

3. Terms of Reference

TERMS OF REFERENCE
FOR
FEASIBILITY STUDY
ON
NIAS ISLAND IRRIGATED AGRICULTURAL DEVELOPMENT PROJECT
IN
NORTH SUMATRA PROVINCE

JANUARY 1989

DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
MINISTRY OF PUBLIC WORKS

Project Digest

1. Project Title
FEASIBILITY STUDY ON NIAS ISLAND IRRIGATED AGRICULTURAL DEVELOPMENT PROJECT.
2. Location
North Sumatra
3. Executing Agency
Directorate General of Water Resources Development, Ministry of Public Works.
4. Objectives
To implement feasibility study for irrigated agricultural development project centering an irrigation project of about 7800 ha, under the framework of integrated rural improvement programme.

To increase rice production and to raise rural living standard in the isolated island of Nias.
5. Project Descriptions
The proposed project in Nias Island is located 135 135 Km far west from Sumatra Island in the Indonesia Ocean. The island has 5,450 Km² of land area and 498,000 of population.

The regional economy has been left behind the development because of the isolated island. However, the agriculture is survivor occupation and 87% of household is farmer, rice production is short to the local consumption due to the poor agricultural infrastructures. The ratio of the irrigated paddy field is only 15%.

The island is favoured with climate for the irrigated agricultural development.
Total potential areas of about 14,000 ha for irrigation development are scattering at the alluvial plains of river mouth. Construction of Gido Zebua irrigation systems was started in 1976, but it is not under hand going because of the present financial depression and bad physical conditions of soil for the main canal.

The project will be composed from the irrigation project with benefited area of 7,800 ha and related sectoral components selected by priority ranking study. The feasibility study for the proposed project will be implemented under the framework of integrated rural development programme, because the programme shall be the most powerful prescriptions together with irrigated agricultural development for the eradication of mass poverty in such an isolated island.

6. Scope of Assistance Required

a. Expert Services	: 73 m.m.	.....	US\$ 1,095,000
b. Local Consultant	: 64 m.m.	.....	US\$ 192,000
c. Fellowships	: 15 m.m.	.....	US\$ 40,000
d. Equipment	:	.....	US\$ 150,000
e. Topo-mapping	: 200 Km ²	.....	US\$ 323,000
Total			US\$ 1,800,000

7. Related to project aid :

1. BACKGROUND AND SUPPORTING INFORMATION

1.1. Justification of the Project

- 1) Nias is the capital island of Nias District in North Sumatra Province, and isolated 135 Km far west from Sumatra Island in the Indonesian Ocean. The island has 5,450 Km² of land area, which occupies 25.8% of Nias District. The population is 498,000 in 1984 and its density is 91.4 persons per Km². The land is mainly utilized for dry arable land and forest. Eighty seven (87) % of the household is farmer and the annual income per capita in Nias District is about Rp. 210,000 in 1984, which is only 57% of that in whole North Sumatra Province.

As for topographic feature, the highest altitude of the island is about 890 meter above sea level, and most of the total area consists of hilly region. Most rivers radiates from the central mountains into the sea and alluvial plains are limited around the coast of small rivers.

- 2) Production of rice, staple food in Nias is short to the local demand of consumption. Eight thousand (8,000) tons of rice is annually imported from main island in previous years. The potential demand of rice based on the up-grading of living standard shall be higher than the results of present consumption. The areas of the paddy cultivation in the island are 41,119 ha, comprising from paddy field of 24,577 ha and dry field of 16,542 ha. Only 15% of the paddy fields are provided with irrigation system, therefore the yield rate of paddy production in Nias is low as compared with that of whole North Sumatra Province.

- 3) Local roads have been improved since 1982 under IBRD loan project and are standing by the development of the related prospective projects such as irrigated agriculture, agro-industry and tourism. Transportations between Sumatra Island and Gunung Sitoli, capital of Nias Island are two ways. One is by sea to and from Sibolga, and an other one is by air to and from both Medan and Padang. Other communication means are telephone, post office services and radio and television

services. Electricity is available in Gunung Sitoli.

- 4) Irrigation development in Nias Island was started from 1969, under the management of the Irrigation Section Service in Kabupaten Nias (Kantor Seksi PU) with the financial support of budget from central government (APBN). Since fiscal year of 1974/1975 the irrigation development was also supported by North Sumatra Provincial Public Works (Kantor Dinas. P.U. Propinsi).
- The construction of the Gido Zebua irrigation project was started from 1976/1977, and the intake weir was completed in 1984, but the main canal has been suffered from the slope sliding caused by the poor soil physical conditions. However the investment, amounting to Rp.2,047 million to the main structures of the irrigation system, the functional area is only 154 ha as against the designed area of 1,440 ha. The progress of irrigation development in Nias Island seems to be very slow.
- 5) The potential areas for possible irrigation systems are scatteringly located at the limited alluvial plains of small river mouth. The size of the potential areas are rather small and medium, and varies from 260 ha up to 3,500 ha.
(See ATTACHMENT - II)

Name of possible irrigation systems	Location (Sub-District)	Area (ha)	
		Potential	Functional
Gido	Gido Zebua	1,428	154
Afia	Tuheberua	1,200	452
Idano Zala	Teluk Dalam	390	-
Idano Mola	Idano Gawo	3,500	-
Mezawa	Idano Gawo	2,300	-
Sobaewa	Lahewa	1,000	-
Torowa	Tuheberua	262	67
Dumula	Alasa	620	-
Zuzoi Humanga	Lahewa	2,600	-
Ndra Humene	Gido	314	269
Total Area		13,594 (ha)	942 (ha)

To cope with the problems of the mass poverty in Nias Island, irrigation development is essential to raise rural living standard by means of the increasing of farmers income. The development also greatly important to overcome the problems of island on the shortage of rice production, and will contribute to improve the conventional diet life which is biased to root crops.

- 6) The island is favoured with climate for rice cultivation. The average annual rainfall records 2,950 mm, and average monthly rainfalls range from 132 mm in February up to 398 mm in November and there is no remarkable dry season. The water resources development in the island is just the beginning stage, and the ratio of irrigated paddy field is only 15%. There would be still large room to accept a new water resources development. Consequently proposed irrigation project will promise the stabilized high yielding rice cultivation in wet season and the introducing of second rice cropping in dry season, without sophisticated irrigation system but moderate one of quick return oriented.

The total areas of the possible irrigation systems are roughly estimated at 14,000 ha, and the concept of phasing development seems to be appropriate in the island. Then about 7,000 ha is proposed for the irrigation project from the high priority potential areas including existing irrigation systems.

- 7) The project areas are located far from the main island of Sumatra, and the scale of the regional economy is small and closed due to the nature of the isolated island. Irrigation development is, however, essential for Nias Island, promotion of supporting services such as extension service, agricultural credit are also very important to realize the increasing of agricultural products. Furthermore, other infrastructures and social services related to the irrigation project shall be integrated to accomplish the final target of up-grading of rural living standard. Integrated rural development programme is verified to be a powerful prescriptions for the eradication of mass poverty, and irrigation project in such an isolated island requires the strong supports from

related other sectoral projects.

1.2. Name of the Project

"Feasibility Study on Nias Island Irrigated Agricultural Development Project" with Integrated Rural Improvement Programme in North Sumatra Province

The Immediate objectives of the study is to prepare the feasibility study report on Nias Island irrigated agricultural development project, which is consisted from irrigation project as a central component and supported by related other projects in agricultural sector.

Integrated rural improvement programme, with which the feasibility study shall be kept in line, will be prepared because the programme will give the most appropriate guidelines for the effective and-balanced development in the depressed rural areas.

The concept of the study is figured in Appendix - I.

1.3. Institutional Framework

Directorate General of Water Resources Development (DGWRD), Ministry of Public Works will act as a responsible agency for the preparation, arrangement and supervising implementation of the project operation.

The study is extended in the North Sumatra Province, then Provincial Public Works Services will cooperate with DGWRD. Necessary coordination with Regional Development Planning Office (BAPPEDA), Ministry of Agriculture, Ministry of Interior, Ministry of Communication and other related agencies is also responsibility of DGWRD.

1.4. Government Follow-up.

After the completion of the feasibility study, the Government of Indonesia will reflect the study result to the irrigated agricultural development, integrating to the comprehensive rural improvement

programme in Nias Island.

High priority project identified in the study will be promoted to the next stage for the project realization based on the recommendation.

The irrigation project will contribute to overcome the local problem of the shortage of rice production and to eradicate the rural mass poverty problems.

II. OBJECTIVES OF THE PROJECT

The study area of Nias Island Irrigated Agricultural Development Project is shown in Attachment - II, in which potential areas for irrigation development are located.

2.1. Immediate Objectives

The immediate objectives of the project are to prepare a feasibility study for Nias Island Irrigated Agricultural Development Project, which will consist of irrigation project selected from potential areas including existing irrigation systems together with related supporting projects. The study will be oriented in the integrated rural improvement programme of the isolated island of Nias. The details are as follows

- 1) To evaluate potential resources, both social and natural necessary for the irrigated agricultural development and integrated rural improvement in Nias Island.

To identify possible irrigation systems under regional irrigation development plan concept with priority ranking study paying attention to the conservation of environmental aspects.
- 2) To prepare the integrated rural improvement programme of Nias Island incorporating with the related sectoral components such as agriculture, communication, tourism, and social services.

To coordinate the regional irrigation development plan with the integrated rural development programme, taking the concept of optimization of irrigation development into consideration.
- 3) To prepare the feasibility study report on Nias Island irrigated agricultural development project, in which irrigation project is a central component incorporating with related supporting projects in agricultural sector.

- 4) To recommend the following items
 - new collection of hydrometeorological data for further step of water resources development
 - essential means of integrated rural development for next step.
- 5) To transfer knowledge to counterpart personnel through the works in the job-site and training abroad in Japan.

2.2. Long-range Objectives

- 1) To solve the problems of shortage of rice products and to increase farmers income through the development of the irrigation project in Nias Island.
- 2) To arrange further studies of possible projects related to the integrated rural improvement as well as further irrigation projects.
- 3) To contribute to the raising of living standard in the isolated island with the integrated rural improvement programmes as anti-poverty projects.

III. SCOPE OF WORKS

3.1. Scope of Works

The study will consist of two stages. At the first stage, making of topographic maps by photogrametric method, and study of integrated rural improvement programme including regional irrigation development plan will be implemented.

At the second stage, feasibility study for the irrigated agricultural development project will be conducted in succession to the results of the first stage study.

3.1-1 First Stage

1) Data collection.

To collect and review available data and information relevant to the both first stage and second stage as following items :

(by sector)

- Agriculture and irrigation
- Manufacturing
- Mining and energy

- Communication and tourism
- Education and culture
- Health and social welfare

- Natural resources and environment

(by field)

- Topography
- Meteorology and hydrology
- Geology and soil mechanics

- Soil classification and land use
- Ill-drainage area and inundation records
- Irrigation and drainage

- Agriculture and agro-economy
- Extension services and post harvest
- Rural electrification and rural industry

- Agricultural credit and
- Others.

2) Field Survey

To carry out field investigation and survey on the following items :

- Preliminary field survey of the potential areas for irrigation development
 - Investigation of existing hydrological and meteorological observation stations
 - Investigation of the existing irrigation schemes
 - Investigation of weir sites with alternative sites, main irrigation canal routes

 - Coordination between survey and irrigation planning such as selection of the place of control point, benchmarks in the study area, etc. and
 - Observation of river discharge at weir site.
- 3) Taking of aerial photographs at the scale of 1 to 25,000 over the whole Nias Island.
- 4) Assessment of natural resources and environment and social resources by means of data processing and remote sensing technology using the aerial photo.

3.1-2 Second Stage

On the basis of the results of preceding survey and study in the first stage, the following works shall be carried out for the feasibility study on Nias Island Irrigated Agricultural Development Project.

- 1) Formulation of the Nias Island Irrigated Agricultural Development Project plan on the basis of the study of integrated rural improvement programme.
 - Irrigation project packaged of about 7,800 ha from a few possible irrigation systems which are selected by priority ranking study in the first stage, will be the major of the component.
 - Prospective other components will be training on agricultural extension services and water management with pilot farm scheme, post harvest, rural electrification by mini-hydro-power generation and etc.
- 2) Field survey and additional data collection
 - Topographic survey.
 - * longitudinal cross sectional survey of main canal routes for selected irrigation systems.
 - * geological survey such as test drilling works at weir sites, test pits along canal routs and duch-cone test for major structure sites.
 - * soil test and water quality test.
 - Hydrological and meteorological survey
 - Survey for irrigation and drainage system including weir sites and main canal routes.
 - Investigation of construction materials
 - Agricultural and agro-economy survey
 - Regional socio-economy survey
 - Other survey and additional data collection if necessary.

3) Feasibility Study and analysis

- Soil analysis for farmland in the irrigation project area
- Assessment of dependable river runoff for irrigation
- Planning of cropping pattern
- Estimation of irrigation water requirement
- Study on irrigable area and suitable land use in the irrigation project area
- Design of the new irrigation/drainage canal systems
- Study on agricultural production and agro-economy
- Study on alternative development plans
- Study on construction material and equipment
- Study on other components for irrigated agricultural development
- Cost estimate of the projects by component
- Verification of feasibility as foreign loan project
 - * estimation of cost and benefit
 - * economic and financial evaluation
 - * implementation schedule and
 - * environmental impact.

3.2. Study Schedule

The study will be conducted in accordance with the tentative study schedule (See Appendix - II).

3.3. Reports

The study team shall prepare and submit the following reports to the Government of Indonesia

(1) Inception Report

Thirty (30) copies within one (1) month after the commencement of the Study

(2) Progress Report

Thirty (30) copies at the end of first field work in Indonesia.

(3) Interim report I

Thirty (30) copies at the start of second stage of the Study.

(4) Interim report II

Thirty (30) copies at the end of second field work in Indonesia.

(5) Draft final report

Thirty (30) copies at the end of the second stage of the Study.

(6) Final report

Fifty (50) copies within two (2) months after receiving the comments of DGWRD on the draft final report.

Final report shall be accompanied with Executive summary reports and Basic data book.

IV. EXTERNAL AND GOVERNMENT INPUTS

4.1 External Inputs

The Government of Japan is kindly requested to extend technical cooperation through JICA (Japan International Cooperation Agency): including dispatching the survey and study team, supplying equipment and machinery necessary for the survey and study and performing transfer of knowledge to the Indonesian counterpart personnel in the course of the survey, study and training.

1) Expertise required

A total of 73 man-months of expert services and 64 man-months of local consultant within a period of 16 months will be required as below :

First Stage

Expertise	Man-months					
	Field		Home		Total	
	F/E*	L/C ^{tr}	F/E	L/C	F/E	L/C
Team Leader	4.0	-	3.0	-	7.0	-
Rural Development Planning	2.5	2.5	2.0	-	4.5	2.5
Irrigation & Drainage	3.5	3.5	2.0	-	5.5	3.5
Agronomy	2.0	2.0	1.0	-	3.0	2.0
Agro-economy	2.0	2.0	1.0	-	3.0	2.0
Hydrology	3.5	3.5	-	-	3.5	3.5
Pedology	2.0	2.0	-	-	2.0	2.0
Mapping Supervising	6.0	-	-	-	6.0	-
Surveying	-	12.0	-	-	-	12.0
Environment	1.5	1.5	-	-	1.5	1.5
Sub-total	27.0	29.0	9.0	-	36.0	29.0

Second Stage

Expertise	Man-months					
	Field		Home		Total	
	F/E	L/C	F/E	L/C	F/E	L/C
Team Leader	3.5	-	2.5	-	6.0	-
Irrigation Planning	3.5	3.5	2.0	-	5.5	3.5
Irrigation Design	3.0	3.0	2.0	-	5.0	3.0
Drainage Engineer	2.0	2.0	-	-	2.0	2.0
Hydrology	-	1.5	0.5	-	0.5	1.5
Geology	1.5	-	-	-	1.5	-
Soil Mechanics	-	3.0	0.5	-	0.5	3.0
Agronomy	2.5	2.5	0.5	-	3.0	2.5
Agro-economy	2.0	2.0	1.5	-	3.5	2.0
Construction Planning	1.5	1.5	0.5	-	2.0	1.5
Topo-surveying	-	10.5	-	-	-	10.5
Rural Development Planning	2.0	2.0	1.5	-	3.5	2.0
Post Harvest	2.0	2.0	0.5	-	2.5	2.0
Electric Engineer	1.5	1.5	-	-	1.5	1.5
Sub-total	25.0	35.0	12.0	-	37.0	35.0
Grant total	52.0	64.0	21.0	-	73.0	64.0

* F/E : Foreign Expert.

* L/C : Local Consultant

2) Equipment

It is kindly requested that the survey and study team bring all kind of equipment, machinery, stationaries and consumables necessary for the work.

3) Training in Japan.

Totally 15 man-months dividing 7.5 man-months for the both first

stage and second stage will be requested.

4.2. Inputs of the Government of Indonesia

To facilitate the smooth implementation of the Study, the Government of the Republic of Indonesia will take necessary measures.

4.2.1 DGWRD will make necessary arrangement with the cooperation of other relevant organizations for the following :

- (1) to secure the safety of the Japanese study team,
- (2) to provide medical services as needed. Its expenses will be chargeable on the members of the Japanese study team,
- (3) to arrange for quick and smooth customs clearance of the equipment and materials required for the Study at free of any charge,
- (4) to permit the members of the Japanese study team to enter, leave and sojourn in Indonesia for duration of their assignment, and exempt them from alien registration requirements (and consular fees),
- (5) to exempt the members of the Japanese study team from taxes, duties and other charges on equipments, machinery and other materials brought into Indonesia for the implementation of the Study,
- (6) to exempt the members of the Japanese study team from income tax and other charges imposed on or in connection with any emolument or allowance paid to the members of the Japanese team for their services in connection with the implementation of the Study,
- (7) to provide necessary facilities to the Japanese team for remittance as well as utilization of funds introduced into Indonesia from Japan ; in connection with the implementation of the Study,
- (8) to secure clearance for the use of communication facilities including transfer with allocated frequency and electronic

distance measuring instruments.

- (9) to ensure permission to take all data and documents related to the Study out of Indonesia to Japan by the study team.

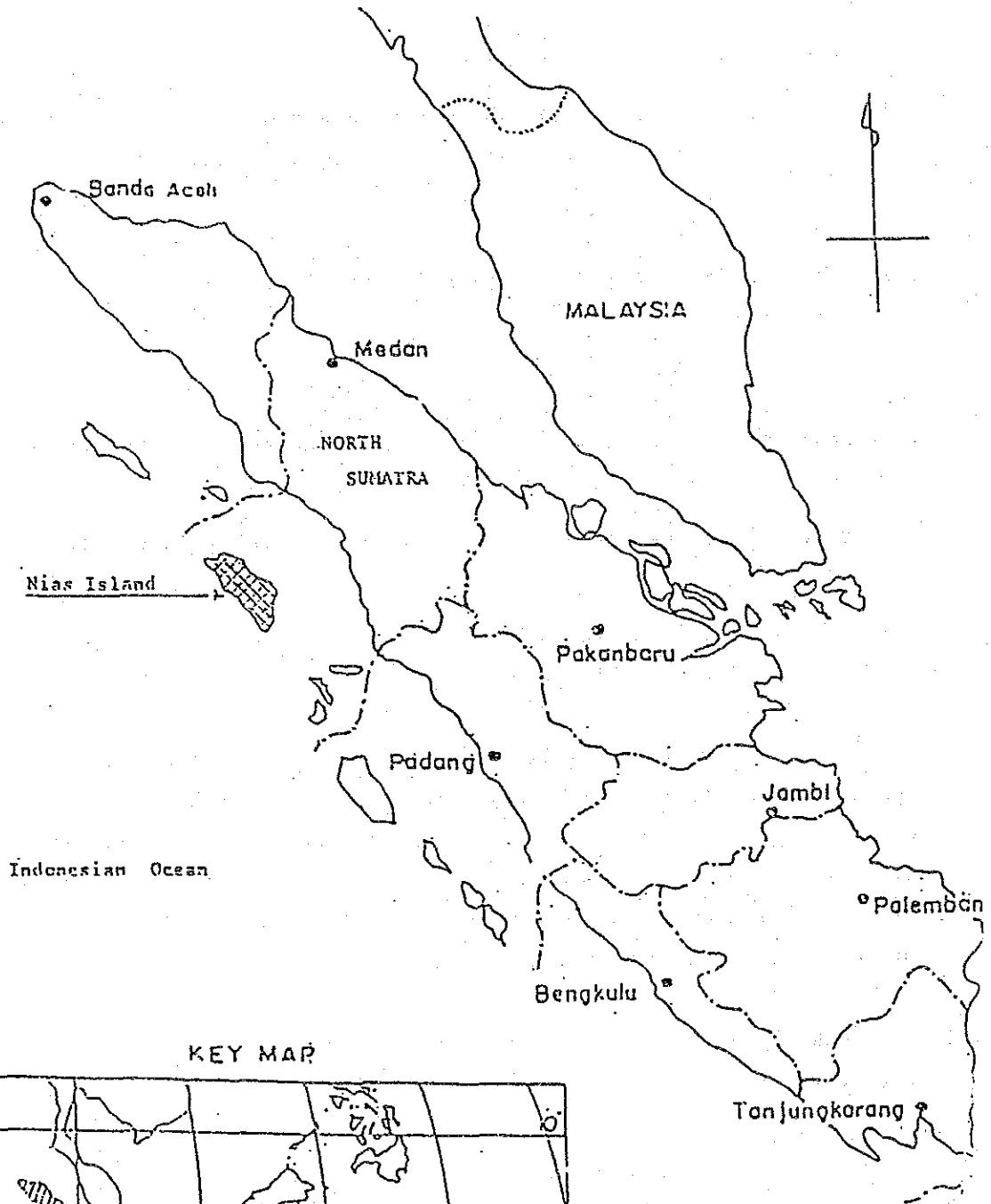
4.2.2 DGWRD will, at its own expence, provide the Japanese study team with the following, in cooperation with the other relevant organizations :

- (1) available data and information related to the Study,
- (2) counterpart personnel to assist the study team and participate in the various activities for the Study,
- (3) suitable office space with necessary equipments in the study area,
- (4) credentials or identification cards to the members of the study team.

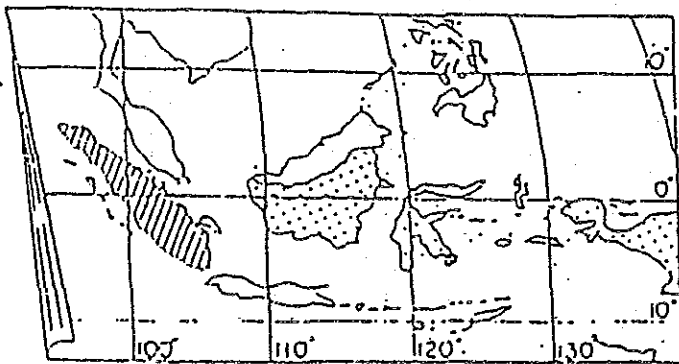
4.2.3 The Government of Indonesia will bear claims, if any arises against the members of the Japanese study team arising from, occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or wilful misconduct on the part or the members of the Japanese study team.....

4.3.4 DGWRD will assist for the Japanese study team to arrange accomodation..

LOCATION MAP



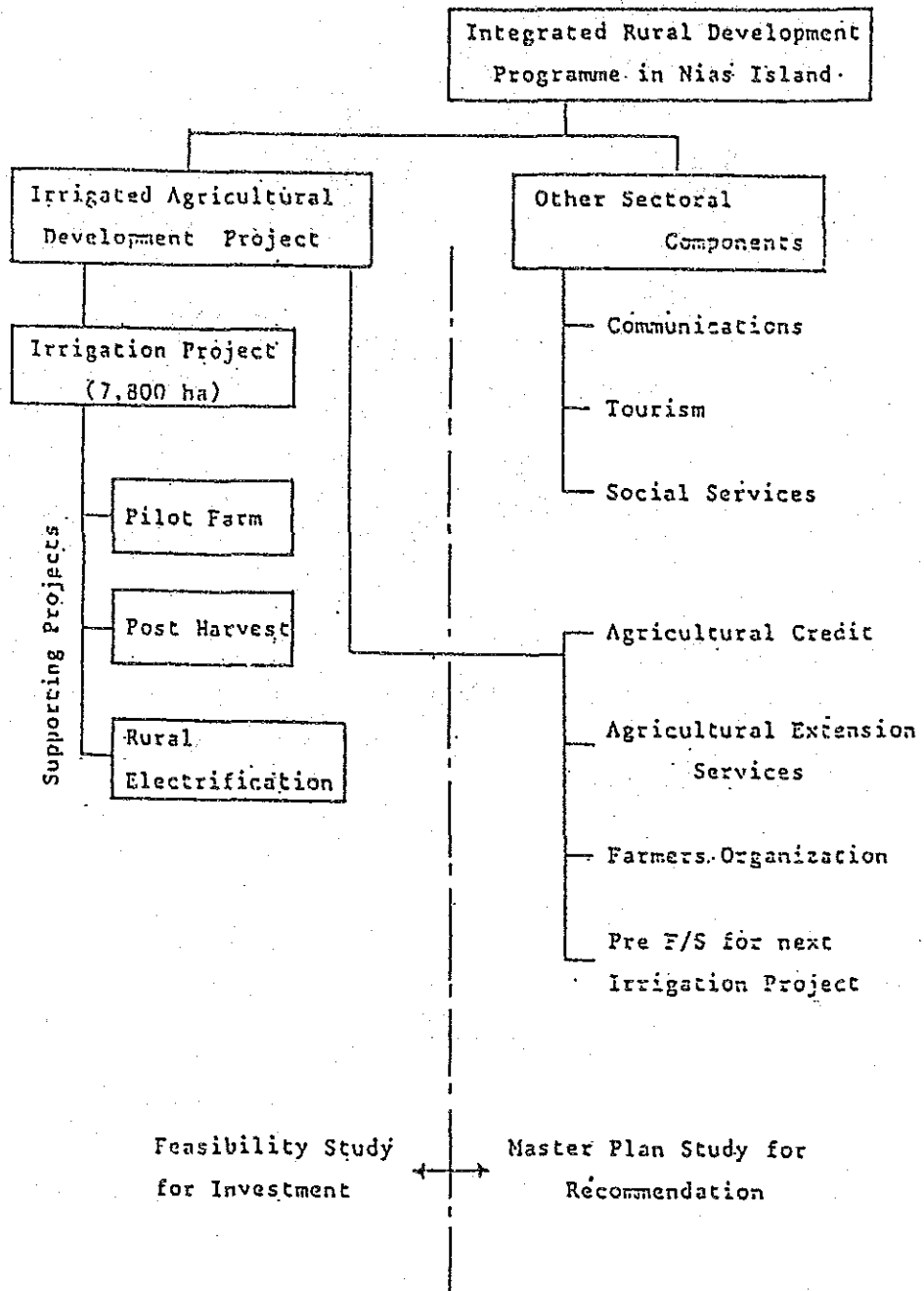
KEY MAP



Scale



Basic Concept of the Study



Appendix - II

Tentative Work Schedule

Work		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
First Stage	Ground Control Survey	[Hatched]																	
	Taking of aerial photos		[Hatched]																
	Topo mapping				[Hatched]														
	Survey & data collection		[Hatched]																
	Study of integrated rural imp.		[Hatched]																
	Training in Japan					[Hatched]													
	Survey & data collection for F/S							[Hatched]											
	Study and analysis								[Hatched]										
	Report	*				*			*		*				*				
		Inception Report																	
	Selection of potential irrigation area																		
	Selection of proposing irrigation sub-project																		
	Progress report																		
	Interim I report																		
	Interim II report																		
	Draft final report																		
	Final report																		
Second Stage																			

First Stage ————— Second Stage

[Hatched] Field Work
[White] Home Work

収集資料

1. 1 : 50,000 Map 1945 war office
2. Kabupaten Nias 1984-1986
3. Kabupaten Nias Dalam Angka 1986, 1987
4. Statistik Pertanian Tanaman Pangan 1987
5. Proposal Pembangunan Pengairan Kabupaten Daerah Ting Kat II Nias 1989
6. 北スマトラ D. P. U 武井専門家提供資料
 - (1) Topographic Map of Nias Island (s=1/250,000).
 - (2) Irrigation Map (Peta Irigasi, PU-Nias).
 - (3) Irrigation Area Managed by PU in Kab. Nias (Abstruction of Inventoru List).
 - (4) Recennaissance Report on Existing Irrigation Schemes in Nias Island by Binnie & Partners, 1980.
 - (5) Summary of Schemes in Nias (proposed by Binnie and Partners in 1980).
 - (6) Development Plan in Fifth 5-Year Development (Pelita V), DPU-North Suamtera (Abstruction).
 - (7) Organization Chart of North Sumatera Irrigation Project.
 - (8) Inventory of Irrigation System Under the Management by Ministry of Public Works as of 1987, JICA 1989.
 - (9) Project List Proposed in Repelita V (Abstruction), JICA, 1989.
 - (10) Population Distribution by Administrative Districts.
 - (11) Land Use in North Sumatera Province.
 - (12) Mean Annual Rainfall in North Sumatera Province.
 - (13) Geology in North Sumatera Province.

JICA