmers' organization.
- Women and youth in the villages of the modernized tank will get in better diet and improved nutrition conditions, if their income is improved due to the modernization of irrigation tanks.
- The traditional discrimination of women may be mitigated and their social position

may be improved in the future, if they are able to be much more educated due to improvement of their families' income.

4.5.9 Overall Evaluation of the Project

The Project shows a basic EIRR of 18.8%, proving the economic and financial feasibility through the viability of this Project. The sensitivity analysis proved also that the Project is economically feasible with corresponding EIRRs of 17.0% (increase of Project cost at 10%), 16.8% (reduction of Project benefit at 10%) and 12.3% (delay of Project benefit for 3 years).

For small and marginal farmers, the financial analysis proved that their farm budgets will be largely improved by the Project implementation. This will result in a substantial raise of their rural living conditions. Landless farmers also will be benefited by the Project as a result of raising of labor-hiring capacities for medium and big farmers.

The "soft" part including institutional components which is an important part for functioning of the Project, however, should be carefully applied in an intensive but flexible way according to local specific conditions to implement the Project procedures smoothly and successfully. The proper supply of necessary inputs including farm materials and crop loans should be applied accordingly for their successful farming.

Apart from the environmental impacts to be separately evaluated, the basic technical and financial aspects of the Project proved possible basic lines for implementing the Project. Further planning in details of these aspects should be elaborated accordingly.

In the short term, the balance and combination of both "hard" and "soft" parts in the implementation of all project components will be very important for a successful achievement of the Project's objectives.

Table 4.5.1 Overall Project Economic Justification

(Basic Conditions)

										(Unit: Rs X1,000)							
Year	Cost Initial	Admin and O&M 5%	Replacement 60%	Cost Total	Crop	Benefit Value added	Total	Cash Flow									
0	1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
1	1998	445,795.0	0.0	0.0	445,795.0	0.0	0.0	0.0	-445,795.0								
2	1999	445,795.0	22,289.8	0.0	468,084.8	27,469.8	3,064.2	30,534.0	-437,550.8								
3	2000	445,795.0	44,579.5	0.0	490,374.5	82,409.5	9,192.5	91,602.0	-398,772.5								
4	2001	445,795.0	66,869.3	0.0	512,664.3	164,819.1	18,385.0	183,204.1	-329,460.2								
5	2002	1,067,660.8	89,159.0	0.0	1,156,819.8	274,698.4	30,641.7	305,340.2	-851,479.6								
6	2003	621,865.7	142,542.0	0.0	764,407.7	450,367.0	50,237.0	500,603.9	-263,803.8								
7	2004	621,865.7	173,635.3	0.0	795,501.0	636,834.9	71,042.4	707,877.4	-87,573.7								
8	2005	621,865.7	204,728.6	0.0	826,594.3	834,252.4	93,058.1	927,310.5	100,716.2								
9	2006	921,187.8	235,821.9	0.0	1,157,009.7	1,042,469.3	116,284.1	1,158,753.3	1,743.6								
10	2007	299,322.1	281,881.3	0.0	581,203.4	1,269,130.4	141,567.4	1,410,697.7	829,494.4								
11	2008	299,322.1	296,847.4	0.0	596,169.5	1,470,145.4	163,990.0	1,634,135.4	1,037,965.9								
12	2009	299,322.1	311,813.5	0.0	611,135.6	1,640,435.9	182,985.3	1,823,421.2	1,212,285.6								
13	2010	299,322.1	326,779.6	0.0	626,101.7	1,790,851.3	199,763.7	1,990,615.0	1,364,513.3								
14	2011	0.0	341,745.7	0.0	341,745.7	1,902,947.4	212,267.6	2,115,215.0	1,773,469.3								
15	2012	0.0	341,745.7	0.0	341,745.7	1,958,280.0	218,439.8	2,176,719.8	1,834,974.0								
16	2013	0.0	341,745.7	0.0	341,745.7	1,995,168.4	222,554.6	2,217,722.9	1,875,972.2								
17	2014	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
18	2015	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
19	2016	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
20	2017	0.0	341,745.7	658,909.1	1,000,654.8	2,013,612.6	224,611.9	2,238,224.5	1,237,569.7								
21	2018	0.0	341,745.7	658,909.1	1,000,654.8	2,013,612.6	224,611.9	2,238,224.5	1,237,569.7								
22	2019	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
23	2020	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
24	2021	0.0	341,745.7	919,151.0	1,260,896.7	2,013,612.6	224,611.9	2,238,224.5	977,327.8								
25	2022	0.0	341,745.7	919,151.0	1,260,896.7	2,013,612.6	224,611.9	2,238,224.5	977,327.8								
26	2023	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
27	2024	0.0	341,745.7	442,414.2	784,159.9	2,013,612.6	224,611.9	2,238,224.5	1,454,064.7								
28	2025	0.0	341,745.7	442,414.2	784,159.9	2,013,612.6	224,611.9	2,238,224.5	1,454,064.7								
29	2026	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
30	2027	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	2,238,224.5	1,896,478.8								
31	2028	0.0	341,745.7	230,296.9	572,042.6	2,013,612.6	224,611.9	2,238,224.5	1,244,577.2								
32	2029	0.0	341,745.7	230,296.9	572,042.6	2,013,612.6	224,611.9	2,238,224.5	1,244,577.2								
33	2030	0.0	341,745.7	230,296.9	572,042.6	2,013,612.6	224,611.9	2,238,224.5	1,244,577.2								
34	2031	0.0	341,745.7	230,296.9	572,042.6	2,013,612.6	224,611.9	2,238,224.5	1,244,577.2								
35	2032	0.0	74,830.5	0.0	74,830.5	368,883.9	41,147.8	410,031.7	335,201.2								
36	2033	0.0	74,830.5	0.0	74,830.5	368,883.9	41,147.8	410,031.7	335,201.2								
37	2034	0.0	74,830.5	0.0	74,830.5	368,883.9	41,147.8	410,031.7	335,201.2								
38	2035	0.0	74,830.5	0.0	74,830.5	368,883.9	41,147.8	410,031.7	335,201.2								
Total										6,834,914.2	9,227,134.1	4,040,948.5	20,102,996.8	50,513,906.7	5,634,662.4	56,148,569.1	36,045,572.3

IRR= 18.848%

Table 4.5.2 Sensitivity Analysis Case 1 : Increase Investment Cost 10%

										(Unit: Rs X1,000)							
Year	Cost Initial	Admin and O&M 5%	Replacement 60%	Cost Total	Crop	Benefit Value added	Total	Cash Flow									
0	1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-490,374.5								
1	1998	490,374.5	0.0	0.0	490,374.5	0.0	0.0	0.0	-484,359.2								
2	1999	490,374.5	24,518.7	0.0	514,893.3	27,469.8	3,064.2	30,534.0	-447,809.9								
3	2000	490,374.5	49,037.5	0.0	539,412.0	82,409.5	9,192.5	91,602.0	-380,726.6								
4	2001	490,374.5	73,556.2	0.0	563,930.7	164,819.1	18,385.0	183,204.1	-367,161.6								
5	2002	1,174,426.8	58,074.9	0.0	1,232,501.7	274,698.4	30,641.7	305,340.2	-340,241.6								
6	2003	684,052.3	156,796.2	0.0	840,848.5	450,367.0	50,237.0	500,603.9	-167,123.8								
7	2004	684,052.3	190,998.9	0.0	875,051.2	636,834.9	71,042.4	707,877.4	-16,056.8								
8	2005	684,052.3	225,201.5	0.0	909,253.8	834,252.4	93,058.1	927,310.5	-113,957.3								
9	2006	1,013,306.6	259,404.1	0.0	1,272,710.7	1,042,469.3	116,284.1	1,158,753.3	771,374.0								
10	2007	329,254.3	310,069.4	0.0	639,323.7	1,269,130.4	141,567.4	1,410,697.7	978,349.0								
11	2008	329,254.3	326,532.1	0.0	655,786.4	1,470,145.4	163,990.0	1,634,135.4	1,151,172.1								
12	2009	329,254.3	342,994.9	0.0	672,249.1	1,640,435.9	182,985.3	1,823,421.2	1,301,903.1								
13	2010	329,254.3	359,457.6	0.0	688,711.9	1,790,851.3	199,763.7	1,990,615.0	1,739,294.7								
14	2011	0.0	375,920.3	0.0	375,920.3	1,902,947.4	212,267.6	2,115,215.0	1,800,799.5								
15	2012	0.0	375,920.3	0.0	375,920.3	1,958,280.0	218,439.8	2,176,719.8	1,841,802.7								
16	2013	0.0	375,920.3	0.0	375,920.3	1,995,168.4	222,554.6	2,217,722.9	1,862,304.2								
17	2014	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
18	2015	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
19	2016	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
20	2017	0.0	375,920.3	724,800.0	1,100,720.3	2,013,612.6	224,611.9	2,238,224.5	1,137,504.3								
21	2018	0.0	375,920.3	724,800.0	1,100,720.3	2,013,612.6	224,611.9	2,238,224.5	1,137,504.3								
22	2019	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
23	2020	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
24	2021	0.0	375,920.3	1,011,066.1	1,386,986.4	2,013,612.6	224,611.9	2,238,224.5	851,238.1								
25	2022	0.0	375,920.3	1,011,066.1	1,386,986.4	2,013,612.6	224,611.9	2,238,224.5	851,238.1								
26	2023	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
27	2024	0.0	375,920.3	486,655.6	862,575.9	2,013,612.6	224,611.9	2,238,224.5	1,375,648.7								
28	2025	0.0	375,920.3	486,655.6	862,575.9	2,013,612.6	224,611.9	2,238,224.5	1,375,648.7								
29	2026	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
30	2027	0.0	375,920.3	0.0	375,920.3	2,013,612.6	224,611.9	2,238,224.5	1,862,304.2								
31	2028	0.0	253,326.6	0.0	253,326.6	1,326,866.5	148,007.6	1,474,874.1	1,221,547.5								
32	2029	0.0	253,326.6	0.0	253,326.6	1,326,866.5	148,007.6	1,474,874.1	1,221,547.5								
33	2030	0.0	253,326.6	0.0	253,326.6	1,326,866.5	148,007.6	1,474,874.1	1,221,547.5								
34	2031	0.0	253,326.6	0.0	253,326.6	1,326,866.5	148,007.6	1,474,874.1	1,221,547.5								
35	2032	0.0	82,313.6	0.0	82,313.6	368,883.9	41,147.8	410,031.7	327,718.2								
36	2033	0.0	82,313.6	0.0	82,313.6	368,883.9	41,147.8	410,031.7	327,718.2								
37	2034	0.0	82,313.6	0.0	82,313.6	368,883.9	41,147.8	410,031.7	327,718.2								
38	2035	0.0	82,313.6	0.0	82,313.6	368,883.9	41,147.8	410,031.7	327,718.2								
Total										7,518,405.6	10,149,847.5	4,445,043.3	22,113,296.5	50,513,906.7	5,634,662.4	56,148,569.1	34,035,272.5

IRR= 16.970%

Table 4.5.3 Sensitivity Analysis, Case 2 : Decrease Incremental Benefit 10%

(Unit: Rs X1,000)									
Year	Cost Initial	Adm and UM 5%	Replacement 60%	Costs Total	Crop	Benefit Value added	Total	CBA Flow	
0	1987	0.0	0.0	0.0	0	0	0	-445,795.0	
1	1998	445,795.0	0.0	0.0	445,795.0	0	0	-440,604.2	
2	1999	445,795.0	22,289.8	0.0	468,084.8	24,723	2,758	-407,932.7	
3	2000	445,795.0	44,579.5	0.0	490,374.5	74,169	8,273	-347,780.6	
4	2001	445,795.0	66,869.3	0.0	512,664.3	148,337	16,547	-282,013.6	
5	2002	1,067,660.8	89,159.0	0.0	1,156,819.8	247,229	27,578	-313,864.2	
6	2003	621,865.7	142,542.0	0.0	764,407.8	405,330	45,213	-158,366.4	
7	2004	621,865.7	173,635.3	0.0	795,501.0	573,196	63,938	-75,985.1	
8	2005	621,865.7	204,728.6	0.0	826,594.3	750,827	83,752	-114,131.7	
9	2006	921,187.8	235,821.9	0.0	1,157,009.7	938,222	104,656	688,424.6	
10	2007	299,322.1	281,881.3	0.0	581,203.4	1,142,217	127,411	874,552.4	
11	2008	299,322.1	296,847.4	0.0	596,169.5	1,323,131	147,591	1,029,943.5	
12	2009	299,322.1	311,813.5	0.0	611,135.6	1,476,392	164,687	1,165,451.8	
13	2010	299,322.1	326,779.6	0.0	626,101.7	1,611,766	179,787	1,561,947.8	
14	2011	0.0	341,745.7	0.0	341,745.7	1,712,653	191,041	1,617,302.1	
15	2012	0.0	341,745.7	0.0	341,745.7	1,762,452	196,596	1,654,204.9	
16	2013	0.0	341,745.7	0.0	341,745.7	1,795,652	200,299	1,672,656.4	
17	2014	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
18	2015	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
19	2016	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
20	2017	0.0	341,745.7	658,909.1	1,000,654.8	1,812,251	202,151	1,013,747.3	
21	2018	0.0	341,745.7	658,909.1	1,000,654.8	1,812,251	202,151	1,013,747.3	
22	2019	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
23	2020	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
24	2021	0.0	341,745.7	919,151.0	1,260,896.7	1,812,251	202,151	753,505.3	
25	2022	0.0	341,745.7	919,151.0	1,260,896.7	1,812,251	202,151	753,505.3	
26	2023	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
27	2024	0.0	341,745.7	442,414.2	784,159.9	1,812,251	202,151	1,230,242.2	
28	2025	0.0	341,745.7	442,414.2	784,159.9	1,812,251	202,151	1,230,242.2	
29	2026	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
30	2027	0.0	341,745.7	0.0	341,745.7	1,812,251	202,151	1,672,656.4	
31	2028	0.0	230,296.9	0.0	230,296.9	1,194,180	133,207	1,097,089.7	
32	2029	0.0	230,296.9	0.0	230,296.9	1,194,180	133,207	1,097,089.7	
33	2030	0.0	230,296.9	0.0	230,296.9	1,194,180	133,207	1,097,089.7	
34	2031	0.0	230,296.9	0.0	230,296.9	1,194,180	133,207	1,097,089.7	
35	2032	0.0	74,830.5	0.0	74,830.5	331,996	37,033	294,198.0	
36	2033	0.0	74,830.5	0.0	74,830.5	331,996	37,033	294,198.0	
37	2034	0.0	74,830.5	0.0	74,830.5	331,996	37,033	294,198.0	
38	2035	0.0	74,830.5	0.0	74,830.5	331,996	37,033	294,198.0	
Total		6,834,914.2	9,227,134.1	4,040,948.5	20,102,996.8	45,462,516.0	5,077,196.2	30,430,715.3	

IRR= 16.777%

Table 4.5.4 Sensitivity Analysis, Case 3 : Delay Project Benefit 3 Years

(Unit: Rs X1,000)									
Year	Cost Initial	Adm and UM 5%	Replacement 60%	Costs Total	Crop	Benefit Value added	Total	Cash Flow	
0	1987	0.0	0.0	0.0	0	0	0	-445,795	
1	1998	445,795.0	0.0	0.0	445,795.0	0	0	-468,085	
2	1999	445,795.0	22,289.8	0.0	468,084.8	0	0	-490,375	
3	2000	445,795.0	44,579.5	0.0	490,374.5	0	0	-512,664	
4	2001	445,795.0	66,869.3	0.0	512,664.3	0	0	-1,126,286	
5	2002	1,067,660.8	89,159.0	0.0	1,156,819.8	27,469.8	3,064.2	-672,806	
6	2003	621,865.7	142,542.0	0.0	764,407.8	82,409.5	9,192.5	-612,297	
7	2004	621,865.7	173,635.3	0.0	795,501.0	164,819.1	18,385.0	-521,254	
8	2005	621,865.7	204,728.6	0.0	826,594.3	274,698.4	30,641.7	-456,406	
9	2006	921,187.8	235,821.9	0.0	1,157,009.7	450,367.0	50,237.0	126,724	
10	2007	299,322.1	281,881.3	0.0	581,203.4	636,884.9	71,042.4	331,141	
11	2008	299,322.1	296,847.4	0.0	596,169.5	834,252.4	93,058.1	547,618	
12	2009	299,322.1	311,813.5	0.0	611,135.6	1,042,469.3	116,284.1	784,596	
13	2010	299,322.1	326,779.6	0.0	626,101.7	1,269,130.4	141,567.4	1,292,390	
14	2011	0.0	341,745.7	0.0	341,745.7	1,470,145.4	163,990.0	1,481,676	
15	2012	0.0	341,745.7	0.0	341,745.7	1,640,435.9	182,985.3	1,648,869	
16	2013	0.0	341,745.7	0.0	341,745.7	1,790,851.3	199,763.7	1,773,469	
17	2014	0.0	341,745.7	0.0	341,745.7	1,902,947.4	212,267.6	1,834,974	
18	2015	0.0	341,745.7	0.0	341,745.7	1,958,280.0	218,439.8	1,875,977	
19	2016	0.0	341,745.7	0.0	341,745.7	1,995,168.4	222,554.6	1,937,570	
20	2017	0.0	341,745.7	658,909.1	1,000,654.8	2,013,612.6	224,611.9	1,237,570	
21	2018	0.0	341,745.7	658,909.1	1,000,654.8	2,013,612.6	224,611.9	1,896,479	
22	2019	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	1,896,479	
23	2020	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	1,896,479	
24	2021	0.0	341,745.7	919,151.0	1,260,896.7	2,013,612.6	224,611.9	977,328	
25	2022	0.0	341,745.7	919,151.0	1,260,896.7	2,013,612.6	224,611.9	977,328	
26	2023	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	1,896,479	
27	2024	0.0	341,745.7	442,414.2	784,159.9	2,013,612.6	224,611.9	1,454,065	
28	2025	0.0	341,745.7	442,414.2	784,159.9	2,013,612.6	224,611.9	1,454,065	
29	2026	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	1,896,479	
30	2027	0.0	341,745.7	0.0	341,745.7	2,013,612.6	224,611.9	1,896,479	
31	2028	0.0	230,296.9	0.0	230,296.9	2,013,612.6	224,611.9	2,007,928	
32	2029	0.0	230,296.9	0.0	230,296.9	2,013,612.6	224,611.9	2,007,928	
33	2030	0.0	230,296.9	0.0	230,296.9	2,013,612.6	224,611.9	2,007,928	
34	2031	0.0	230,296.9	0.0	230,296.9	1,326,866.5	148,007.6	1,474,874	
35	2032	0.0	74,830.5	0.0	74,830.5	1,326,866.5	148,007.6	1,400,044	
36	2033	0.0	74,830.5	0.0	74,830.5	1,326,866.5	148,007.6	1,400,044	
37	2034	0.0	74,830.5	0.0	74,830.5	1,326,866.5	148,007.6	1,400,044	
38	2035	0.0	74,830.5	0.0	74,830.5	368,883.9	41,147.8	335,201	
Total		6,834,914.2	9,227,134.1	4,040,948.5	20,102,996.8	49,407,254.9	5,511,219.0	34,815,477.1	

IRR= 12.264%

Table 4.5.5 Summary of Likely Environmental Impacts in Pilot Tank Areas

Environmental Impact	Northern Area					Southern Area				
	Echur	Cherukkanur	Polambakkam	Enadur Big	Vadakkupattu	Sirvalai	Ramalinguram	Pandikanmoi	Sengangulam	Kurumbi
1. Social Environment 1) Socio-economic Issues - Conflict/friction on water sharing (By establishment of WUA) 2) Health and Sanitary Issues - Increase of agrochemical use (By expansion of irrigated agriculture) - Spreading of filariasis/malaria (By expansion of irrigation) 3) Cultural Asset Issues	○	○	○	○	○	○	○	○	○	○
2. Natural Environment 1) Biological and Ecological Issues - Negative impact on wildlife (peacocks) (During rehabilitation works of tank) 2) Soil and Land Resources - Soil contamination (By increase of agrochemical use) - Soil salinization & deterioration of soil fertility (By saline groundwater utilization) 3) Hydrology and Water Quality - Water contamination (By increase of agrochemical use) - Lowering the water table (By large scale groundwater extraction) - Sea water intrusion (By large scale groundwater extraction)	○	○	○	○	○	○	○	○	○	○

Note: ♦ : Significant impact, * : Medium impact, ○ : Small impact or likely no impact, ---: No impact

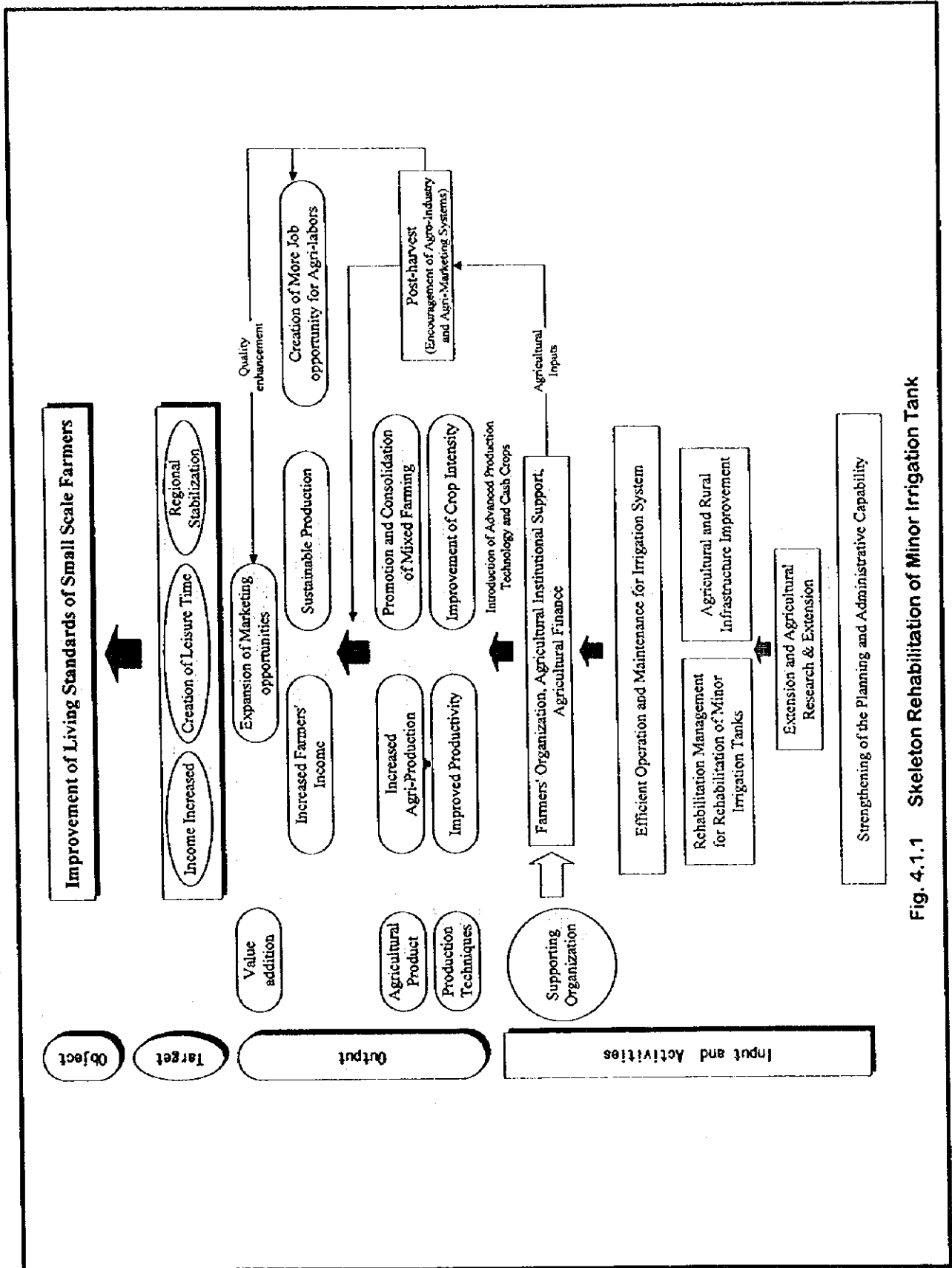


Fig. 4.1.1 Skeleton Rehabilitation of Minor Irrigation Tank

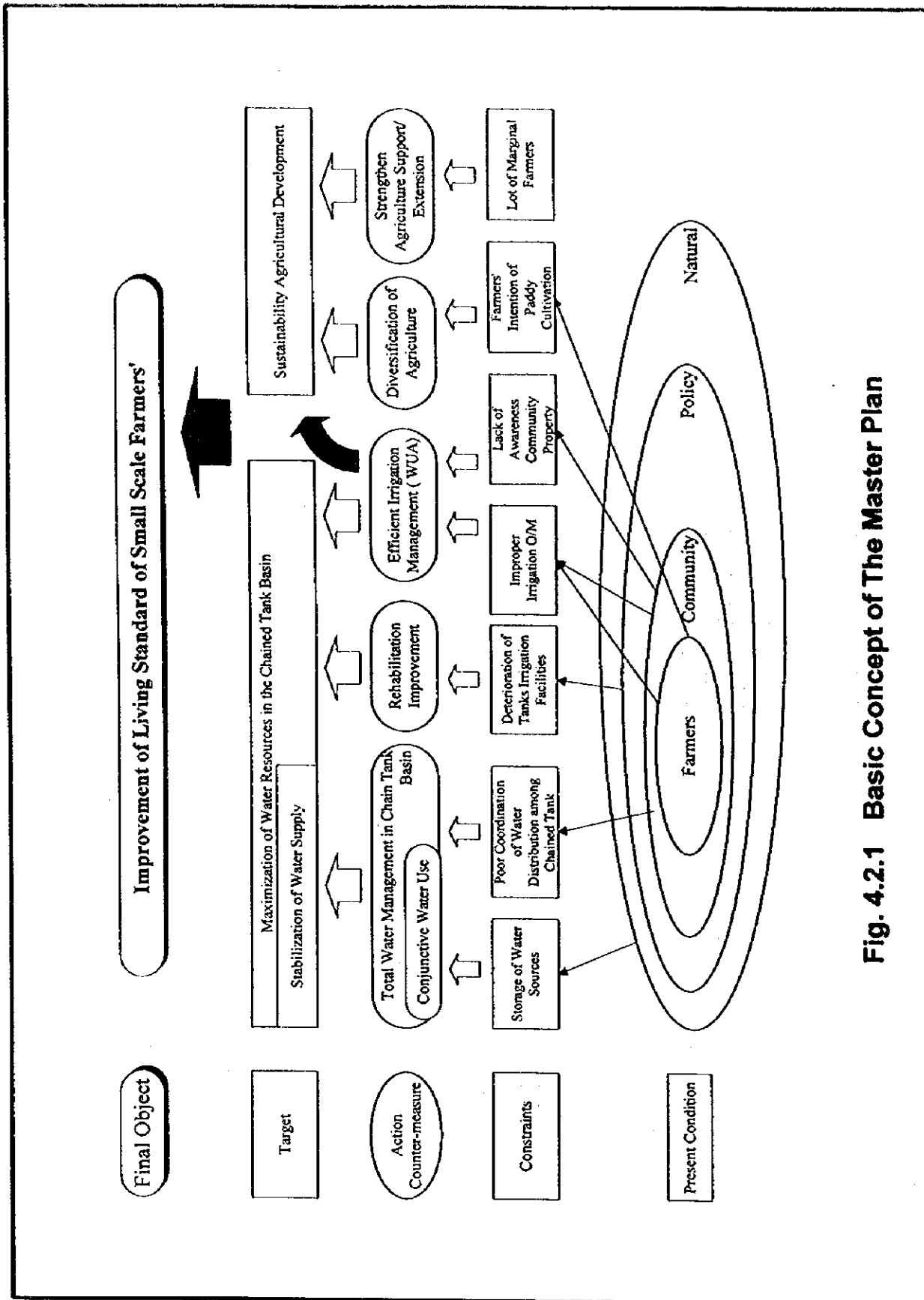


Fig. 4.2.1 Basic Concept of The Master Plan

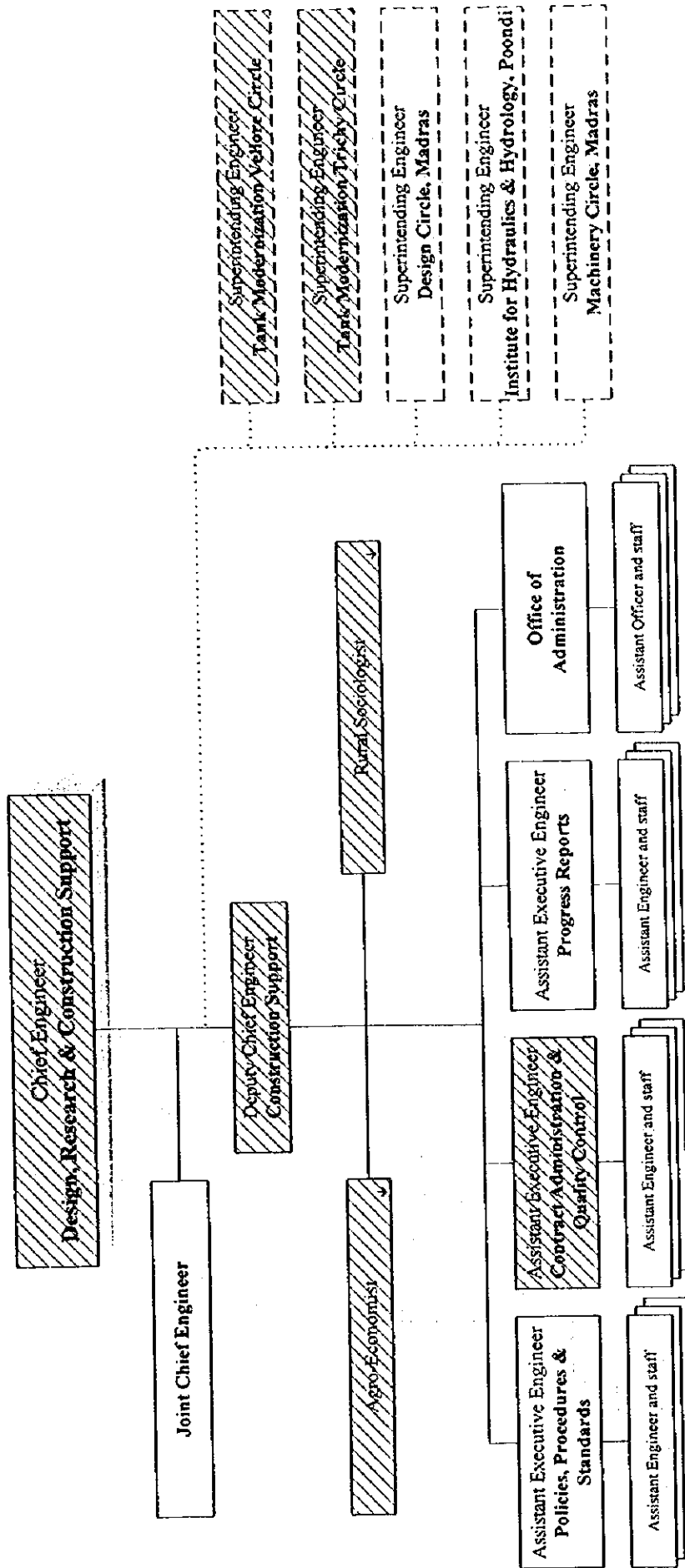


Fig. 4.4.1 DRCS Organization Chart (1/2)
(Office of Chief Engineer for Design, Research and Construction Support)

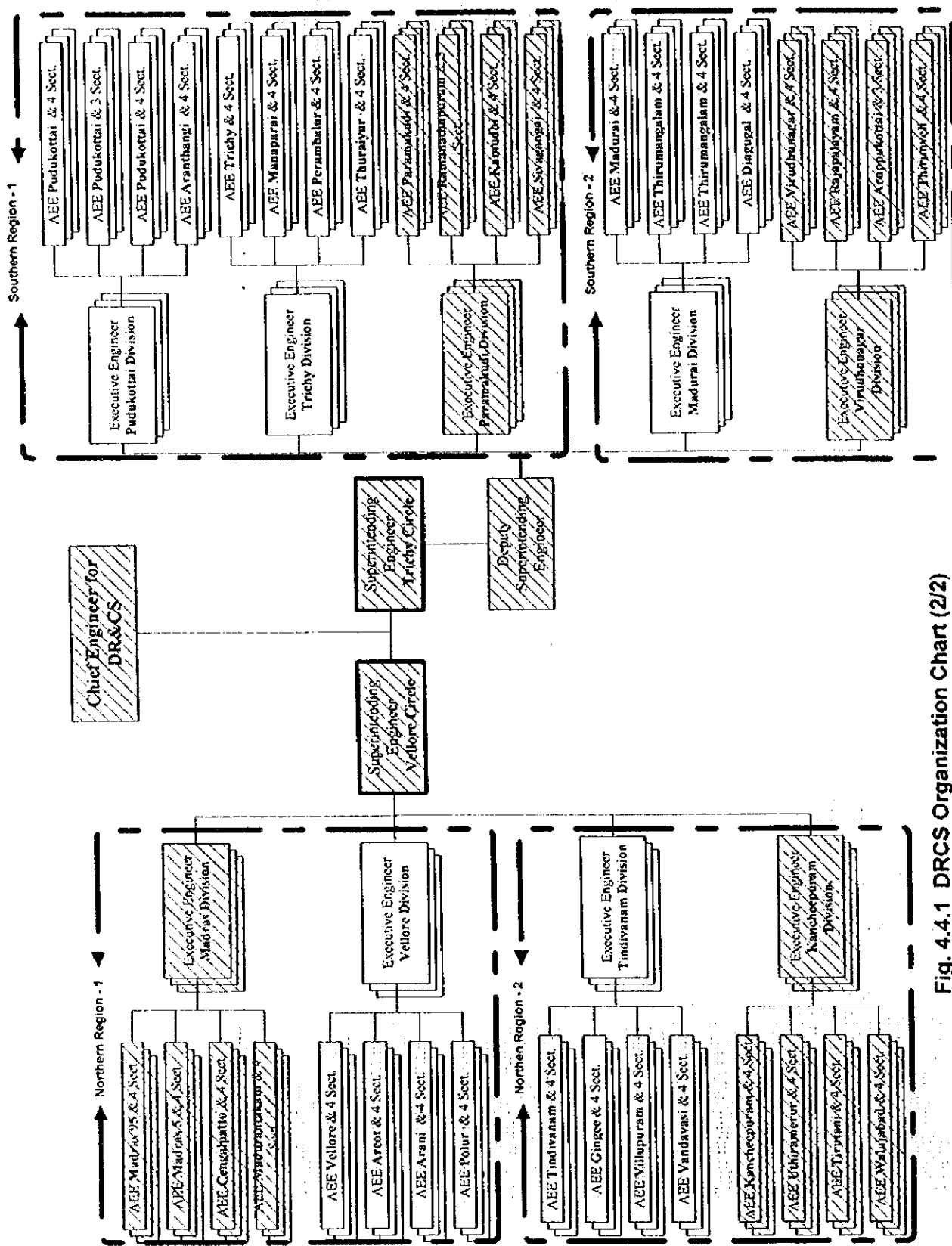


Fig. 4.4.1 DRCS Organization Chart (2/2)
(Tank Modernization Circle)

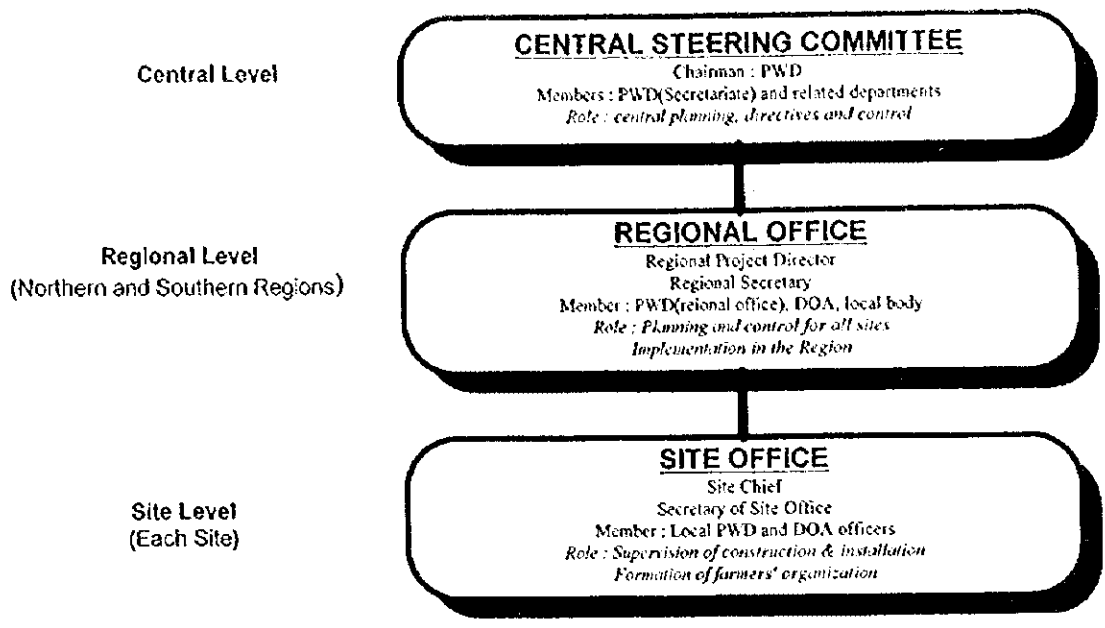


Fig 4.4.2 Management Organization during Construction Stage

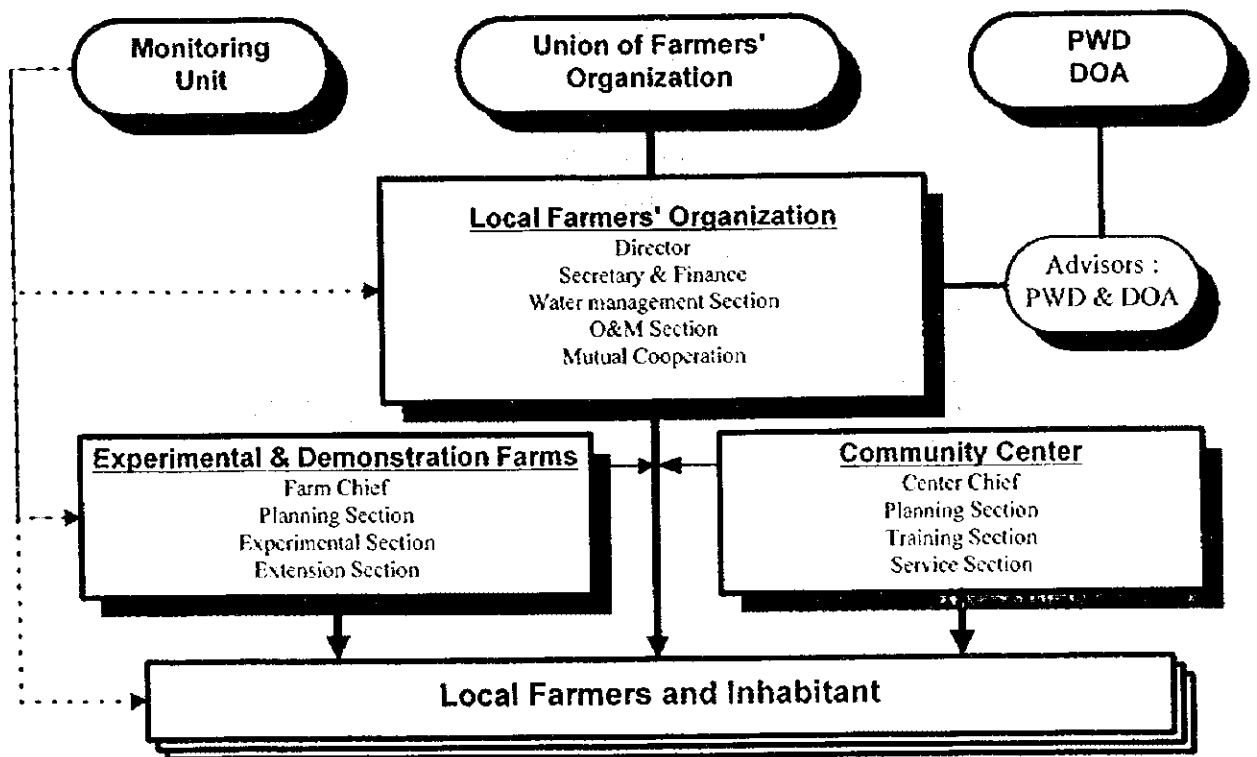
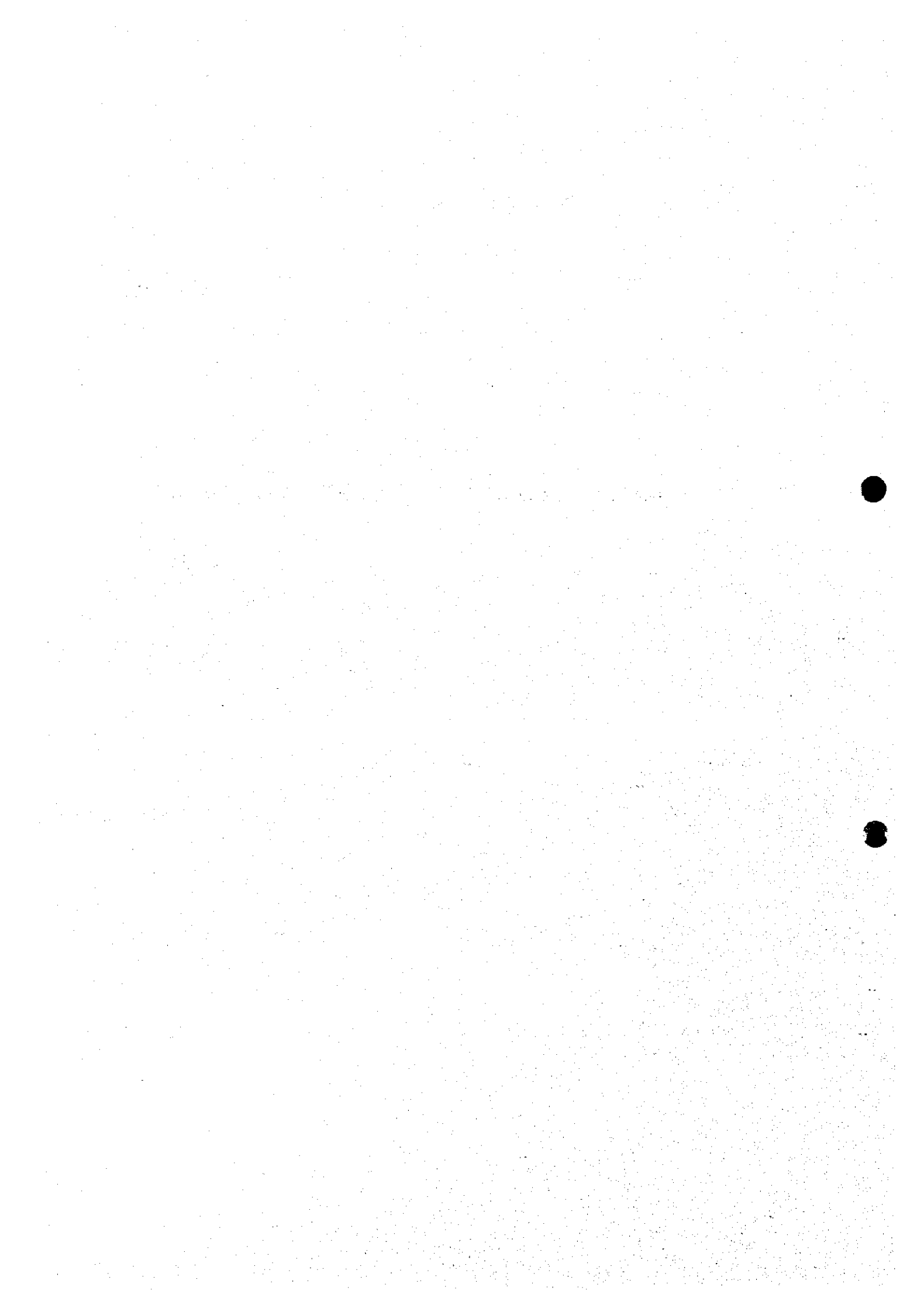


Fig 4.4.3 Organization for Operation and Maintenance of the Project

CHAPTER 5 : CONCLUSION AND RECOMMENDATIONS



CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

The Project should be implemented as soon as possible in consideration of the following matters:

- a. The Project is feasible judged from both economic and financial view points, and the implementation of the Project will contribute very much to the improvement of living standards of the farmers in the area and also to development of the State.
- b. The Project is very important as the pilot rehabilitation and agricultural/rural development in PWD rainfed tank area. This pilot project will be applied to the rehabilitation of PWD rainfed tank areas out of the Project Area.

It is confirmed that any serious adverse effect is not anticipated by implementing the Project through some sociological effects are pointed out as a results of the environmental impact assessment carried out during the Study period.

5.2 Recommendations

5.2.1 Early Implementation of the Project

The Project is recognized as an urgent necessity by the GOTN for improving the farmers' living in the State. Its early implementation is expected strongly because there are about 5,300 PWD rainfed tanks in the State and most of them are found to require early repair and rehabilitation. The EC has taken great efforts to contribute the modernization of these tanks so far, and about 500 tanks were taken up for the modernization by the EC finance. However, the GOTN still have many tanks to be modernized, and the finance necessary for modernizing these tanks have not been determined.

As a matter of fact, in some areas in the southern region there are small farmers who have not succeeded paddy cultivation for these five (5) years because of lack of tank water. The GOTN understands that the Project is indispensable for contributing the welfare of the farmers in the State as well as the development of rural areas, and it is also considered necessary to continue the modernization of these minor irrigation tanks in the State. Therefore, it is recommended to commence the Project's implementation as soon as possible.

Since the Project implementation requires huge amount of costs, it is also recommended to implement the Project with some steps taking the high priority tanks first to facilitate the financing and to examine the procedures of implementation.

5.2.2 Involvement of Community Organizer as a Staff of PWD

From the initial stage of the implementation of the Project up to the operation and maintenance of the tank irrigation system, the WUA is the most important under the farmers participation. Through the previous EC Project, the community organization system is effectively functioning and its importance are recognized by PWD. It is possible to say the community organizer system is key for the success of the Project. Therefore, the important system shall be implemented under the direct control of PWD. Asking the NGO to do these might be considered as a negligence of the important activities of the Project by PWD.

5.2.3 Coordination and Collaboration Works with Other Government Agencies

PWD is mainly civil engineers group, but the target of the Project cannot achieved by the physical rehabilitation but also it requires improvement of agricultural production. As proposed, and practiced in the EC Project, the coordination and collaboration with other concerned government agencies such as Department of Agricultural, Agricultural Engineering Department in the State Government and Ministry of Water Resources in the Central Government, for the implementation of the Project.

The collaboration works can be obtained through the exchange of opinions with other field experts, sometimes it is important to exchange the government staff among the related government agencies.

The decision making of the Project implementation can be coordinated under the proposed steering committee.

5.2.4 Early Implementation of Demonstration Farms in the Project Area

Visual training to the farmers is most easy to understand. As planned the high production, crop diversification, value adding of agricultural products, etc., the demonstration farms in the Project Area shall be started prior to the Project implementation.

5.2.5 Provision of Opportunity of Suitable Training by Establishing New Training Organization

At present, the training for the community organizers is held mainly by IMTI and KVK aiming to increase the number of community organizers in line with the recommendation by EC assisted schemes. In the Project, various new technologies will be introduced; water-saving irrigation, crop diversification, value-added agriculture, etc. The farmers have to understand and practice these technologies in order to receive the Project's effects as envisaged, and they will need frequent assistance of the government. To furnish the farmers with knowledge on these technologies, it is necessary to provide proper training to farmers and community organizers as well as government officials. It

is, therefore, recommended to establish the coordination organization which will be in charge of coordination among such training agencies as IMTI, KVK, and other international and national training agencies. The organization is proposed to be attached to the IMTI and be named as the Management Center of Tank Rehabilitation Training. Its functions will cover a wide range of services relating to the training from travel and tour arrangements to preparation of training program and budget allocation.

5.2.6 Finalization of Tank Inventory applying the Database System for the Study

Such a large number of minor tanks are going to be rehabilitated by the Project. In the preparation of implementation or prioritization, the data on each tank is most important prior to the field survey. The tank inventory list for the Study prepared by PWD can not say to be completed. There are many tanks several data/information on important dimensions are not available at present. It also has several mistake while converting the British units to metric units. The database system established under the Study can be easily modify the data. Therefore, prior to the rehabilitation implementation, the database shall be completed by PWD staff.

Furthermore, the tank data is subjected only to the tanks in the Study Area, so that, tanks locate out of the Study Area in the State shall be prepared for the future implementation and extension of the Project. For this purpose, computers with proper peripherals as same as the Study used are required.

5.2.7 Selection of Contractors for Smooth Implementation

From the experiences of EC Project one of the reasons for the low progress is the capability of contractors. For the smooth implementation of the Project, the participation of qualified contractor under own good management of the construction is necessary.

As implemented in the WRCP under the World Bank assistance, the contractors, who construct by their arrangement of the construction material, labour forces and construction equipment, shall be employed by the PWD in the Project. In order to employ the good contractors in the Project, the scale of the works shall be considered. Then several tanks shall be tendered as a package among tanks to be rehabilitated.

Presently, no list of local contractors in the State are available because of the government's decentralization policies. They shall be stocked in the database including the evaluation of previous work performance, so that easy selection of good contractors can become possible by PWD. These works can be prepared by the monitoring unit of the EC Project, and will be continued under the Project.

5.2.8 Introduction of New Technology for the Construction

In order to the smooth implementation of the rehabilitation works and efficient O&M,

the new technology or construction method shall be studied and introduced in the Project.

In order to implement smoothly with in the limited period of construction, use of pre-cast concrete by the manufacturers or in-situ using the standardized concrete forms by contractor, using small scale construction equipment such as earth moving by bulldozers, excavators shall be studied in the Project. Also measurement devices, such as Parshal Flumes, at the outlet sluices or at the head of the field channel shall be installed to implement the efficient O&M in the Project.

ATTACHMENTS

ATTACHMENT - A :

SCOPE OF WORK OF THE STUDY

I. INTRODUCTION

In response to the request of the Government of India (hereinafter referred to as "GOI"), the Government of Japan (hereinafter referred to as "GOJ") has decided to conduct the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu, (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of GOJ, will undertake the Study in close cooperation with the authorities concerned of GOI and the Government of Tamil Nadu (hereinafter referred to as "GOTN").

On the part of GOI and GOTN, the Ministry of Water Resources (hereinafter referred to as "MOWR"), and the Public Works Department (hereinafter referred to as "PWD") shall act, respectively, as counterpart agencies to the Japanese study team and also as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To formulate Master Plan on the Rehabilitation of Minor Irrigation Tanks for Rural Development for the State of Tamil Nadu.
2. To conduct Feasibility Studies in the selected areas where tank irrigation agriculture is predominant in the rural society, and
3. To carry out technology transfer to the Indian counterpart personnel through on-the-job training in the course of the Study.

III. STUDY AREA

The Study covers Anna, MGR, Kamarajapuram, Pasumpun, Muthuramalinga Thevar and

SCOPE OF WORK

FOR

THE STUDY ON THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR RURAL DEVELOPMENT IN TAMILNADU

AGREED UPON BETWEEN

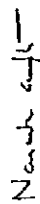
THE MINISTRY OF WATER RESOURCES, GOVERNMENT OF INDIA, AND THE PUBLIC
WORKS DEPARTMENT, GOVERNMENT OF TAMILNADU

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

DELHI, 9TH AUGUST, 1996

A-1




Mr. Naresh Gupta
Secretary,
Public Works Department,
Government of Tamil Nadu



Mr. Rajendra Mishra
Deputy Secretary,
Ministry of Water Resources



Mr. Tadashi Tsuchiya
Leader,
Preparatory Study Team,
Japan International Cooperation Agency



Mrs. Rama Murals
Joint Secretary,
Department of Economic Affairs,
Ministry of Finance



Kannur districts (a total area of approximately 20,463 sq. km.).

IV. SCOPE OF THE STUDY

Phase I (Master Plan Study)

1. Collection and review of the existing reports, data and information by way of field survey with emphasis on the following items:
 - a. Location and current condition of irrigation tanks in the study area.
 - b. Tank operation and water management systems
 - c. Rehabilitation and maintenance system of the irrigation tanks
 - d. Agricultural practices and agro economy
 - e. Socio-economic conditions and social environmental aspects
 - f. Natural conditions (climate and geographical environment, etc.)
 - g. Analysis of the governmental policies and agricultural preferences for the rural sector
2. Major constraints which impair the efficiency of the irrigation tanks and remedial measures necessary
3. Review of the ongoing tank rehabilitation plan and projects including criterion adopted
4. Formulation of Master Plan for the rehabilitation of irrigation tanks and selection of areas for the Feasibility Study

Phase II (Feasibility Study)

1. Collection of data and information in the selected areas through additional field survey.
2. Formulation of rehabilitation plan of irrigation tanks in line with rural participation promotion in the selected areas covering the following elements:
 - a. Land use plan, farming plan and agricultural supporting system
 - b. Preliminary engineering design for the rehabilitation work
 - c. Operation and maintenance plan for irrigation
 - d. Water management
 - e. Environmental protection plan

- f. Designing of optimum implementation schedule of the rehabilitation works
- g. Estimation of the project costs and benefits
- h. Evaluation and recommendation

3. Establishing guidelines on the irrigation tanks for subsequent rehabilitation plans and project appraisal

V. STUDY SCHEDULE

The tentative work schedule of the Study is as attached (see Annex I).

VI. REPORTS

Japanese side shall prepare and submit the following reports in English to GOI/GOTTN.

1. Inception Report
Thirty (30) copies in English at the commencement of Phase I Study.
2. Progress Report (1)
Thirty (30) copies in English at the end of the field work of Phase I Study.
3. Interim Report
Thirty (30) copies in English at the commencement of Phase II Study.
4. Progress Report (2)
Thirty (30) copies in English at the end of the field work of Phase II Study.
5. Draft Final Report
Thirty (30) copies in English at the end of the second home office work. The Indian side provides JICA with its comments on the Draft Final Report within one (1) month after receipt of the Draft Final Report.
6. Final Report
Fifty (50) copies in English within one (1) month after receiving GOI's comments on the Draft Final Report.

VII. UNDERTAKING OF GOI/GOTN

1. To facilitate the smooth conduct of the Study, GOI/GOTN shall take necessary measures:
 - (1) To secure the safety of the Japanese study team during their assignment in India.
 - (2) To permit the members of the Japanese study team to enter, leave and sojourn in India for the duration of their assignments therein, and exempt them from foreign registration requirements and consular fees.
 - (3) To exempt the members of the Japanese study team from taxes, duties and other charges on equipment, machinery and other materials brought into and out of India for the conduct of the Study.
 - (4) To exempt the members of the Japanese study team from income taxes and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study.
 - (5) To provide the necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into India from Japan in connection with the implementation of the Study.
 - (6) To secure permission for entry into private properties and other areas for the conduct of the Study when necessary arises.
 - (7) To make available to the Japanese study team to take all data and documents (including photographs and maps), other than those restricted, related to the Study out of India to Japan, and.
 - (8) To provide medical services as needed and its expenses will be chargeable on the members of the Japanese study team.
2. GOI/GOTN shall bear claims, if any arises, against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

3. MOWR/PWD, have all responsibilities for the implementation of the Study and also as coordinating bodies in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
4. MOWR/PWD shall, at its own expense, provide the Japanese study team with the followings, in cooperation with other relevant organizations:
 - (1) Counterpart personnel.
 - (2) Suitable office space with necessary equipments in Madras and survey site.
 - (3) Vehicles with drivers and necessary equipment for the Study, and
 - (4) Credentials or identification cards.

VIII. UNDERTAKING OF JICA

- For the implementation of the Study, JICA shall take the following measures:
- (1) To dispatch, at its own expense, the Japanese study team to India, and
 - (2) To perform technology transfer to the Indian counterpart personnel in the course of the Study.

IX. CONSULTATION

JICA and MOWR/PWD shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Handwritten signatures and initials are present at the bottom of the page, including a large signature on the left and several smaller initials on the right.

MINUTES OF MEETING

ON
DISCUSSIONS OF SCOPE OF WORK
FOR

THE STUDY ON THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR RURAL DEVELOPMENT IN TAMILNADU

DELHI, 9TH AUGUST, 1996

TENTATIVE WORK SCHEDULE

Period	Work in India	Home office work in Japan	Phase	Reports
1				IC/R
2				P/R(1)
3				P/R(1)
4				
5				
6				IC/R
7				P/R(2)
8				P/R(2)
9				
10				
11				IC/R
12				
13				
14				
15				

IC/R : Inception Report
P/R(1) : Progress Report(1)
IC/R : Interim Report
P/R(2) : Progress Report(2)
IC/R : Draft Final Report
P/R : Final Report
⊙ : Comments on DE/R by the Indian side

(Remarks)

Naresh Gupta
Mr. Naresh Gupta
Secretary,
Public Works Department
Government of Tamil Nadu

Rajendra Mishra
Mr. Rajendra Mishra
Deputy Secretary
Ministry of Water Resources

Rama Morali
Mrs. Rama Morali
Joint Secretary,
Department of Economic Affairs
Ministry of Finance

Tadashi Tsuchiya
Mr. Tadashi Tsuchiya
Leader,
Preparatory Study Team
Japan International Cooperation Agency

system tanks) which have larger command area under the control and maintenance of PWD are proposed to be taken up.

There are approximately 2,600 such PWD tanks in the study area (see Annex I)

2. A long list of the minor irrigation tanks will be prepared and handed to the study team at the time of the commencement of the Study. Contents of the list are as attached. (see Annex III)
3. A 1:5,000 map for each village in the study area and 1:50,000 maps of the study area, with indications of catchment area, command area and other necessary information on them, will be made available to the study team when required.
4. Areas for the Feasibility Study will be selected on the basis of the outcomes of the Phase I Study, and the guidelines will be formulated to suggest rehabilitation methods and maintenance system of the irrigation tanks.
5. The Indian side explained that environmental impact of the rehabilitation work will be negligible because the work will be made only on the structures existing for centuries and therefore EIA will not be necessary.
6. A steering committee will be established for coordinating the authorities concerned and enhancing effective implementation of the project. The authorities gracefully scheduled to participate are: Departments of Public Works, Agriculture, Agricultural Engineering, Environment, and Rural Development of the State of Tamil Nadu.
7. In view of conducting a site survey in distant areas of the Tamil Nadu State, the portable communication equipment will be provided whenever available under the extended network of Public Works Department.
8. PWD explained the difficulties to provide vehicle because of their limitation of the budget and requested the Japanese side to procure the vehicles. The Japanese side stated that it would convey the request to the Japanese Government.

The Preliminary Study Team, headed by Mr. Tadashi Tsuchiya, for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study") made a visit to India from 29th July, 1996, to discuss the Scope of Work for the Study with authorities concerned of the Government of India.

In connection with the above, a series of discussions was held between the Japanese study team and the authorities concerned of the Government of India/the Government of Tamil Nadu (list of participants attached as Annex I), and both sides came to an agreement and signed the Scope of Work on the 9th of August, 1996.

The salient results of the discussions are as follows:

1. The Study will be conducted in Anna and MGR (former Chengalpattu - MGR district) and Ramanaapuram, Pasumpon Muthuramalinga Thevar and Kamarajar districts (former Ramanaapuram district) with focus on the PWD tanks, based upon explanations by PWD as follows:
 - A. Selection of above five districts
 - a. These five districts account for more than 35% of minor irrigation tanks in the State.
 - b. The command area of tanks in these districts account for more than 43% of the total command area in the State.
 - c. These districts lie in different agro-climatic zones.
 - d. The number of marginal and small farmers forms a high percentage in these districts.
 - B. Focus on PWD tanks

There are three types of minor irrigation tanks in the State of Tamil Nadu, i.e.: Panchayat Union tanks, PWD tanks and Ex-zamin tanks. Some of the minor irrigation tanks are called as "system tanks" because of their nature that they get their supply of water through a system of canals from storage Reservoirs and have assured supply apart from the yield from their own catchments.

The Panchayat Union tanks are under the control of Panchayat Unions with command area less than 40 ha. The Ex-zamin tanks are generally small tanks with limited command area mostly less than 40 ha. The PWD tanks have command area more than 40 ha and supply water to many farmers.
2. With a view to derive maximum benefits from the rehabilitation project, PWD tanks (except

- I Government of India
 - 1 Ministry of Finance
 - (1) Mrs. Rama Murali, Joint Secretary
 - (2) Mr. D. N. Narasimha Raju, Deputy Secretary
 - (3) Mr. G. S. Grewal, Under Secretary
 - 2 Ministry of Water Resources
 - (1) Mr. Rajendra Mishra, Deputy Secretary
- II State Government of Tamil Nadu
 - 1 Department of Public Works
 - (1) Mr. Durai Murugan, Minister
 - (2) Mr. Naresh Gupta, Secretary
 - (3) Mr. M. Kaliperumal, Chief Engineer, for Minor Irrigation
 - (4) Mr. M. Krishnamoorthy, Joint Chief Engineer
 - (5) Mr. S. M. Arasu, Superintending Engineer
 - (6) Mr. T. J. Kisbore Vincent, Executive Engineer
 - (7) Mr. P. Nivasanigamao, Assistant Executive Engineer
 - 2 Others
 - (1) Mr. P. A. Viswanathan, Superintending Engineer, Agricultural Engineering Department
 - (2) Mr. K. Chandrasekhar, Joint Director of Agriculture Department
- III Japanese Side
 - Preparatory Study Team
 - (1) Mr. T. Tsuchiya, Leader
 - (2) Mr. T. Iijima
 - (3) Mr. T. Aoki
 - (4) Mr. T. Kume
 - (5) Ms. M. Yamazaki

DISTRICTWISE LIST OF TANKS IN TAMIL NADU

Sl. No.	Name of District	In Charge of		Public Works Dept.	In-Charge (Total)				
		Area from 20 ha to 49 ha	Area from 50 ha to 100 ha						
1.	Chennai	120	542	178	1202	5	1207	756	3145
2.	North Arcot	1487	602	2884	632	537	1355	422	3125
3.	South Arcot	1213	553	1766	573	184	357	79	2657
4.	Salem	449	100	549	188	-	182	-	732
5.	Dharmapuri	1451	120	1579	98	3	103	354	1834
6.	Coimbatore & Pudukottai	42	22	64	57	7	55	-	123
7.	Thanjavur	338	153	491	5	680	455	-	1176
8.	Pudukottai	4689	725	5414	349	183	330	58	6394
9.	Tiruchy	-	-	-	173	85	258	214	-
10.	Madurai & Anna	3147	245	3391	284	483	771	331	4473
11.	Tamil Nadu - Karaikal, Pondicherry & Madhavaram & Madhavaram	642	691	1333	1378	130	1508	7367	18706
12.	Tamil Nadu - Kattabomman & Coimbatore	406	159	565	283	377	665	445	2086
13.	Tamil Nadu - Tirupattur	1002	12	1014	21	549	934	-	2088
14.	Milgiri	-	-	-	-	-	-	-	-
Total		16477	3736	20413	5776	3627	8703	9825	37207

* Includes tanks having area less than 10 hectares also.

AUSREACT

- 1. Panchayat Union Tanks 20,413
- 2. P.W.D. Tanks 8,993
- 3. District Tanks 9,886
- Total 39,292

Items of Long List

A Name of Tank
 B Tank Circle No. (under H.P.C. scheme)
 C Location:

1. Administrative Unit

District

Taluk

Village

2. Coordinates

Latitude

Longitude

Altitude

3. River Basin

D Climatology

1. Stations of Reference

2. Coordinates *

Latitude

Longitude

Altitude

3. Years of Observations *

4. Average Rainfall *

SW Monsoon

NE Monsoon

Winter period

Hot period

Total

* for each station

E Hydrology

1. Catchment Area

Free Catchment Area

Intercepted Catchment Area

Total

Equivalent Catchment Area

2. Type of Catchment

- 3. Dependable Yield per Area
- 4. Yield
 - From Free Catchment
 - From Intercepted Catchment
 - From Supply Channel
 - Total

F Tank Characteristics

- 1. Full Tank Level
- 2. Maximum Water Level
- 3. Top Bund Level
- 4. Free Board
- 5. Length of Bund
- 6. Height of Bund
- 7. Top Width of Bund
- 8. Side slope: Front X:1
Rear Y:1

9. No. of Fillings

10. Useful Yield

- 11. Live Storage Capacity
- 12. Dead Storage Capacity
- 13. Maximum Depth of Storage

G Surplus Arrangement

- 1. Length of Weir
 - B. C. Calingula Weir
 - Sand Weir
 - Total

- 2. Crest Level
- 3. Maximum Flood Discharge
- 4. Designed Flood Discharge
- 5. Flood Lift

H Head Structures

For each sluice

- 1. Chaise
- 2. Sill Level
- 3. Discharge
- 4. Lining

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J Socio Economics

5. Regulating Arrangement

6. Registered Ayacut

1. Production

- 1. Ayacut
- Irrigable Area
- by Tank Only
- by Tank and Well
- Other Cultivated Area
- Permanent Crop
- Registered Ayacut

- 2. No. of Well for Irrigation Energized
- Common Use
- Individual Use
- Not Energized
- Common Use
- Individual Use
- Total

- 3. Crop Area
- Permanent Crop
- Sugar Cane
- Banana
- Others
- Sub Total
- Seasonal Crop
- 1st Rice
- 2nd Rice
- 3rd Rice
- Cotton
- Pulse
- Miller
- Oil seed
- Others
- Sub Total
- Fallow Area
- Total

- 4. Average Crop Yield
- Permanent Crop
- Sugar Cane
- Banana
- Others
- Seasonal Crop
- 1st Rice*
- 2nd Rice*
- 3rd Rice*
- Cotton
- Pulse
- Miller
- Oil seed
- Others

(* in Husk)

A-15

1. No. of Farmers by Size

- below 1 ha
- between 1 - 2 ha
- above 2ha
- Total
- Average Size

2. No. of Persons Concerned

- Farmers' Family
- Farm Labourers' Family

3. Hamlets

- For each Hamlet
- Name
- No. of Farmers
- No. of Persons
- Male Adult (Work age)
- Female Adult
- Children
- Aged

4. W. U. A.

- Name
- Name of President
- Registered Date

5. Status of On-going Project

- EEC
- DANIDA
- WB

ATTACHMENT - B :

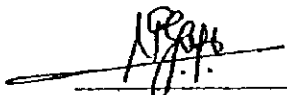
MINUTES OF MEETINGS

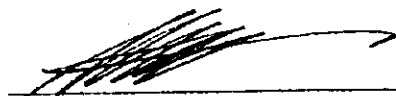
- B-1 : Inception Report*
- B-2 : Progress Report (1)*
- B-3 : Interim Report*
- B-4 : Progress Report (2)*
- B-5 : Draft Final Report*

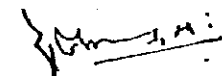


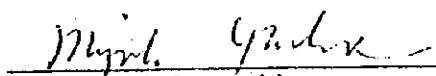
MINUTES OF MEETING
ON
INCEPTION REPORT
FOR
THE STUDY
ON
THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR
RURAL DEVELOPMENT IN TAMIL NADU
BETWEEN
THE MINISTRY OF WATER RESOURCES, GOVERNMENT OF INDIA,
WATER RESOURCES ORGANIZATION,
THE PUBLIC WORKS DEPARTMENT, GOVERNMENT OF TAMIL NADU
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

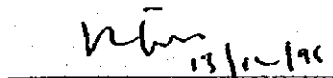
DELHI, 13TH DECEMBER, 1996


Mr. N. P. Gupta
Secretary,
Public Works Department,
Government of Tamil Nadu


Dr. Shoji Kanatsu
Leader,
JICA Study Team


Mr. Rajendra Mishra
Deputy Secretary,
Ministry of Water Resources


Ms. Miyuki Yamazaki
Advisory Team,
JICA


Mr. D.N. Narasimha Raju
Deputy Secretary,
Ministry of Finance,
Department of Economic Affairs

In accordance with the Scope of Work for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Dr. Shoji Kanatsu and the Advisory Team, JICA represented by Ms. Miyuki Yamazaki for the implementation of the Study to India. At the commencement of the Study, the Study Team officially submitted thirty (30) copies of the Inception Report and explained basic concepts, methodology and schedule of the Study in the presence of Indian authority represented by Water Resources Organization of Public Works Department, Government of Tamil Nadu between 9th and 11th December, 1996, at the office of Public Works Department. As a result of explanation and exchange of opinions on the Inception Report, the following points were agreed upon by the Indian side and Japanese side:

1. The Indian side basically agreed upon the contents of the Inception Report that was prepared in due compliance with the conditions set forth in the Scope of Work for the Study.
2. The Indian side agreed upon that the Study Team would proceed to the next stage of the Study in accordance with the methodology and schedule mentioned in the Inception Report.
3. The Indian side agreed upon that the Steering Committee should meet at the required stages of the Study such as explanation session of Progress Reports, Interim Report and Draft Final Report.
4. Both sides agreed to collaborate each other for the efficient implementation of the Study in order to achieve the objectives of the Study accorded in the Scope of Work.
5. Additionally, both parties discussed and confirmed on the following items:

5.1 JICA Study Team explained the importance of the tank inventory list to be


B - 2

prepared by the Indian side and handed to the JICA Study Team at the commencement of the Study, as stated in the Minutes of Meeting for Scope of Work, is yet under preparation by the Indian side, and the Indian side expressed that such list will be completed and handed to the JICA Study Team by the end of December 1996.

5.2 For the extension of technical cooperation and technology transfer during the Study, the Indian side requested the JICA Study Team for the counterpart training in Japan during the period of the Home Office Work of the Study Team in 1997. The JICA Study Team stated that it would convey the request to the Japanese Government.

5.3 The Indian side requested that the database and GIS systems, which will be formulated by the Study Team, will be handed over to the Indian side together with system, computer and peripherals.

5.4 Both parties agreed to prepare the Minutes of Meeting on the Progress Report (1), which will be prepared by the Study Team and discussed with the Indian side at the end of Phase 1 Field Work in India, and to be signed between the Government of Tamil Nadu represented by the Public Works Department and the JICA Study Team in Chennai. It will be reported to the Government of India through JICA India Office in Delhi.

5.5 Both sides agreed that vehicles should be provided by the JICA Study Team.

22

AP





PARTICIPANTS OF THE MEETING

INDIAN SIDE

Ministry of Finance, Government of India

Mr. D.N. Narasimha Raju	Deputy Secretary
Mr. G.S. Grewal	Under Secretary

Ministry of Water Resources, Government of India

Mr. N. Suryanarayan	Commissioner
Mr. Rajendra Mishra	Deputy Secretary

Public Works Department, Government of Tamil Nadu

Mr. Durai Murugan	Minister
Mr. N. P. Gupta	Secretary
Mr. G. Ganapathi Subramanian	Engineer in Chief, Water Resources Organization(WRO)
Mr. R. Syed Badruddin	Chief Engineer
Mr. M. Krishnamoorthy	Joint Chief Engineer
Mr. A. Veerappan	Deputy Chief Engineer
Mr. T.J. Kishore Vincent	Executive Engineer
Mr. N. Vaidyanathan	Executive Engineer
Mr. P. Natanasigamani	Assistant Executive Engineer
Mr. R. Venkatesan	Assistant Executive Engineer

Agriculture Department, Government of Tamil Nadu

Mr. P.A. Ramiah	Director of Agriculture
Mr. K. Chandrudu	Joint Director

JAPANESE SIDE

JICA Study Team

Dr. Shoji Kanatsu	Team Leader
Mr. Keiji Matsumoto	Irrigation and Drainage Engineer
Mr. Soichiro Yumoto	Farmers' Organization and Institution Specialist
Mr. C. Kadirvel	Rural Community Specialist

JICA Advisory Team

Ms. Miyuki Yamazaki	Agriculture, Forestry and Fisheries Development Study Department, JICA
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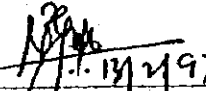
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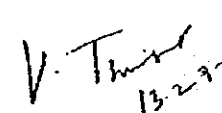


**MINUTES OF MEETING
ON
PROGRESS REPORT (1)
FOR
THE STUDY
ON
THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR
RURAL DEVELOPMENT IN TAMIL NADU
BETWEEN
THE MINISTRY OF WATER RESOURCES, GOVERNMENT OF INDIA,
THE PUBLIC WORKS DEPARTMENT, GOVERNMENT OF TAMIL NADU
AND
JAPAN INTERNATIONAL COOPERATION AGENCY**

Chennai, 13th February, 1997


Dr. Shoji Kanatsu
Team Leader
JICA Study Team


Mr. N.P. Gupta
Secretary,
Public Works Department,
Government of Tamil Nadu


Mr. V. Thirumurthi
Chief Engineer, DRCS, WRO
Public Works Department

In accordance with the Scope of Work for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Dr. Shoji Kanatsu for the implementation of the Study to India since 5th December 1996.

At the end of the field survey of the Phase I Study, the Study Team officially submitted thirty (30) copies of the Progress Report (1) and explained its contents with an emphasis laid on the results of data collection and their review, present conditions of the Study Area, the basic concepts for Master Plan, candidate scheme for the Feasibility Study, etc. at the presence of Indian authority represented by the Public Works Department of Tamil Nadu State on 10th and 12th February, 1997. At the office of Public Works Department.

As a result of explanation and exchange of opinions on the Report, the following points were agreed upon by the Indian side and Japanese side:

1. The Indian side confirmed that the Progress Report (1) was prepared in due compliance with the conditions and methodology set forth in the Inception Report for the Study except categorization of tanks, which is studied tentatively based on the available data in this Stage because of the delay of Tank Inventory List completion by PWD.
2. The basic concepts for the Master Plan of the Project presented in the Report have been good correlation with the results of the diagnosis and analysis of the prevailing potentials and constraints in the Study Area. The detailed review on the Report will made by the Indian side and comments will be send to the Study Team by 10th March, 1997, if any.
3. The Indian side requested the study on the conjunctive use of water sources in the chained tanks basin within the Study.
4. The Indian side explained the difficulty to prepare the suitable office spaces/facilities for the Study Team. The Study Team answered that these requests will be conveyed to the Government of Japan.
5. The Indian side agreed upon that the Study Team would proceed to the next stage of the Study including the analysis and categorization of tanks, in accordance with the methodology and schedule mentioned in the Inception Report.

[Signature]
1.13/1997

V. T.
13/2/97

PARTICIPANTS OF THE MEETING

INDIAN SIDE

Public Works Department, Government of Tamil Nadu

Mr. N.P Gupta

Mr. V. Thirumurthi

Mr. M. Krishnamoorthy

Mr. P. Natanasigamani

Secretary

Chief Engineer for Design, Research and Construction Support (DRCS), Water Resources Organization (WRO)

Joint Chief Engineer, DRCS-WRO

Assistant Executive Engineer

JAPANESE SIDE

JICA Study Team

Dr. Shoji Kanatsu

Mr. Keiji Matsumoto

Mr. Souichiro Yumoto

Mr. C. Kadirvel

Dr. Michio Nozaki

Mr. Daigo Yano

Mr. Abo Abe

Team Leader

Irrigation and Drainage Engineer

Farmers' Organization and Institution Specialist

Rural Community Specialist

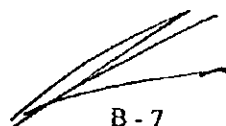
Agriculture and Agricultural Extension

Facility Design/Cost Estimate

Agro-economy/Project Evaluation




V Thir
13.2.17




MINUTES OF MEETING
ON
INTERIM REPORT
FOR
THE STUDY
ON
THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR
RURAL DEVELOPMENT IN TAMIL NADU
BETWEEN
THE PUBLIC WORKS DEPARTMENT, GOVERNMENT OF TAMIL NADU
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

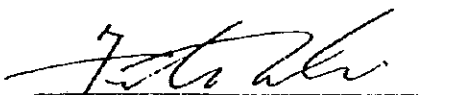
Chennai, 16th May, 1997



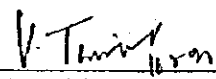
Dr. Shoji Kanatsu
Team Leader
JICA Study Team



Mr. N.R. Gupta
Secretary
Public Works Department
Government of Tamil Nadu



Ms. Fumiko Nakai
Advisory Team
JICA



Mr. V. Thirumurthi
Chief Engineer
Design, Research and Construction
Support, Public Works Department
Government of Tamil Nadu

- 1 -

In accordance with the Scope of Work for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Dr. Shoji Kanatsu for the implementation of the Study to India

At the beginning of the field survey of the Phase 2 Study, the Study Team officially submitted thirty (30) copies of the Interim Report and explained its contents with an emphasis on the basic concepts for the Master Plan of Rehabilitation of Minor Irrigation Tanks, candidate scheme for the Feasibility Study, and work items and schedule of field survey in Phase 2 Study at the presence of Indian authority represented by the Public Works Department of Tamil Nadu State (PWD), from 12th to 16th May, 1997, at the office of Public Works Department.

The following points were discussed by the Indian side and the Japanese side:

1. The Indian side examined the contents of the Interim Report and made the following observations.
 - (1) The Indian side desired that the project area should cover the entire State of Tamil Nadu and should not be confined to the study area only. The Indian side also informed that the study area need not be changed for this purpose.
 - (2) The Indian side did not agree with the implementation procedures indicated in page S-38 of the Interim Report. The Indian side informed that sufficient technical expertise and manpower are available within the PWD, Tamil Nadu for the items of works indicated therein particularly on preparation of the estimates, preparation of tender documents and implementation of the Project. Hence, there is no need to employ consultants for this purpose.
2. On the above comments from the Indian side, the Japanese side responded as follows:
 - (1) The Japanese side emphasized that such request goes beyond the Scope of Work, which was previously agreed by the both sides, and hence can not be accepted. As mentioned in the Inception Report, it is the responsibility of the Indian side to formulate the projects in such areas outside the Study Area.
 - (2) The Japanese side agreed that the further discussion should be held in the course of Phase 2 Study on the best and practical implementation method of the Project, especially on the employment of consultants for technical services wherever the required expertise is not available in the department.
3. In response to the comment 2(1), the Indian side, however suggested that even without any modification to the Study Area, the project area could be much larger due to its agro-climatic similarity. There should also therefore be no delay in the implementation of the Project.

V. Thiruv
11/21



B - 9



The Japanese side indicated that it is clear from the Inception Report that tanks located outside the Study Area are not covered by the Study. The Japanese side reiterated that the study for such tanks should be carried out by the Indian side based on the methodology applied to the Study.

4. The Indian side agreed that the basic concepts for the Master Plan of the Project for rehabilitation of minor irrigation tanks (the Project) presented in the Interim Report have been in good correlation with the results of the diagnosis and analysis of the prevailing potentials and constraints in the Study Area.
5. Both sides agreed that the JICA Team would train the counterpart Indian staff and permit the PWD to use their computer systems and software for preparing the master plan in the areas outside the Study Area.
6. It was agreed by the both sides that the feasibility studies shall be conducted for the following pilot tanks:

Northern Study Area			
Catg.	Name of Tank	District	Taluk
NR-1	Kilambakkam	Anna	Chengalpattu
NR-2	(to be decided later)		
NR-2	Polampakkam	Anna	Madurantakam
NR-3	Enaduri Periyaeri	Anna	Kanchipuram
NR-4	Vadakkapattu	Anna	Sriperumbudur
Southern Study Area			
Catg.	Name of Tank	District	Taluk
SR-1	Siruvile	Pasumpon	Sivaganga
SP-1	Kurumbi	Pasumpon	Karaikudi
SP-2	Ramalingapuram	Kamarajar	Sattur
SP-3	Sankankulam	Pasumpon	Manamadurai
SP-4	Pandikanmoi	Ramanathapuram	Paramakudi

7. The Indian side agreed that the Study Team would proceed to the next stage of the Study in accordance with the methodology and schedule as mentioned in the Interim Report.
8. The Indian side assured that the proposed candidate for the counterpart training to be held in Japan shall work closely with the Study Team members during the Phase 2 field survey in order to gain a good understanding of the Study.
9. The Indian side agreed that it shall secure an appropriate office space as discussed in which the Study Team will work throughout the Phase 2 field survey.
10. The Tank Inventory List which was submitted to the Study Team during the discussion of the Interim Report shall be examined by the Study Team, and the Indian Side agreed to make corrections and modifications, if necessary.
11. The Indian side reiterated the request to hand over the computer and software used for the study to PWD to continue the analyses, which was recorded in the Minutes of Meeting on the Inception Report. The Japanese side informed that such request should be made formally in writing to JICA.

V. Thiruv
10/11/91

PARTICIPANTS OF THE MEETING

INDIAN SIDE

Public Works Department, Government of Tamil Nadu

Mr. Durai Murugan	Minister
Mr. N.P Gupta	Secretary
Mr. V. Thirumurthi	Chief Engineer for Design, Research and Construction Support (DRCS), Water Resources Organization (WRO)
Mr. M. Krishnamoorthy	Joint Chief Engineer, DRCS-WRO
Mr. K. Balakrishnan	Assistant Executive Engineer

JAPANESE SIDE

JICA Study Team

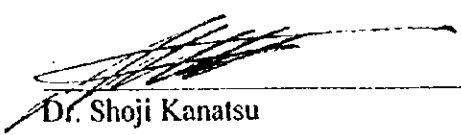
Dr. Shoji Kanatsu	Team Leader
Mr. Keiji Matsumoto	Irrigation and Drainage Engineer
Mr. Souichiro Yumoto	Farmers' Organization and Institution Specialist
Mr. C. Kadirvel	Rural Community Specialist
Dr. Michio Nozaki	Agriculture and Agricultural Extension Specialist
Mr. Daigo Yano	Facility Design and Cost Estimate
Dr. V. Anbumozhi	Hydrologist


JICA Advisory Team


Ms. Fumiko Nakai	Agriculture, Forestry and Fisheries Development Study Department, JICA
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MINUTES OF MEETING
ON
PROGRESS REPORT (2)
FOR
THE STUDY
ON
THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR
RURAL DEVELOPMENT IN TAMIL NADU
BETWEEN
THE MINISTRY OF WATER RESOURCES, GOVERNMENT OF INDIA,
THE PUBLIC WORKS DEPARTMENT, GOVERNMENT OF TAMIL NADU
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Chennai, 23rd July, 1997


Dr. Shoji Kanatsu
Team Leader
JICA Study Team


Mr. N.P. Gupta
Secretary,
Public Works Department,
Government of Tamil Nadu

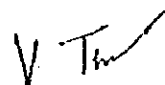

Mr. V. Thirumurthi
Chief Engineer, DRCS, WRO
Public Works Department

In accordance with the Scope of Work for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Dr. Shoji Kanatsu for the implementation of the Phase Two Study to India since 8th May 1997.

At the end of the field survey of the Phase 2 Study, the Study Team officially submitted thirty (30) copies of the Progress Report (2) and explained its contents with an emphasis laid on the results of data collection and their review, present conditions of the Pilot Tank Areas for the feasibility study, the basic concepts for implementation, etc. at the presence of Indian authority represented by the Public Works Department of Tamil Nadu State on 21st and 22nd July 1997 at the office of Public Works Department.

As a result of explanation and exchange of opinions on the Report, the following points were agreed upon by the Indian side and Japanese side:

1. The Indian side confirmed that the Progress Report (2) was prepared in due compliance with the conditions and methodology set forth in the Inception Report for the Study.
2. The basic concepts for the rehabilitation plan of 10 pilot tanks for the feasibility study presented in the Report have been in good correlation with the results of the diagnosis and analysis of the prevailing potentials and constraints in the Study Area. The Indian side will study the Progress Report (2) and will send the observations in the Report by 20th August 1997 so that they can be incorporated in the Draft Final Report.
3. The Indian side agreed upon that the Study Team would proceed to the next stage of the Study, in accordance with the methodology and schedule mentioned in the Inception Report.



PARTICIPANTS OF THE MEETING

INDIAN SIDE

Public Works Department, Government of Tamil Nadu

Mr. N.P Gupta	Secretary
Mr. V. Thirumurthi	Chief Engineer for Design, Research and Construction Support (DRCS), Water Resources Organization (WRO)
Mr. M. Narasimhan	Joint Chief Engineer (I/C), DRCS, WRD
Mr. N. Vaidyanathan	Executive Engineer, Madurai
Mr. K. Balakrishnan	Assistant Executive Engineer, Counterpart
Mr. P. Natanasigamani	Assistant Executive Engineer
Mr. T. Sundara Raj	Assistant Executive Engineer

JAPANESE SIDE

JICA Study Team

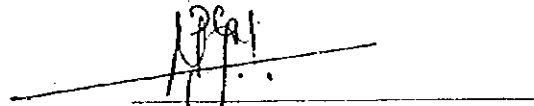
Dr. S. Kanatsu	Team Leader
Mr. K. Matsumoto	Irrigation and Drainage Engineer
Mr. S. Yumoto	Farmers' Organization and Institution Specialist
Mr. C. Kadirvel	Rural Community Specialist
Dr. M. Nozaki	Agriculture and Extension Specialist
Mr. D. Yano	Facility Design Engineer
Mr. B. Abe	Agro-economist
Mr. S. Hosono	Environment Specialist
Mr. F. Ukaji	Dam and Foundation Engineer
Dr. V. Anbumozhi	Hydrologist

MINUTES OF MEETING
ON
DRAFT FINAL REPORT
FOR
THE STUDY
ON
THE REHABILITATION OF MINOR IRRIGATION TANKS
FOR
RURAL DEVELOPMENT IN TAMIL NADU
BETWEEN
MINISTRY OF WATER RESOURCES, GOVERNMENT OF INDIA
AND
THE PUBLIC WORKS DEPARTMENT, GOVERNMENT OF TAMIL NADU
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

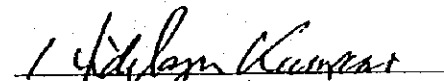
Delhi, 1st October, 1997



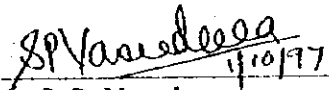
Dr. Shoji Kanatsu
Team Leader
JICA Study Team



Mr. N.P. Gupta
Secretary,
Public Works Department,
Government of Tamil Nadu



Mr. Hidekazu Kumano
Resident Representative,
JICA India Office



Mr. S. P. Vasudeva
Director,
Ministry of Water Resources



Mrs Rama Murali,
Joint Secretary
Department of Economic Affairs
Ministry of Finance

In accordance with the Scope of Work for the Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu (hereinafter referred to as "the Study"), the Government of Japan dispatched through Japan International Cooperation Agency (JICA) the Study Team headed by Dr. Shoji Kanatsu for the implementation of the Study to India.

As a result of the Study, the Study Team officially submitted thirty (30) copies of the Draft Final Report on the Study (hereinafter referred to as "the Report") and explained its contents with an emphasis laid on the economic and financial feasibility of the Project schemes as well as the justification of overall project in the presence of Indian authority represented by the Public Works Department (PWD) of Tamil Nadu State from 24th to 29th September 1997 at the office of the PWD and from 30th September to 1st October, 1997 at the office of the Department of Economic Affairs, Ministry of Finance, Government of India.

The following points were agreed upon by the Indian and the Japanese sides.

1. The Indian side confirmed that the contents of the Report were prepared in due compliance with the conditions and methodology set forth in the Inception Report.
2. Regarding the roles of consultants during the Project implementation, the representatives of the Government of Tamil Nadu stated that:
 - i) The GOTN had adequate technical capability and manpower to execute the project. Consultancy is not required for social screening and determination of requirement of community organizers; detailed design and preparation of tender documents; tendering civil works under NCB/LCB; supervision of construction; and final inspection.
 - ii) They were prepared to consider a consultancy fee of upto 1% of the project cost for assisting in various facets of the project.

The Japanese side stated that:

- i) The project covered a large number of tanks and it would be very difficult to monitor the progress of implementation unless a database system was established. For this, assistance from a consultant was desirable.
- ii) The consultant would assist only peripherally in technical issues if desired by the GOTN.
- iii) The consultancy fee could be reduced.

Both parties agreed that these issues needed to be carefully analyzed at the time of the project appraisal by the funding agency before a final view was taken.

3. GOTN wished to implement the Project in two (2) phases within a span of 10 years instead of in three (3) phases within a span of 13 years, as stated in the Report. The Japanese side has agreed to consider this point, if there is a strong evidence that the PWD posses enough human resources capability, technical expertise and project management skills to complete the Project within the limited time period without

 B - 16

affecting the quality of the works. DEA pointed out that under all circumstances, any case, the project implementation period could not exceed five years. GOTN stated that in such a case, they would like to pose the balance part of the project as a second phase.

4. Both sides agreed that the community organizers are the important component of operation and maintenance of the tank irrigation system and hence community organizers should be employed by the PWD to motivate the farmers for their active involvement in the operation and maintenance of the rehabilitated tanks.
5. Both sides agreed to combine the cost estimates for the components of the selective lining and on-farm development into one (1) category without change in the total cost estimate. The Japanese side also replied that, even though the PWD has the technical capability to take up the on-farm development works for 10 ha or below, the other government agencies which have long time experience and expertise should also be asked to participate in these kinds of works.
6. GOTN representatives pointed out that two components of the project as mentioned in the report need not be included in the project. These were:
 - i) The component for community well construction in the command area. GOTN felt that their past unsuccessful experience in this did not justify inclusion of this component.
 - ii) The component for the community building construction need not be included in this project as it was proposed to be separately constructed under the aegis of the Rural Development department.

The Japanese Side felt that:
 - i) The community well construction component was essential in the Southern Study Area.
 - ii) The community building was essential, but they had no objection if it's construction was sponsored by the Department of Rural Development.
7. It has been agreed by the both sides that based on the experience gained the guidelines evolved in the feasibility report can be extended to cover other districts of Tamil Nadu state for the future projects.
8. In general, the project proposed in the Report accurately reflected the prevailing potentials and constraints in the Study Area. The detailed review on the Report will be made by the Indian side and the comments, if any will be sent to the Study Team by October 20, 1997.
9. The Study Team will modify and/or correct the Report based on the above comments, if necessary and send the Final Report to PWD through the JICA headquarters Office in Tokyo within one (1) month after receiving the said comments from the Indian side.

B - 17

LIST OF PERSONS WITH WHOM DISCUSSIONS WERE HELD

INDIAN SIDE

Ministry of Finance (Government of India)

Mrs. Rama Murali	Joint-Secretary
Mr. V. Bhaskar	Director

Ministry of Water Resources (Government of India)

Mr. S. P. Vasudeva	Director
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Public Works Department, Government of Tamil Nadu

Mr. N.P Gupta	Secretary
Mr. G Ganapathi Subramanian	Engineer-in-Chief
Mr. V. Thirumurthi	Chief Engineer for Design, Research and Construction Support (DRCS), Water Resources Organization (WRO)
Mr. A. Veerappan	Executive Engineer
Mr. P. Natanashigamani	Assistant Executive Engineer

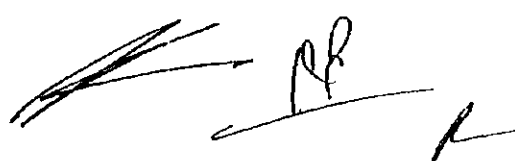
JAPANESE SIDE

JICA Study Team

Dr. Shoji Kanatsu	Team Leader
Mr. Keiji Matsumoto	Irrigation and Drainage Engineer
Mr. Souichiro Yumoto	Farmers' Organization and Institution Specialist
Dr. V. Anbumozhi	Hydrologist

JICA India Office

Mr. Hidekazu Kumano	Resident Representative
Mr. Tsutomu Shimizu	Assistant Resident Representative



ATTACHMENT C :

STUDY TEAM MEMBERS AND COUNTERPARTS

STUDY TEAM MEMBERS AND COUNTERPARTS

as of May 1997

Assignment	Study Team	Counterpart
Team Leader	S. Kanatsu	N. Vaidyanathan (Executive Engineer, Madurai)
Irrigation & Drainage	K. Matsumoto	K. Balakrishnan* (Assistant Executive Eng., Vellore)
Farmers' Organization & Institution	S. Yumoto	P. Natanasigamani (Assistant Executive Eng., PMU)
Rural Sociology & Farmers Support	C. Kadirvel	N. Dayanandam (Sociologist, PMU)
Agriculture & Agricultural Supporting	M. Nozaki	I. Durairaj (Department of Agriculture)
Facility Design & Cost Estimate	D.Yano	V.N. Ganesan (Assistant Engineer, DR&CS)
Agro-economy & Project Evaluation	B. Abe	A. Krishnamoorthy (Agro-economist, PMU)
Environment	S. Hosono	S. Dhanasekaran (Project Formulation, WRO)
Top. Survey Supervisor	O. Nogoshi	R. Soundararajan(DR&CS)
Dam/Soil Mechanic	F. Ukaji	A. Pragadeeswaran(DR&CS)
Hydrology	V. Anbumozhi	S. S. Chellapar(DR&CS)

Notes: * full time counterpart, PMU:Tank Modernization Project Monitoring Unit, WRO: Water Resources Organization-PWD, DR&CS:Design and Research and Construction Support-WRO-PWD

STEERING COMMITTEE OF TAMIL NADU STATE GOVERNMENT FOR THE STUDY

(Government Order G.O. MS. No.5, dated January 6, 1997)

	Position & Office	Name
1	Chairman Secretary to Government, PWD	Mr. N.P.Guputa
2	Member/ Secretary Chief Engineer (DRCS-WRO),PWD	Mr. V.Thirumurthi
3	Member Secretary to Government, Environment and Forest Department	Mr. K.Sripathi
4	Member Secretary to Government, Rural Development Department	
5	Member Secretary to Government, Agricultural Department	
6	Member Director of Agriculture, Agriculture Department	Dr. Arulmozhi
7	Member Chief Engineer (Agricultural Engineering), Agricultural Engineering Department	Mr. N.Rajarathinam

ATTACHMENT - D :

LIST OF PERSONS CONTACTED



List of Persons Contacted

1. Central Government

1.1 Department of Economic Affairs, Ministry of Finance

Mrs. Rama Murali	Joint Secretary
Mr. D.N. Narasimha Raju	Deputy Secretary
Mr. G.S. Grewal	Under Secretary

1.2 Ministry of Water Resources

Mr. N. Suryanarayan	Commissioner
Mr. Rajendra Mishra	Deputy Secretary (upto June 1997)
Mr. S.P. Vasudeva	Director(since August 1997)

2. Tamil Nadu State Government

2.1 Public Works Department : PWD

2.1.1 Chennai Head Office

[Secretariat]

Mr. Durai Murugan	Minister
Mr. N.P. Guputa	Secretary to Government, PWD

[Chepauk]

Mr. G. Subramanian	Engineer in Chief, Water Resources Organization (WRO), PWD
Mr. R. Syed Badruddin	Chief Engineer, Design, Research and Construction Support (DRCS)-WRO, PWD (upto December 1996)
Mr. V. Thirumurthi	Chief Engineer, DRCS-WRO, PWD (since January 1997)
Mr. Krishnamoorthy	Joint Chief Engineer, DRCS-WRO, PWD (upto May 1997)
Mr. A. Veerappan	Deputy Chief Engineer, DRCS-WRO, PWD
Mr. Natanasigamani	Assistant Executive Engineer, DRCS-WRO, PWD
Mr. T. Sundara Raj	Assistant Executive Engineer, DRCS-WRO, PWD
Mr. N. Dayanandam	Rural Sociologist
Mr. A. Krishnamoorthy	Agricultural Economist

2.1.2 Tank Modernization Vellore Circle

Mr. S.M. Arasu	Superintending Engineer, Vellore Circle
Mr. T.J. Kishore Vincent	Executive Engineer, Chennai Division
Mr. K. Balakrishnan	Assistant Executive Engineer, Vellore Division

2.1.3 Tank Modernization Trichy Circle

Mr. Ramaiyan	Superintending Engineer, Trichy Circle
Mr. Vaidyanathan	Executive Engineer, Madurai Division
Mr. K. Muthusamy	Executive Engineer, Palamakudi Division
Mr. A. Ganesan	Assistant Executive Engineer, Kamudhi Sub-division
Mr. M.C. Raju	Assistant Executive Engineer, Sivagangai Sub-division

2.1.4 Institute for Water Studies (IWS)

Mr. D. Chengalvarayan	Director of IWS
-----------------------	-----------------

2.1.5 Institute of Hydraulics and Hydrology (IHII)

Mr. A. Veerasamy Deputy Director

2.2 Department of Agriculture

[Head Office, Chepauk]

Mr. P.A. Ramiah Director of Agriculture (upto March 1997)

Dr. Arulmozhi Director of Agriculture (since April 1997)

Mr. K. Chandrudu Joint Director

Mr. M. Malik Feroz Khan Deputy Secretary

[Southern Study Area]

Mr. S. Shanmugam Joint Director, Sivagangai

Mr. R. Guousany Joint Director, Virudunagar

Mr. V. Krishnamurthy Joint Director, Ramanathapuram

Mr. C. Chockappa Deputy Director, Sivagangai

Mr. N. Thillainathan Deputy Director, Sivagangai

Mr. A. Thangaraj Deputy Director, Sivagangai

Mr. R. Ramasamy Pardian Agriculture Officer, Ramanathapuram

2.3 Agricultural Engineering Department

Mr. N. Rajarathinam Chief Engineer, River Valley Project

2.4 Environment and Forest Department

Mr. K. Sripathi Secretary

2.4 Rural Development Department

Mr. K. Devamurthi Deputy Secretary

3. Other Organization

3.1 Agricultural University of Tamil Nadu

Dr. Palanisamy Professor, Water Technology Center

3.2 Center for Water Resources & Ocean Management, Anna University

Dr. N.V. Pundarikanthan Director

3.3 Professional Assistance for Development Action (PRADAN)

Dr. M.P. Vasimalai Programme Director

Prf. C.R. Shanmugam Programme Director

Mr. R. Seenivasan Team Leader, Tank Programme

4. Government of Japan

4.1 Embassy of Japan

Mr. R. Kawakami Counsellor

Mr. M. Fukushima First Secretary (upto March 1997)

Mr. J. Taniuchi First Secretary (Since April 1997))

4.2 Consulate-General of Japan in Chennai

Mr. Y. Kaku Consul General

Mr. K. Ibara Consul

Mr. H. Okamoto

Vice - Consul

4.3 JICA India Office

Mr. H. Kumano

Mr. T. Tanaka

Mr. T. Shimizu

Resident Representative

Deputy Resident Representative

Assistant Resident Representative

4.5 OECF NewDelhi Office

Mr. R. Fuwa

Mr. H. Suzuki

Mr. N. Takesada

Mr. S. Hara

Mr. E. Natarajan

Chief Representative

Senior Representative

Representative

Representative

Project Officer

