

4. TERMS OF REFERENCE FOR FIELD SURVEYS

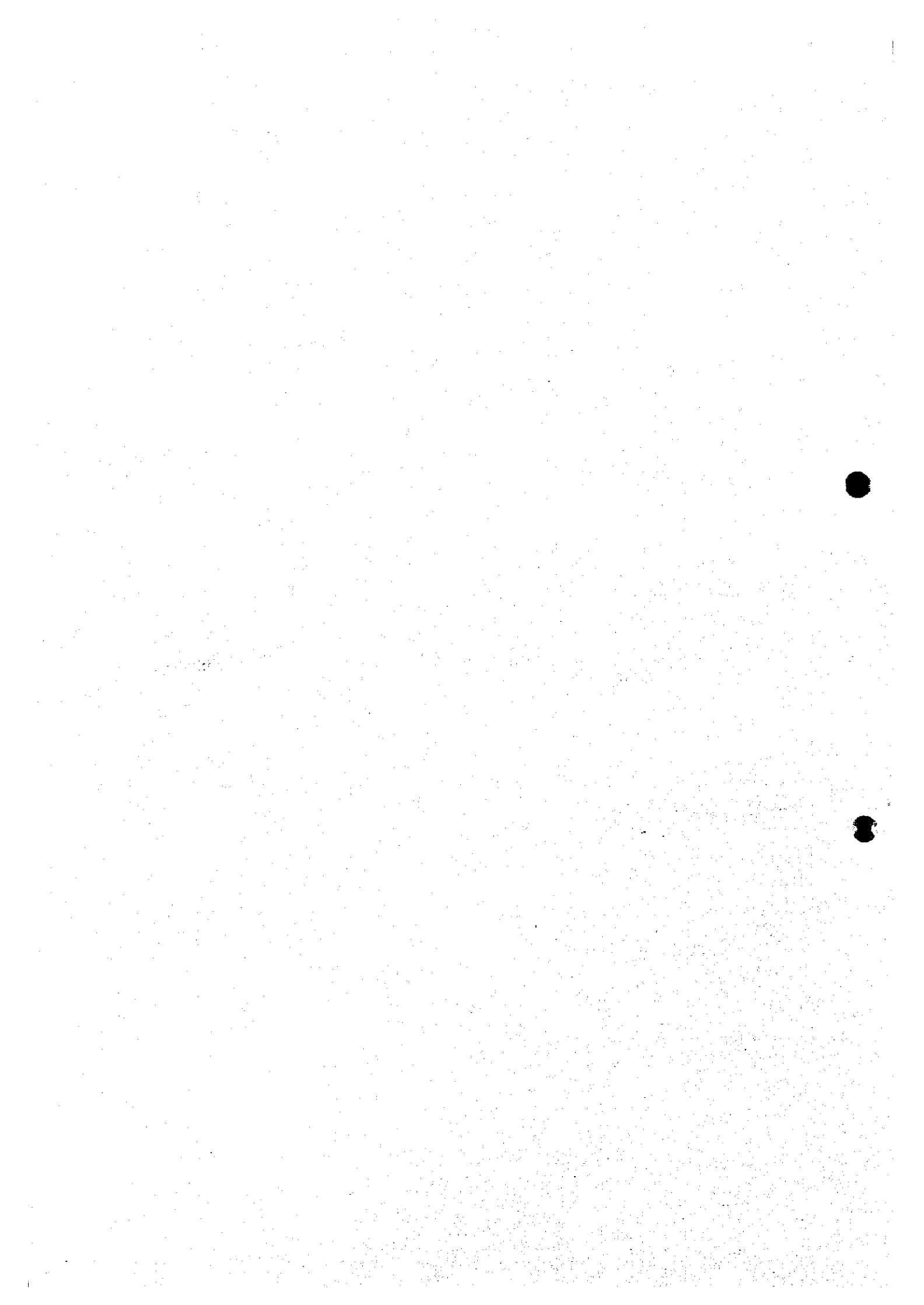
4.1 SOCIAL ENVIRONMENTAL SURVEY

4.2 FARM HOUSEHOLD ECONOMY SURVEY

4.3 TEST BORING AND HYDROGEOLOGICAL INVESTIGATIONS

4.4 TOPOGRAPHIC SURVEY

4.1 SOCIAL ENVIRONMENTAL SURVEY



TERMS OF REFERENCE

1. Objective

The objective of this social environment survey is to assist in formulating a social environment study for "The Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu". The survey works are grouped into the following two (2) categories.

- Rural Community Survey
- Farmers' Organization Survey

2. Survey Area

240 villages of which names will be given by the JICA Study Team prior to commencing the survey works shall be surveyed by the Surveyor using the questionnaire attached hereto. The villages given by the JICA Study Team will be scattered in the following five (5) districts in the Tamil Nadu state.

- Chengalpattu MGR district
- Anna district
- Pasumpon Muthuramalinga Thevar district
- Kamarajar district
- Ramanathapuram district

3. Survey Works

The required survey works are described below.

(1) Rural Community Survey

- 1) To collect the data and information in the following aspects by interviewing influential persons of Hamlet such as government officers village president, village administrative officer in accordance with the questionnaire provided by the JICA Study Team.

(A) Institution and Customs

- Present situation in land tenure and land use
- Farming practices
- Rights of the use of water
- Fishing rights in the farm pond
- Rights of common land use
- Present situation of employment in the village
- Social security and social welfare

- Organization of the village administrative office
- Kinds of national taxes, local taxes and other taxes paid by farmers

(B) Social Condition of Village

- Rural infrastructures (laying down in a map)
- Farmers' housing situation
- Support activities for farmers
- Present state of rural community in village
- Family size and standard of living
- Population

(C) Present Social Problems and Administrative Action

- Present administrative and social constraints encountered in the village
- Policy on activation of agriculture and rural community
- Expectation for government

(D) Others

- 2) To collect the data and information in the following aspects by interviewing selected five (5) marginal farmers to grasp their intentions in accordance with the questionnaire provided by the JICA Study Team.

- Name, address, etc. of the interviewed farmer
- Present situation of family
- Farmer's intention
- Constraints encountered by the family
- Expectation for the government
- Expectation of the tank rehabilitation
- Others

(2) Farmers' Organization Survey

To collect the data and information in the following aspects by interviewing influential persons of village such as government officers village president, village administrative officer in accordance with the questionnaire provided by the JICA Study Team.

- Available farmers' organization
- Water Users' association
- Agricultural cooperatives
- Other farmers' organizations

In addition to the above, the following items of works shall be carried out by the Surveyor in consultation

with the JICA Study Team.

- (1) To arrange and compile the above-collected data and information in the forms suitable and usable for the further analyses and investigation on the social environmental study.
- (2) To summarize the arranged data and information, and compile a report which presents all the data and information collected. All the expression in the report shall be of a typed format in English.
- (3) To investigate and analyze the arranged data and information in order to grasp and clarify the exact situation and tendency of the rural communities such as constraints, problems, intentions, etc. putting emphases on the marginal farmers' situations.

(Rural community: India)

Questionnaire for Government Officers in the Study Area (Draft)
(for Village Administrative Officer, Village President or Influential Persons of each Village)

A. Institution and customs

1. Present situation in land tenure and land use

1) Area of each land use and land tenure

Land use	Total area	Public area	Land tenure in private area				
			State property	Private property			
				Individual	Company	x	Common
Paddy land							
Upland							
Grass land							
Orchard							
x							
Agricultural total							
Forest							
Water (pond etc.)							
Roads							
Buildings							
Others(unproductive)							
Non-agricultural total							
Total village							

2) Prices of buying and selling farm lands

3) Brief explanation of laws and ordinances and customs on inheritance of land in the study area

4) Brief explanation of the history of agrarian reform in village

5) Acreage of farm land and number of households by types of land ownership in each village

Type: large landowners (including absentee landowners), other landowners, tenant

2. Farming practices

1) Direct sowing or transplanting ?

2) Rice varieties, growing period, sharing rate of each variety

3) General cropping calendar

4) Land preparation by man power, draft animals or machinery ?

5) Role women in farming activities

6) Use of fertilizer and chemicals (general method)

7) How to mill paddy ?

8) How to store paddy ?

9) To whom to sell paddy surplus (local market, government agency, other channels) ?

3. The rights of the use of water and manner of water distribution

Brief explanation on the rights, inheritance of the rights

4. Leadership of water management

5. The fishing rights in the farm pond

Brief explanation on the rights, inheritance of the rights

6. The rights of common land use

Brief explanation on the rights, inheritance of the rights

7. Present situation of employment in the village

- 1) Rate of unemployed persons for working population
- 2) Unemployment insurance
- 3) Kinds of pensions, amount of each pension and number of recipients of the pension

8. Social security and social welfare

- 1) Kinds of social security system
e.g. Medical insurance, aid with government, etc.
- 2) Kinds of social welfare system, their facilities in the study area and the results of use
e.g. The aged welfare, the disabled persons welfare, mental welfare, etc.

9. Organization of the village administrative office

- 1) Organizational structure (chart)
- 2) Staffing (total number, number of each section)
- 3) Responsibilities and duties of the chairman
- 4) How to elect the chairman ?
- 5) Annual budget
- 6) Present administrative and sociological constraints encountered in your village.
 - (1) Are there any conflicts among the tribes, religions or classes of caste in your village ?
 - (2) Other constraints if any ?
 - (3) Who and how to solve such constraints and conflicts if any ?
 - (4) If these constraints and conflicts could not be solved by the chairman, whom do you contact ?
 - (5) What is the socio-administrative matter that the chairman has severely got into trouble at present ?

10. Kinds of national taxes, local taxes and other taxes paid by farmers

11. Maintenance of irrigation facilities

B. Social condition of village

1. Rural infrastructures (laying down in a map)

- 1) Roads (road system, width, pavement, traffic, etc.)
- 2) Facilities of transport and marketing of agricultural products
e.g. Processing facilities, cereal storehouse, markets, etc.
- 3) Post offices, telegraph and telephone offices; number of telephone sets and telephone circuits, telephone charges
- 4) Network of electric supply, agencies of electric supply, amount used electricity and electric fees
- 5) Range of water services, agencies of water supply, capacity of water works, source of water supply and water qualities
- 6) Sewer system and range of sewage services, agencies of the services, capacity of treatment

- 7) Number of schools, number of class rooms, number of pupils and teachers in each school
- 8) Number of medical institutions (public and private), number of beds and doctors in each institution (including primary health care center and Ayurveda)
- 9) Number of dumps for refuse
- 10) Number of stores by type
- 11) Distance from urban area (km)

2. Farmers' housing situation

3. Support activities for farmers

1) Agricultural credit

Kinds, terms for borrowing, results in 1996

2) Agricultural extension works

Kinds of extension activities, organization of extension works

3) Government grant-in-aids for farming and farmers

e.g. For buying farm machinery, farm land and farming materials, for building granary, processing facilities and market and for livelihood improvement

4. Present state of rural community in village

1) Official and customary methods of communication from village to villagers and methods of reflecting the villagers' opinions to the village

2) Races and caste groups in village (including the minority races) and religions of villagers

3) Standard of education in village

% of persons who were not received compulsory education, receiving or received compulsory education and receiving or received higher education

4) Habitual mutual aids in rural community

(1) Obligations to maintain the social conditions in village

e.g. Repairing roads, labor services to irrigation canals, obligations to traditional festivals and religious ceremonies

(2) Mutual aids of villagers

e.g. In case of building houses, funeral, marriage, childbirth, no cash to buy something and food and meals, etc.

5. Family size and standard of living

1) Number of households by family size in village

2) Number of farm households by family size in village

3) Role of grown-up men and women in the typical farm household

Legal history of the position and role of women (woman's suffrage, equality of engagement opportunity, equality of wages between sexes, inheritance of property by system of equal division among all children or inheritance to the eldest son, marriage by understanding between marital partners, etc.) and rural customs on the position and role of women

4) % of farm households having farming successors

5) Daily working hours in farming in each season by sexes

6) Eating habits in village

Breakfast, lunch and supper

7) Standard of living in village

(1) % of food and drink expenses for whole living expenditure

(2) Spread rate of radios, black-and-white televisions, color televisions, electric washing machines, electric refrigerators, air conditioners, motorcycles, trucks and motorcars in village

(3) Decision-maker in typical family

Property management and inheritance, domestic account, occupations of family members,

- School attendance, attendance to village's meeting, mutual aids in community and divorce
- 8) Energy sources in typical farm households
 - Lighting, cooking, heating and air conditioning
- 9) Source of drinking water in farm households
 - Tap water, deep well, shallow well, river, etc.
 - Quality and quantity of drinking water in each source
- 10) Type of toilets in farm households
 - % of flush toilet, toilet dipping up night soil, toilet dug only a hole in the ground, etc.
- 11) Illness attacked seriously villagers and problems of the medical facilities in village

6. Population

- 1) Population by age and caste and working population by industries in village
- 2) Number of Hamlet in village and population of each Hamlet
- 3) Number of farm households and working population
 - Full-time farm households
 - Part-time farm households
 - Mainly engaging in farm
 - Engaging in other jobs than farming
 - Tenant farmers

7. Frequency of conflicts and settlement

C. Present social problems and administrative action

- 1. Present administrative and social constraints encountered in village
- 2. Policy on activation of agriculture and rural community

- 1) At present and in near future
- 2) As long-term plan
- 3) Policy after construction of irrigation facilities by the study
- 4) How do you think the influence of construction of irrigation facilities by this study on rural community ?

(1) Influence for social life

- 1. For farmers' life
- 2. For population in the study area
- 3. Change of farmers' economical activities
- 4. Change of system and customs in rural community

(2) Influence on health and sanitation of farmers in the study area

- 1. Increase of quantity of farm chemicals used and accumulation of residual toxicity
- 2. Spreading endemic diseases and diseases by irrigation
- 3. Spreading infectious diseases
- 4. Influence on quality and quantity of drinking water
- 5. Accelerating pollution with excrement of livestock for groundwater by irrigation
- 6. Increase of wastes and residues with farming production and disposal measures of them

3. Expectation for Government

5. Please enter the constraints encountered in your family

1) Constraints in farming:

.....

2) Constraints in living:

.....

6. Please enter your expectation for the Government in the order of importance

1).....

2).....

3).....

4).....

5).....

7. Expectation for this study

1) If you have demand for the irrigation facility, please enter it.

.....
.....

2) Do you have intention to contribute positively the water charge and to participate the maintenance and management of irrigation facilities through the water use association ?

.....

3) Other expectation ?

.....
.....
.....
.....

(Farmers' Organization : India)

Questionnaire for Government Officers in the Study Area (Draft)
(for Village Administrative Officer, Village President or Influential Persons of each Village)

A. Farmers Organization

1) How many farmers' organizations in the Area? Including registered and non-registered organizations.

Type of Organization	Name of Organization	Activities	Number of Members

B. Water Users' Association

1) Number of members, and requirement of membership

Holding Agricultural Area	Number of Members
below 1.0 ha	
1.0 to 2.0 ha	
2.0 to 4.0 ha	
4.0 - 10.0 ha	
10.0 ha above	
Total	

2) Organizational structure (chart)

3) Staffing (total number, number of each section and their training system)

4) Responsibilities and duties of the headman

5) How to elect the headman ?

6) Annual budget

7) Present administrative and sociological constraints encountered in your village.

- (1) Are there any conflicts among the tribes, religions or classes of caste in your village ?
- (2) Other constraints if any ?
- (3) Who and how to solve such constraints and conflicts if any ?
- (4) If these constraints and conflicts could not be solved by the headman, whom do you contact ?
- (5) What is the socio-administrative matter that the headman has severely got into trouble at present ?

8) Outline of the irrigation by the farm pond

9) Water management

- (1) Availability of water management rule
- (2) How / who decides time and order to start irrigation water delivery ?
- (3) How / who operates the main gate at the main canal ?
- (4) How / who operates turnouts ?
- (5) Irrigation rotational system
- (6) Overflooding irrigation method ?
- (7) Maintenance of canals (desilting, weeding, canal shaping, some repairs, etc.)
- (8) How to maintain canals by farmers' themselves, if some farmers do not attend to go to field for maintenance, how to compensate for this work by those farmers ?
- (9) Is there any trouble with irrigation water supply among the farmers ?

C. Agricultural Cooperatives

- 1) Organizational structure (chart)
- 2) Number of members, requirements for membership

Holding Agricultural Area	Number of Members
below 1.0 ha	
1.0 to 2.0 ha	
2.0 to 4.0 ha	
4.0 - 10.0 ha	
10.0 ha above	
Total	

- 3) Activities/Services made in 1995-96

Activities/Services	Quantities	Beneficiaries	Amount

- 4) Staffing (total number, number of each section)
- 5) Responsibilities and duties of the headman
- 6) How to elect the headman ?
- 7) Annual budget and government subsidies
- 8) Present administrative and sociological constraints encountered in operation.
 - (1) Are there any conflicts among the tribes, religions or classes of caste in your village ?
 - (2) Other constraints if any ?
 - (3) Who and how to solve such constraints and conflicts if any ?
 - (4) If these constraints and conflicts could not be solved by the headman, whom do you contact ?
 - (5) What is the socio-administrative matter that the headman has severely got into trouble at present ?

D. Other Organizations

- 1) Organizational structure (chart)
- 2) Number of members, requirements for membership
- 3) Activities/Services made in 1995-96

Activities/Services	Quantities	Beneficiaries	Amount

- 4) Staffing (total number, number of each section)
- 5) Responsibilities and duties of the headman
- 6) How to elect the headman ?
- 7) Annual budget and government subsidies
- 8) Present administrative and sociological constraints encountered in operation.
 - (1) Are there any conflicts among the tribes, religions or classes of caste in your village ?

- (2) Other constraints if any ?
- (3) Who and how solve such constraints and conflicts if any ?
- (4) If these constraints and conflicts could not be solved by the headman, whom do you contact ?
- (5) What is the socio-administrative matter that the headman has severely got into trouble at present ?

4.2 FARM HOUSEHOLD ECONOMY SURVEY

TERMS OF REFERENCE

1. Objective

The objective of this Farm Household Economy Survey is to assist in formulating an agro-economical study for "The Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu" focusing on household characteristics, life and agricultural production in the village, land ownership, irrigation situation, agricultural production, farmers' attitudes, and other economic activities.

2. Survey Area

The survey works shall be conducted in the following 10 villages which were selected for the feasibility study.

Northern Study Area		
Name of Tank	District	Taluk
Kilambakkam	Anna	Chengalpattu
Cherukkanur Big Tank	MGR	Tiruthani
Polampakkam	Anna	Madurantakam
Enadur Periyaeri	Anna	Kanchipuram
Vadakkapattu	Anna	Sriperumbudur
Southern Study Area		
Name of Tank	District	Taluk
Siruvile	Pasumpon	Sivaganga
Kurumbi	Pasumpon	Karaikudi
Ramalingapuram	Kamarajar	Sattur
Sankankulam	Pasumpon	Manamadurai
Pandikanmoi	Ramanathapuram	Paramakudi

Note: Northern Study Area consists of MGR and Anna districts, and Southern Study Area consists of Kamarajar, Pasumpon Muthramlinga Theval and Ramanathapuram districts.

3. Survey Works

The required survey works are described below.

(1) Preparatory Works

- 1) To prepare work schedule to complete the Survey Works successfully within the specified period, as soon as the names and locations of the villages to be surveyed are provided by the JICA Study Team. The prepared work schedule and the names of the appropriate number of personnel assigned for the Survey Works shall be submitted to the JICA Study Team for its approval.

- 2) To study and examine the questionnaire to be provided after signing the Agreement, to discuss the contents, and to finalize it together with the JICA Study Team.
- 3) To check and examine the applicability of the prepared questionnaire at site and to suggest measures for modification and improvement as required.
- 4) To produce necessary numbers of copies of the finalized questionnaire.

(2) Interview Survey on the Questionnaire

- 1) To explain the village head or leader on the purposes and objectives of the Survey Works in order to avoid unnecessary misunderstanding of the interviewees prior to commencing the Survey Works.
- 2) To select the farmers to be interviewed as follows:

- Large Scale:	1 Farmer
- Medium Scale:	2 Farmers
- Small Scale:	4 Farmers
- Marginal Scale:	2 Farmers
<u>- Landless Scale:</u>	<u>1 Farmer</u>
Total	10 Farmers
- 3) To conduct the interview survey following the provided questionnaire and to collect the data and information on the following aspects.
 - Household characteristics
 - Life and production in the village
 - Land ownership
 - Irrigation situation
 - Agricultural production
 - Farmers' attitudes
 - Other economic activities

(3) Compilation of the Results of Survey Works

- 1) To check and examine the data and information collected through the interview survey in the fields as soon as such works are finished, and to correct such data and information that are considered to be unrealistic or wrong.
- 2) To compile the collected data and information in the forms and manners which will be directed by the JICA Study Team using computer application, and to submit them to the JICA Study Team both in floppy disks and printed forms considering the suitability for the further analyses and investigation to be conducted by the JICA Study Team.

- 3) To summarize the arranged data and information, and compile a report which presents all the data and information collected. All the expression in the report shall be of a typed format in English.

**DRAFT QUESTIONNAIRE
FOR
FARM HOUSEHOLD ECONOMY SURVEY**



*The Study on The Rehabilitation of Minor Irrigation Tanks
for Rural Development in Tamil Nadu*

by
Japan International Cooperation Agency (JICA)

QUESTIONNAIRE - CONTENTS

1. Household Characteristics
2. Life and Production in the Area
3. Land Ownership
4. Irrigation Situation
5. Agricultural Production
6. Other Economic Activities
7. Farmers' Attitudes

SAMPLE No _____ CODE : _____ Survey Date _____, 1997
 Surveyor _____ Group-Chief: _____
 District: _____ Village: _____ Family-Level: H, M, L

1. HOUSEHOLD CHARACTERISTICS:

1.1 Respondent's relationship to Head of Household: Age:
 Head of Household: Man / Woman
 Category of Farmer: Large / Medium / Small / Marginal / Agricultural labor
 Caste: Other caste / Backward Caste / Most Backward Caste / Scheduled Caste
 Religion: Hindu / Muslim / Buddhist / Christian / Other (.....)

1.2 Family Structure:

No.	Family-Position	Age	Health	Education	Profession	Special Remarks
1
2
3
4
5
6
7
8

1.3 How long have you lived in this place? Years
 What main professions during this period?
 1. (..... Years)
 2. (..... Years)
 3. (..... Years)

1.4 How your living conditions?

Previously: Very well / Well / Medium / Poor / Very Poor
 Recently: Very well / Well / Medium / Poor / Very Poor

1.5 What are the main constraints in living conditions?

1. Insufficient income 2. Severe climatic conditions 3. Bad social environment
 4. Unequal administration treatments 5. Improper infrastructure

1.6 What are the main constraints in farming?

1. Insufficient finance 2. Lack of agricultural inputs 3. Lack of Labor
 4. Lack of irrigation 5. Improper marketing 6. Improper infrastructure

1.7 Does your family continue to live in this place? Yes / No

Reasons: 1.
 2.
 3.

2. LIFE AND PRODUCTION IN THE AREA

2.1 What kind of construction is your house? Brick / Wood/Mortar / Light Material / Thatch
 How long? Years Constructed (Owned) by:

2.2 Is the house space sufficient for all family members? Yes / No (.....m²)

Comments:

2.3 In your house, do you have Electricity? Yes / No
 City Water? Yes / No
 Well? Yes / No
 Toilet? Yes / No
 Bathroom? Yes / No

2.4 Are there any problems to access from your house to Farm? No / Yes. Problem:

Hospital? No / Yes. Problem:
 Market? No / Yes. Problem:
 School? No / Yes. Problem:
 City? No / Yes. Problem:

2.5 Problems in daily life according to seasons in a year:

Problems in dry season: 1. 2. 3.
 Problems in wet season: 1. 2. 3.

2.6 How about your living expenditures in a year?

1	Food:	Rs.	(%)
2	Clothes:	Rs.	(%)
3	Education:	Rs.	(%)
4	Medicaments:	Rs.	(%)
5	Transports:	Rs.	(%)
6	Ceremonies:	Rs.	(%)
7	Housing Miscellaneous	Rs.	(%)
Total		Rs.	(100 %)

2.7 What are your financial sources for these expenditures?

1.	.....	(.....	/year)
2.	.....	(.....	/year)
3.	.....	(.....	/year)
4.	.....	(.....	/year)
5.	.....	(.....	/year)
Total		(.....	/year)

2.8 Can you save some money in a year? No / Yes Amount: Rs/Year

2.9 Do you borrow money for living expenditures? No / Yes Amount:Rs/Year
Borrowing Sources:.....

2.10 Do you sell some of your farm products? No / Yes
1. Product: (..... Rs/Year) Unit Price:
2. Product: (..... Rs/Year) Unit Price:
3. Product: (..... Rs/Year) Unit Price:

2.11 Do you store farm products and foodstuffs for family consumption? No / Yes
1. Product:..... (.....Kg)
2. Product:..... (..... Kg)
3. Product:..... (..... Kg)

2.12 Is the food situation sufficient in your family? Yes / No
Insufficient Items: 1. 2. 3.
Reasons:

2.13 From your general view, how about the present living conditions in the area?
Very well / Well / Medium / Bad / Very Bad
Comments:.....

2.14 How about the present farming conditions in the area?
Very well / Well / Medium / Bad / Very Bad
Comments:.....

2.15 What crops are you planting in a year?
1. (..... ha) 2. (..... ha) 3. (..... ha)

2.16 Do you practice double-crop in a year? No / Yes Crop: (..... ha)
Comments:

2.17 Do you have sufficient labor force for agricultural production? Yes / No
Comments:

2.18 How about the labor force distribution in your farm in a year?
Dry season: persons (.....)
Wet season: persons (.....)

2.19 Are some of your family members work as labor in other places? No / Yes
If yes, persons in season (Wage: Rs. / day or season)

2.20 Do you continue to do farming in this place? Yes / No
Comments:

3. LAND OWNERSHIP

- 3.1 The present status of your residential land (house and garden)? Total area: m²
Private: m²; Rent: m²; Public: m²
- 3.2 The present status of your land? Total area: ha
Private: ha; Tenant: ha; Rent: ha; Other: ha
- 3.3 If private, the obtaining procedure: How long, so far? Years
If tenancy, the tenant conditions: How long, so far? Years
If renting, the rental conditions: How long, so far? Years
If other, utilization conditions: How long, so far? Years
- 3.4 What is your land utilization patterns in a year?
Dry season: 1. (.... ha) 2. (.... ha) 3. (.... ha)
Rainy season: 1. (.... ha) 2. (.... ha) 3. (.... ha)
- 3.5 Is your land suitable for farming? Yes / No Comments:
1. 2. 3.
- 3.6 Improvement works for land to be good for farming:
1. 2. 3.
- 3.7 Any land problems facing by you in future? Yes / No
Residential land:
Farm land:
- 3.8 The succession system of your present land;
Residential land:
Farm land:

4. IRRIGATION SITUATION

- 4.1 Do you have irrigation in Rainy Season: No/Yes (Source:)
Dry Season: No/Yes (Source:)
- 4.2 Are you member of water user association? No / Yes (Group: Years:)
Comments;
- 4.3 Is there any irrigation system in your area? No / Yes (Irrigation System:)
Comments;
- 4.4 If yes, do you participate in the O.M. and pay for this irrigation system?
Participation-Items: Remarks:
Payment: Comments:
- 4.5 If belonging to an irrigation association in your area, what are your obligations?
Obligations:
Comments:
- 4.6 How many ha of your land are subjected to irrigation? ha (....%)
Irrigation-type: Pump / Other
- 4.7 Crops subjected to irrigation: 1. (.... ha) 2. (.... ha) 3. (.... ha)
Irrigation periods:

4.8 Water-sources for irrigation: 1. 2. 3.

4.9 Are the water sources sufficient for irrigation in your farm land? Yes / No

Wet season: ha (.....%) Crops:

Dry season: ha (.....%) Crops:

4.10 How many ha of your land are under rainfed cultivation?

Crops: 1. (.... ha) 2. (.... ha) 3. (.... ha)

4.11 What is your total cost for irrigation in a year? Total: Rs/Year

Breakdown Items: 1. Rs/Year 2. Rs/Year 3. Rs/Year

Comments:

4.12 Do you have problems for this payment? Yes / No

Comments:

4.13 Do you want more irrigation water? Yes / No

If yes, for what crops and what seasons? 1. Crop: Season: (..... ha)

2. Crop: Season: (..... ha)

3. Crop: Season: (..... ha)

4.14 For your additional irrigation, what kind of irrigation system do you expect?

Irrigation System:

Comments:

4.15 From your idea, do you want to pay for irrigation? No / Yes

Reasons:

If yes, what amount of payment can you afford:

If no, what financial sources to cover this cost:

4.16 How do you think about tank irrigation?

1. Very helpful:

2. Helpful:

3. Sometime helpful:

4.17 Necessities in improvement of structures in priority:

1. Repairmen of sluice gates
2. Consolidation works of tank embankments
3. Desiltation of tank bed
4. Lining of existing canal system
5. Consolidation works for catchment area
6. Construction of new canal system
7. Others;.....

4.18 Necessities in improvement of management system in priority:

1. Reorganization of water management system
2. Making a new management organization
3. Total participation of small, marginal and landless farmers in O.M. works

4.19 With these improvements, what changes in farming do you expect:

1.
2.
3.

4.20 Items you can participate for these improvement works:

1.
2.
3.

4.21 Your idea for the management of the irrigation tank:

.....

4.22 Your idea for the O.M. works for tank irrigation:

.....

5. AGRICULTURAL PRODUCTION (in 1995-96)

5.1 Your farming system: Crop only / Crop + Livestock / Crop + Livestock + Fisheries / Crop + Others (.....)

5.2 Your cropping application:

Rainy season Crops	1. (... ha)	2. (... ha)	3. (... ha)
Dry season Crops:	1. (... ha)	2. (... ha)	3. (... ha)
Perennial Crops:	1. (... ha)	2. (... ha)	3. (... ha)

5.3 How many persons participate in cultivation works ?

Name of Crop	(Man-days/ha/Annum)				
	Crop 1	Crop 2	Crop 3	Crop 4	Crop 5
1 Land Preparation
2 Sowing
3 Planting
4 Irrigation
5 Weeding
6 Plant protection
7 Harvesting
8 Miscellaneous
Total

5.4 Your irrigation application:

Crops	Area (ha)	Date of Irrigation (from to)	No. of Days irrigated (days)	Water source (tank/well/others)
1.
2.
3.
4.
5.
6.
7.

5.8 Your crop production:

Name of Crop	1	2	3	4	5
Area sown (ha)					
Area harvest (ha)					
Production (kg)					
Yield (kg/ha)					
Date sown					
Date harvested					
Remarks					

5.9 Your annual consumption of agricultural products:

Name of Crop	1	2	3	4	5	6	7
Consumption(kg)							
Remarks							

5.10 Your annual sales of agricultural products:

Name of Product	1	2	3	4	5	6	7
Amount(kg)							
Remarks							

5.11 Your selling channels, amounts and prices:

Item sold	Dealing at farm		Selling at local market	
	Amount (kg)	Unit Price (Rs / Kg)	Amount (kg)	Unit Price (Rs / kg)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

5.12 Your labor utilization:

(Man-day/ha/Annum)

Name of Crop	1	2	3	4	5
	Man/Woman	Man/Woman	Man/Woman	Man/Woman	Man/Woman
Land Preparation					
Seeding					
Transplanting					
Irrigation					
Weeding					
Caring					
Harvesting					
Transport to storage					
Miscellaneous					

5.13 Market prices and supply sources of fertilizers and pesticides:

Name	Fertilizer				Disease & Pesticide			
	1	2	3	4	1	2	3	4
Market price								
Supply Source								
Unit								

5.14 Your livestock and poultry production (on 1.Jan. and on 31.Dec.1996):

Item	Cattle	Goat	Sheep	Poultry
1. Number of heads				
on 1.Jan.'96				
on 31.Dec.'96				
2. Number of heads				
Born in '96				
Dead in '96				
Sold in '96				
Purchased in '96				
3. Production in '96				
Milk (liters)				
Eggs (pieces)				
4. Unit price sold				
Body (Rs/head)				
Milk (Rs/liter)				
Egg (Rs/piece)				
5. Breeding cost				
Feed cost				
Labor cost				
Other cost				

5.15 Your possession of draft animals, farm tools and farm machinery:

Draft animals (Units)		Farm tools (Units)		Farm machinery (Units)	
Kind	Unit	Kind	Unit	Kind	Unit
1.		1.		1.	
2.		2.		2.	
3.		3.		3.	
4.		4.		4.	

5.16 Conditions of your draft animals, farm tools and farm machinery:

Item	Kind	Good	Not so good	Unusable
Draft Animal	1			
	2			
	3			
Farm tool	1			
	2			
	3			
Farm machinery	1			
	2			
	3			

5.17 Do you practice fisheries? No / Yes Reasons.....
 If yes, the scale of fisheries(Area of water surface): m²
 Persons engaged in fisheries:..... Annual period engaged..... Days
 Kind of fish breeding:

5.18 Annual Incomes from Fisheries:

Gross Income: Rs., Input Cost: Rs., Net Income: Rs.

5.19 Your problems in practicing Livestock and Fisheries:

Livestock		Fisheries	
1	.....	1	.....
2	.....	2	.....
3	.....	3	.....

5.20 Evaluation of your farm management: Very good / Good / Medium / Bad / Very bad

5.21 Improvements needed for your farm management:

- 1.....
- 2.....
- 3.....

6. OTHER ECONOMIC ACTIVITIES:

6.1 Do you (your family) have other off-farm economic activities? Yes / No

Reasons.....

6.2 Your Annual Off-Farm Income Sources and Amounts:

Source	Amounts(Rs.)	Remarks
1
2
3

6.3 Your ideas for making higher Off-Farm Incomes:

- 1.....
- 2.....
- 3.....

7. FARMER'S ATTITUDES

7.1 Do you know about The Project of Rehabilitation of Irrigation Tanks in the area?

Yes / No

If yes, by what means:

7.2 How do you think about this Project? Very necessary / Necessary / Not necessary

Reasons:.....

7.3 For this irrigation project, what works should be done in priority/

- 1..... Reason:.....
- 2..... Reason:.....
- 3..... Reason:.....

7.4 For improving rural living conditions, what works should be done in priority?

- 1..... Reason:.....
- 2..... Reason:.....
- 3..... Reason:.....

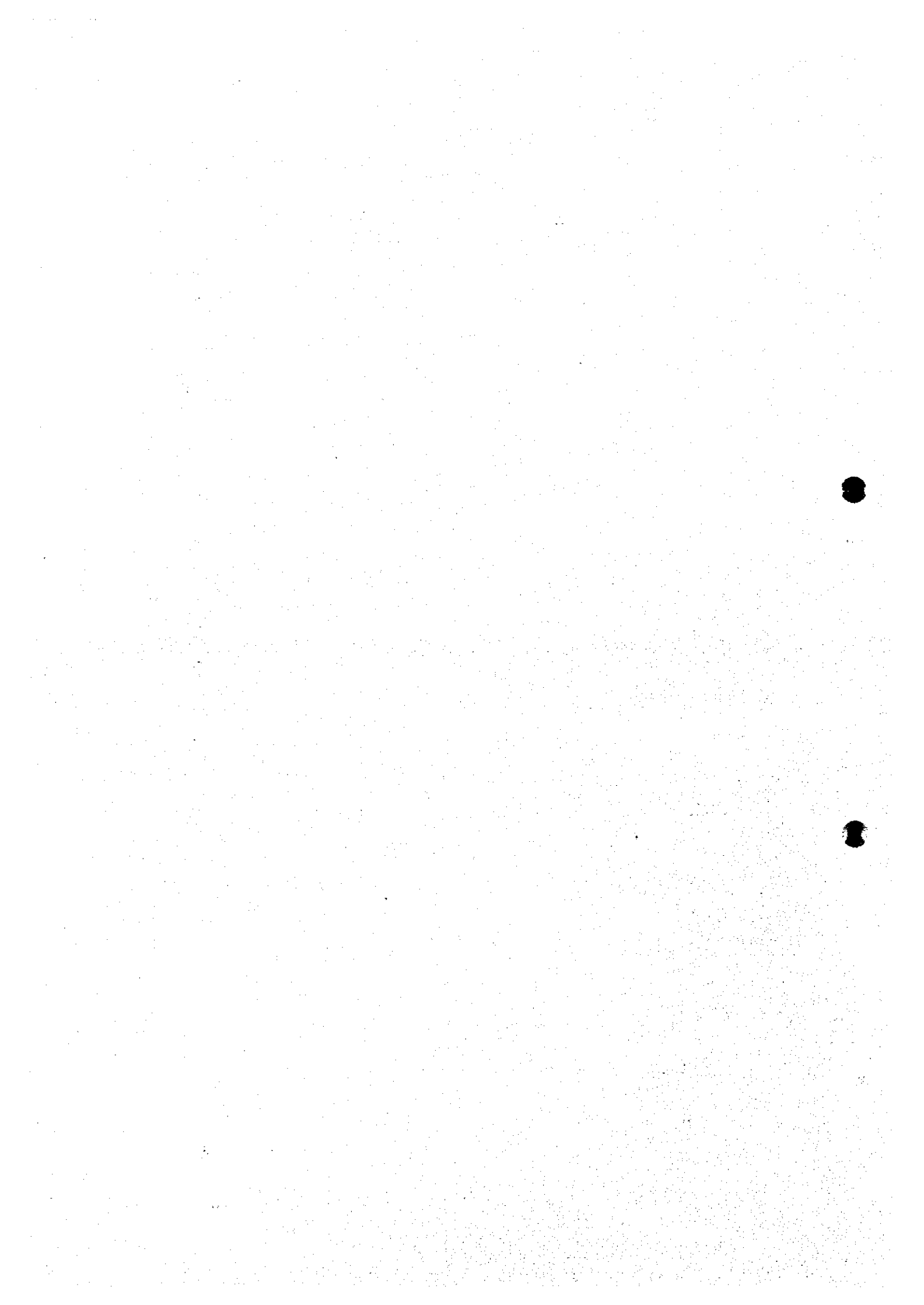
7.5 Your ideas / suggestions on the execution procedure for this project:

- 1.....
- 2.....
- 3.....

7.6 What is the constraint factors for your farming in priority?

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....
- 6.....

4.3 TEST BORING AND HYDROGEOLOGICAL INVESTIGATIONS



TERMS OF REFERENCE

1. Objective

The objective of the Test Boring and Hydrogeological Investigation is to assist in formulating a hydrogeological study for "The Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu" to facilitate conjunctive use of surface and groundwater available in the area.

2. Survey Area

The works shall be conducted in the four (4) village areas to be selected among the following 10 pilot tank areas which were selected for the feasibility study.

Name of Tank	District	Taluk
Northern Study Area'		
Kilambakkam	Anna	Chengalpattu
Cherukkanur Big	MGR	Tiruthani
Polampakkam	Anna	Madurantakam
Enadur Periyaeri	Anna	Kanchipuram
Vadakkapattu	Anna	Sriperumbudur
Southern Study Area'		
Siruvile	Pasumpon	Sivaganga
Kurumbi	Pasumpon	Karaikudi
Ramalingapuram	Kamarajar	Sattur
Sankankulam	Pasumpon	Manamadurai
Pandikanmoi	Ramanathapuram	Paramakudi

Note: Northern Study Area consists of MGR and anna districts, and Southern Study Area consists of Kamarajar, Pasumpon Muthramlinga Theval and Ramanathapuram districts.

3. Required Works

The Scope of Work consists mainly of the test boring of 12 sites in four (4) villages including pumping tests and permeability tests and the provision of competent and experienced engineer to conduct a hydrogeological study and investigations for 2.5 months together with the members of the JICA Study Team.

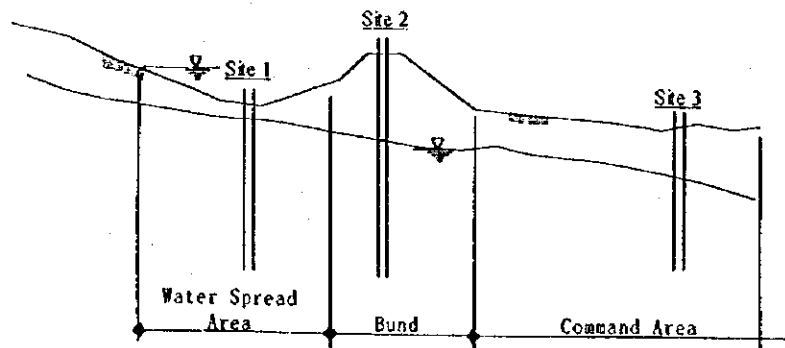
The following items of works and services shall be provided by the Contractor.

3.1 Test Boring

(1) Drilling of boreholes

Test borings of 12 sites shall be conducted in the selected four (4) village areas; three (3) boreholes a village area as shown in the following illustration.

Three (3) sites will be selected in a village area by the JICA Study Team; one site in the tank area (Site 1), the other on the top of the bund (Site 2), and third one in the command area (Site 3). Boreholes shall be drilled in each site in accordance with the Technical Specification in Appendix E.



(2) Permeability tests

Permeability tests shall be conducted in the boreholes drilled at Site 2 in accordance with the Technical Specification in Appendix E. The boreholes at Site 1 shall be filled up after the permeability tests are completed.

(3) Construction of test well

The boreholes drilled at Site 3 shall be cased by casing and screen pipes and finished with packing of appropriate gravel materials as specified in the attached Appendix E. Well development shall be conducted with the mechanical or chemical methods suitable for the purpose conforming to the Technical Specifications.

(4) Pumping tests

Pumping tests shall be conducted in the boreholes at Site 3 conforming to the manners, methods and procedures specified in the attached Appendix E after installing casing and screen pipes. The test wells shall be capped and sealed with an appropriate materials in accordance with the Technical Specifications in appendix E.

(5) Sampling of drill cutting

Drill cutting samples shall be collected in all the boreholes to be drilled during drilling works, and such samples shall be kept in the appropriate manner conforming to the Technical Specification.

The boreholes at Site 1 shall be filled with appropriate materials after collecting such samples in the manners specified in Appendix E.

3.2 Provision of Hydrogeological Engineer

A competent engineer who has experienced previously in the hydrogeological studies on minor irrigation tanks in Tamil Nadu State shall be provided by the Contractor. He shall be engaged in the hydrogeological studies and investigations together with the staff of the JICA Study Team for 2.5 man-months. His scope of work shall include:

- Collection of data and information relating to the hydrogeological study in the Study Areas,
- Supervision of the above test boring works,
- Analyses and investigation of the results obtained through the above test boring works,
- Estimation of the groundwater potential exploitable in each tank areas based on such results of analyses and investigations, and
- Preparation of the reports required by the JICA Study Team on the results and outcome of his hydrological studies.

4. Breakdown of Cost

Breakdown of Costs for the above-stated works and services is provided in Appendix C.

5. Technical Specifications

Technical Specifications are provided in Appendix E.

TECHNICAL SPECIFICATIONS

1. GENERAL

- (1) The Contractor is responsible for providing all facilities, equipment, materials and staff that are required for the proper execution of the works.
- (2) All measurements in the work shall be recorded in metric unit.
- (3) The word "Engineer" in Appendices E shall mean the JICA Study Team and its authorized representatives.
- (4) The Contractor shall submit the following reports and records of A4 size to the JICA Study Team.
 - 1) Work schedule
 - 2) Daily driller's log
 - 3) Engineering report (including pumping test report)

The work schedule shall include time schedule, staff schedule and equipment list, which shall be submitted prior to the commencement of the work, together with a photocopy of insurance certificate.

- (5) The work schedule and the completion report shall be prepared in English.
- (6) Any other Terms of Reference required shall be discussed by the JICA Study Team and the Contractor.

2. TRANSPORTATION

2.1 Mobilization

Contractor, under this item, shall transport to the first work sites all equipment, materials, spare parts and personnel, which according to Contractor's judgment and in due consideration of the provisions of Terms of Reference, the Information and any other contractual statements are required for the efficient execution of the work as described in these specifications and the Bill of Quantities.

This item will not include such materials as are to be supplied to the site by Contractor but are listed under separate items in the Bill of Quantities, as for example well-casing, screens and gravel. This item does cover the rent of all equipment and any and all expenses connected with the shipping and transportation of equipment, personnel and material, including insurance.

2.2 Installation on Site

The well sites for drilling will be given to the Contractor by the Engineer. Contractor shall prepare and arrange each site together with all weather site access provided for the needs of equipment, personnel and

operation. All clearing of vegetation, ground surface modification, grading, drainage provisions and digging of required mud pits will be the responsibility of Contractor. He will erect plant, equipment and facilities and will install all necessary utilities. Contractor shall prepare and maintain the entire well site and all facilities in such a manner as to cause minimal public nuisance and interference with public travel. Contractor shall make provisions to keep unauthorized persons off the drilling site and maintain a safe working operation at all times. The price for this item including all direct and related costs as labor and overheads, material consumed, etc. are included in the mobilization and demobilization.

2.3 Shift between Sites

Installation of each rig at its first site is covered by the item "Mobilization and Demobilization". Transportation of equipment from one site to the next is covered by this item, and shall include dismantling of all installation at the site where work has been completed, preparation of new site, transfer of drilling and other equipment, clearing of abandoned site, erection of rig and installation of other equipment, facilities and utilities, necessary for the execution of the work.

2.4 Demobilization and Site Clean Up

After the construction of all the wells and the pumping test have been completed, the sites shall be cleared and cleaned by dismantling and removal of all equipment, plant, barracks stores, materials rubbish and debris. The ground surface shall be filled and leveled, returning the drilling site environment as near to its original condition as reasonable as possible. Wells and holes will not be considered as completed for acceptance by Engineer until the site clean-up has properly been finished.

3. SUMMARY OF DRILLING AND TESTING PROCEDURES

3.1 Working Procedure

The well and pipe size to be drilled for each type of well specified in Table 1. of APPENDIX A are shown below.

Site	Borehole Size	
	Hole	Casing & Screen
In water spread area	4"	-
On bund	6"	-
In command area	8"	6"

3.2 Site Representative

There shall continuously be responsible representative of Contractor on duty at the work site during the field work who will have full authority to supervise the proper execution of the contracted work. The Contractor's Representative shall provide all information required by Engineer. All communication between Engineer and Contractor will be carried with the Contractor's Site Representative.

4. WELL DRILLING

4.1 Drilling Methods

The test wells shall basically be drilled by the direct rotary method. However, employment of other method to adapt to the actual drilling conditions is at the Engineer's discretion.

Prior to commencement of drilling Contractor shall submit a tentative program for drilling, etc. which in his opinion will meet the specific requirements for the hold. Any revisions of this program should duly be communicated to Engineer.

When drilling mud is used, Contractor will be required to take all precautions to avoid plugging and minimize mud-invasion in the aquifers. Interruptions of the drilling procedures should be avoided.

Contractor shall take care not to contaminate boreholes during drilling and afterwards. However, the pilot holes shall be drilled with high quality (non-salty) drilling fluid.

4.2 Conductor Casing Placement

Conductor casing pipe of appropriate diameter shall be installed as necessary to stabilize the upper portion of the borehole during drilling and well construction operations. Contractor shall determine the length to be installed and type of conduction casing requirement. Prior to the placement of cement grout for the sanitary seal, Contractor may elect to remove the conductor casing or left in the borehole.

4.3 Sampling of Formation Material and Water

Cutting samples will be taken for each running one (1) meter of depth and each change of formation. Contractor shall install at the borehole a suitable equipment for taking such samples (Vibratory sieve). The cutting samples dried will be placed into plastic, glass or tin containers. The containers will be labeled and arranged in study boxes identified with name of the well reference number and depth collected. At the end of the job they will be delivered to the storage of the Client. Engineer reserves the right to direct Contractor to take cutting samples for grain size analysis.

4.4 Mud Control, Circulation Losses, Cementing

Contractor shall regularly monitor density and viscosity of mud, using the appropriate equipment. Pressure of the drilling fluid in the borehole should be adapted to formation pressure. Utilization of biodegradable mud is encouraged. For clay-mud only high-quality, processed bentonite shall be used with a yield adequate to obtain a viscosity of 15 centipoise with less than 10% by weight of solids. For routine control of mud, Contractor shall have test kits at the drilling site. Soda ash or equivalent may be used to control stability of the mud. The use of objectionable additives like mica, toxic materials, etc. will not be permitted.

Losses of circulation shall be measured by Contractor; He shall record these losses in the daily "driller's log" sheets.

4.5 Water Level Measurement

Contractor shall measure at least twice daily and at every change of formation or similar event, the level of water in the hold.

Measurement shall be made with an electric water level probe to an accuracy of one (1) cm.

4.6 Quantities of Casing and Screen

Casing design for each well will be determined by the Engineer, based on the hydrogeological conditions.

5. INSTALLATION OF CASING, SCREEN AND GRAVEL PACK

5.1 Installation of Casing and Screen

After completion of the hole and prior to installation of casing and screen, the borehold shall be cleaned and flushed as far as possible without endangering the stability of the walls of the hole.

After completion of remaining and cleaning the holes, Engineer will provide Contractor with a final design schedule for well casing, screen and gravel pack, after which Contractor shall commence installation. The casing-screen assembly will be installed by the drill rig. Well casing and screen will be set round, true to line and centered. Joints may be threaded or welded.

Deviations in installation and alignment shall be corrected by the contractor at his own expense. An accurate record shall be kept by the contractor for presentation to Engineer of all types, grades, sizes, lengths, and positions of materials installed in the well.

To avoid loss of casing and screen, installation of the entire casing string shall be carried out in one single uninterrupted operation which is followed immediately by the gravel packing operations.

The screen and casing must be lowered slowly and smoothly into the borehold without dropping, pushing or turning. In the event of squeezing, Contractor will clean and ream the borehole before attempting to reinstall the casing.

5.2 Installation of Gravel Pack and Seals

Prior to the installation of the gravel, mud viscosity and settlement in the hole shall be checked. If the observed mud settlement is to the opinion of Engineer likely to impede gravel installation, the mud shall be flushed or thinned before commencing gravel pack installation.

Gravel pack material shall be installed in the annulus. Filling of the annulus is done carefully by means of a tremie pipe in order to obtain a uniform gravel envelope around casing and screen from the bottom of well to approximate 10 m below ground surface. Clay seal (approximately 1 - 3 m thick) be installed before cement grout. The method adopted by Contractor for placing gravel filter shall be subject to the

approval of Engineer and shall prevent bridging and segregation of gravel fractions. Placing under reverse circulation may be required.

After a 1 - 3 m thick layer of clay seal are placed on top of the gravel pack, then cement grout (1 Portland cement : 2 sand : 3 water) shall be pumped into the annular space through a tremie pipe. Care will be taken to keep the bottom end of the pipe always immersed in fresh grout. Grouting shall continue until the slurry flows over at the surface. The grout shall serve as a sanitary seal.

5.3 Cleaning and Development of Test Wells

Cleaning and Development of each well shall commence immediately upon completion of installation of the gravel pack material. Cleaning procedures shall be based on the drilling technique, the mud used and the type of aquifer.

Cleaning shall be carried out by jetting and/or air lift pumping, whereby it may be necessary to use liquefier to break down the mud. Then the settlement at tail pipe shall be bailed out. High velocity water and air jetting shall be applied for cleaning of screens.

During development Contractor shall regularly check the sand content of the water. Development is continued until the produced water at maximum pumping rate becomes continuously free of sand and mud (less than 0.1 g/m³ water). The use of chemicals, such as polyphosphate acid is subject to Engineer's approval. Discharge of water as well as pumping water levels during air lift development shall be measured by Contractor using a weir box, water level measuring device or similar, approved by Engineer. Contractor shall keep records of sand content discharge and cleaning program in his daily "driver's log" sheets. Development shall be concluded with Engineer's consent.

5.4 Plumbness and Alignment Test

Test for Plumbness and alignment of the pump chamber casing following installation of the casing shall be performed. Tests shall be carried out by lowering a dummy into the well, as recommended by AWWA standard (1958).

Contractor shall provide all equipment for such tests.

Measurement shall be recorded per every six (6) running meters of casing to the bottom of the pump chamber. Contractor shall prepare a drift vs. depth graph.

Test for plumbness and alignment are required for each test well and will be separately reimbursed.

6. PUMPING TESTS

Following the completion of the development work at a production well to the satisfaction of the Engineer, the Contractor shall, when instructed by the Engineer, conduct the pumping test of the well using an approved pump and ancillary equipment.

During the period between the completion of the development work and the commencement of the pumping test the Contractor shall measure and record the static water level in the well daily.

(1) Pumping Test Procedure

Pumping test of each well shall be require Step Drawdown Test, Long Term Constant Rate Test and Recovery Test. Engineer will request a testing program for each well on the pump setting depth, pump capacity, flow rate, pumping duration and intervals for measurement of discharge and water level in the well.

(2) Water Level Measuring

All water levels in the well shall be measured using an approved electrical measuring device. A similar spare device in working order shall be kept on the Site of these tests for the duration of the tests.

In addition, the Contractor shall provide and install in the pumped well, a 19 mm (3/4 inch) dip tube with smooth internal surfaces. The dip tube shall be installed in a manner such that a water level indicator can pass through it freely to measure water levels.

The Contractor shall also provide an electrical conductivity meter for rapid determination of water quality during the test. The Contractor shall measure the conductivity at each end of step during step draw down test and each 6 hours during constant rate test.

The Contractor shall determine some observation wells among the existing wells located around the drilled one, and, he shall, after the approval of the Engineer, measure the change of water levels therein throughout the period of pumping tests. The distance between such selected wells and locations shall be measured and plotted on the maps by the Contractor.

(3) Method of Test

1) Item of Pumping Test

The pumping test shall be carried out as following items:

Item 1: Step drawdown test

The test shall be run at least 5 steps as round steps (discharge increased and decreased), and each step shall be measured 120 minutes duration.

Item 2: Constant rate test

The test shall be run at least 48 hours or occasionally longer in duration followed by a recovery test. The test shall be performed as soon as the water in the well has recovered its static water level after completion of the Step Drawdown Test or at a time agreed upon by the Engineer.

Item 3: Time recovery test

The test shall be start immediately on completion of the Constant Discharge Test and shall be carried out for a minimum period of 24 hours or such longer period as the Engineer may direct.

The Engineer shall decide the rates of discharge and duration of the each tests necessary for the purpose of analysis of well yield and shall instruct the Contractor to alter discharge rates, test duration's, number of steps, and time interval accordingly. In the event of interruption of any testing stage, that stage shall be rescheduled at a time to be decided by the Engineer and redone through to completion without interruption. The Contractor shall bear the cost of any test that is interrupted, in the opinion of the Engineer, due to negligence of the Contractor or to failure, breakdown or inadequacy of any of the plant or equipment provided by the Contractor, or where the collection or recording of data or samples has been unsatisfactory.

2) Method of Measurement

The static water level in the production well shall be measured immediately before any pumping test commences. Throughout the duration of each test, the water level in the hole shall be measured and recorded following the observation time schedule listed below.

Time from start of pumping or pumping rate increase (minutes)	Time interval between observations (minutes)
0 - 5	1/2
5 - 10	1
10 - 20	2
20 - 30	3
30 - 60	5
60 - 120	10
120 - 240	20
240 - 360	40
360 and longer	60

The flow of all water pumped from the well during pumping test shall be measured by an approved method using a triangular weir or circular orifice. Discharge readings shall be recorded during the pumping test at intervals corresponding to those for water level measurements.

After the pumping and recovery tests have been completed, the Contractor shall, subject to the permission of the Engineer, remove the test pump, the delivery pipework and all other temporary fittings.

(4) Disposal of Water from Well Sites

The Contractor shall during all pumping tests provide hoses, lay-flat hoses, pipes and pumps so that water produced at the well can be transported a distance of at least 500 (five hundred) meters away

from the well. When necessary the Contractor shall provide an additional 250 (two hundred and fifty) meters of ditches lined with plastic sheet to convey the water beyond the end of the hoses or pipes. The whole assembly necessary for the conveyance of water away from the pumped well must be approved by the Engineer prior to use.

(5) Reporting

Hydrogeologist analysis of the pumping test result shall be reported. The report shall include analysis and calculation of hydrogeological constant such as well loss, permeability, transmissivity, etc., using "Theis" and "Jacob" method. Process of analysis shall be described in detail together with each graph and data sheet.

7. PERMEABILITY TESTS

The permeability tests shall be conducted in the boreholes drilled on the existing bunds of the irrigation tanks. The tests shall be made at two (2) positions of a borehole; one in the existing bund and the other at the bottom of borehole to grasp the permeabilities of the bund materials and the foundation of the bund.

An open-end tests shall basically be carried out and some pressure shall be applied if required. Constant head, constant rate of flow into the hole, size of casing pipe, and elevations of top and bottom of casing, etc. shall be properly recorded. The Contractor shall, prior to commencing the tests, submit to the Engineer for his approval the method and procedure which he considers the most appropriate taking into account the soil and groundwater conditions therein.

All the necessary equipment, tools, instruments, materials as well as labourers shall be arranged by the Contractor. All the materials shall be removed after the tests are finished and the boreholes shall be filled by the appropriate materials.

8. WELL HEADS AND ABANDONED HOLES

Well heads shall be completed with concrete pedestals and casing caps and protective covers with padlocks. All above-ground metal of the well heads shall be suitably painted with rust resistant paint.

Abandoned holes, if any, shall be backfilled to the bottom of the upper aquifer and sealed with a concrete plug. Leakage between aquifers shall be eliminated by the placement of clay or grout seals at suitable depths.

9. RECORDS AND REPORTING

9.1 Records

Detailed records of all operations shall be kept in English during the construction of each wells. The Contractor shall, at all times, keep complete and accurate records of all site activities, daily driller's log and shall make these records available to Engineer whenever requested. Such records shall include the following:

- (1) Accurate records of strings such as casing, screens and etc., and details of all materials, tools, pumps, or other equipment used in the well, whether Temporary or Permanent Works.
- (2) Complete logs and records of all development Work including pumping test. These data shall include well yields, static and dynamic water levels, methods and materials used, duration of each operation, results of observations for sand content, turbidity, color, temperature and etc.
- (3) All pumping and step drawdown test and/or constant discharge test records including full description and duration of all operations.
- (4) Observation of sand content and of the pumped water.
- (5) Any other data which the Contractor may be required to record by the Engineer.

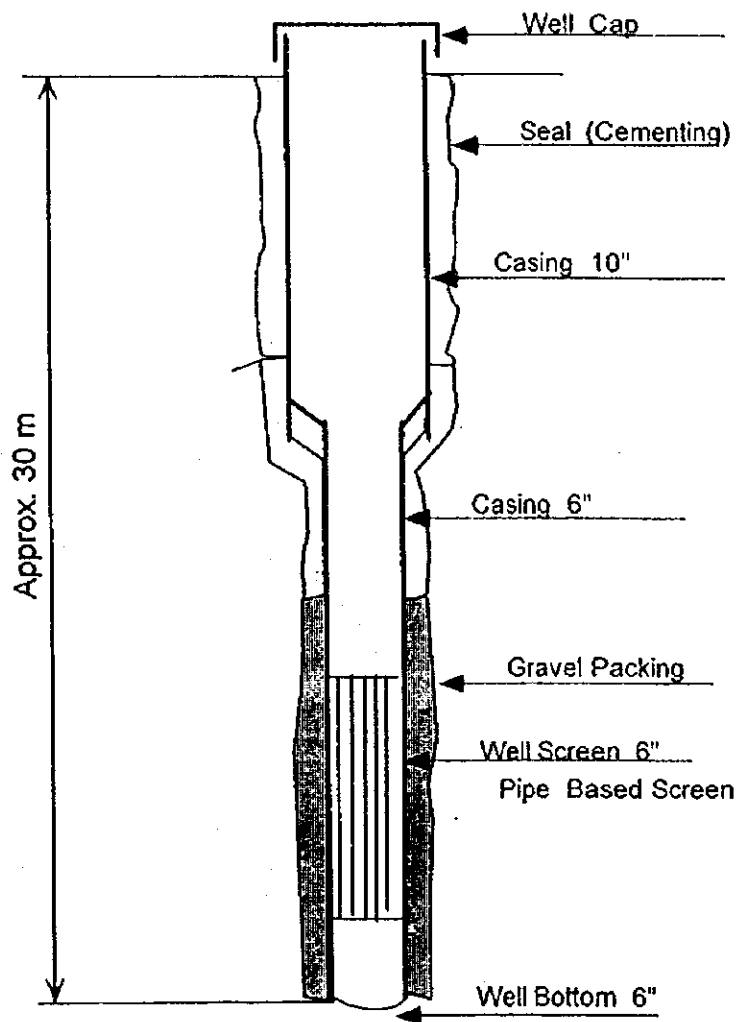
9.2 Reporting

The contractor shall submit to the Engineer following specified report.

<u>Report</u>	<u>Description/Submitting time</u>
1 Daily drilling report	daily activities, lithology observed, equipment and materials used, etc. on every day.
2 Final report	contents of the report is described in below this table, on 10 days after the completion of the each well.

At the completion of drilling and sampling operations for the each wells, a final report in English shall be submitted to the Engineer. It shall contain all details concerning the well and supporting data and a written summary giving the details of all construction and testing operations.

Hydrogeological analysis of the pumping test result also shall be included in this report. The analysis shall be made by the Contractor's hydrogeologist, and shall includes analysis and calculation of hydrogeological constant such as well loss, permeability transmissivity etc., using "Theis" and "Jacob" method.



Standard Borehole Structure

4.4 TOPOGRAPHIC SURVEY

TERMS OF REFERENCE

1. Objective

The objective of the Topographic Survey is to assist in formulating the facility plan and the operation and maintenance plan for "The Study on the Rehabilitation of Minor Irrigation Tanks for Rural Development in Tamil Nadu" to maximize the rehabilitation effects.

2. Survey Area

The works shall be conducted in the following ten (10) village areas selected for the feasibility study by the JICA Study Team.

Name of Tank	District	Taluk	Water Spread Area (km ²)	Irrigation Canal (km)	Existing Bund (km)	Ayacut Area (ha)
Northern Study Area*						
Kilambakkam	Anna	Chengalpattu	0.25	2.7	7.6	54
Cherukkanur Big Tank	MGR	Tiruthani	0.35	4.6	1.9	91
Polampakkam	Anna	Madurantakam	0.63	4.7	1.3	95
Enadur Periyaeri	Anna	Kanchipuram	0.73	28.7	2.1	575
Vadakkapattu	Anna	Sriperumbudur	1.00	20.9	1.4	417
Southern Study Area*						
Siruvile	Pasumpon	Sivaganga	0.45	2.7	2.3	49
Kurumbi	Pasumpon	Karaikudi	0.35	2.6	0.9	53
Ramalingapuram	Kamarajar	Sattur	0.13	2.9	3.0	57
Sankankulam	Pasumpon	Manamadurai	0.85	5.0	4.2	99
Pandikanmoi	Ramanathapuram	Paramakudi	0.45	2.1	3.0	42

Note: Northern Study Area consists of MGR and Anna districts, and Southern Study Area consists of Kamarajar, Pasumpon Muthramlinga Theval and Ramanathapuram districts.

3. Required Works

The Scope of Work consists mainly of the following topographic survey works.

(1) Grid Survey of the Water Spread Area of Tank

Spot elevations shall be measured in the water spread areas of the existing tanks with 50 m interval of the grid, and 50 cm interval of contour lines shall be drawn based on the measured grid elevations. The prepared maps of 1:5,000 scale with the contour lines will be used for calculating the existing tank capacity.

(2) Longitudinal Profile and Cross-section Survey of the Existing Bund

Longitudinal profile and cross-section survey shall be conducted along the existing bund. The interval of the cross-section shall be 50 m and all the points which are considered important in preparing rehabilitation plans of bund. The longitudinal profile with 1:100 and 1:2,000 of vertical and horizontal scales, and the cross-section of 1:100 scale shall be prepared after the survey works are completed.

(3) Longitudinal Profile and Cross-section Survey of the Existing Irrigation Canal

Longitudinal profiles and cross-section survey shall be conducted along the existing irrigation canals extending from the existing irrigation tank to the command area. The interval of each cross-section shall be 50 m and all the points which are considered necessary for preparing the facility plan shall be measured, and the related irrigation structures such as culverts, drops, division boxes, foot paths, etc. shall be measured and their locations shall be mentioned on the profile to be prepared by the Surveyor. The longitudinal profile with 1:100 and 1:2,000 of vertical and horizontal scales, and the cross-section of 1:100 scale shall be prepared after the survey works are completed.

(4) Spot Elevation Survey in the Command Areas

Spot elevations in the command areas shall be measured. The location spot to be surveyed will be directed by the JICA Study Team on the 1:5,000 scale of maps, and measured spot elevations shall be clearly mentioned in the 1:5,000 scale of maps.

Prior to commencing the topographic survey works, the Surveyor shall prepare and submit to the JICA Study Team, for his approval, a survey schedule indicating the deployment plan of the survey team and all the sequences of the survey works. A list of the surveyor shall also be attached.

The above survey works shall be conducted based on the 1:5,000 scale of village maps which will be provided to the Surveyor when the names and locations of the surveyed villages are informed by the JICA Study Team.

In each survey site, the Surveyor shall make a simple triangular survey applying the Electronic Distance Meter and the Electronic Theodolite in order to confirm and check the accuracy of the 1:5,000 scale of village map.

Temporary bench marks shall be established by the Surveyor prior to commencing his survey works in each survey site, and the locations of the established bench marks shall be clearly indicated on the 1:5,000 scale of village maps with photographs. The bench marks shall be of the permanent peg or mount made of concrete so as to enable to be referred in future.

4. Unit to be Used

Unit for measurement provided for by the Japanese Law of Measurement (Metric System) shall be used.

5. Language

Language to be used shall be English.

6. Accuracy of the Measured Elevation

Elevations of each point shall be determined by direct leveling from the established temporary bench marks, and the accuracy of the levelling survey shall be calculated as follows:

$$\text{Accuracy} : 5cm \times \sqrt{S}$$

where : "S" in km

7. Work Schedule

All the works shall be completed by the 15th day July, 1997.

8. Breakdown of Cost

Breakdown of Costs for the above-stated works and services is provided in Appendix C.







