

In Bacho and Kab Daeng, soil foundation is weak, according to the bearing capacity measured by cone penetrometer. Accordingly, swamp bulldozer shall be utilized for excavation, moving, spreading and compaction.

5.8.3 Project Cost

The total project cost including the cost for price escalation is estimated at 98, 99, 144million Bahts in Bacho, Kab Daeng and Mu No-Koknai areas, respectively, as shown in Table-16, 17 and 18. Details are given in Appendix K.

Table-9 Target of Crop Yield (Bacho Area)

Crop	Unit	Target
Paddy rice	kg/ha	2,344 (375)
Sweet corn	ton/ha	10.0 (1.6)
Baby corn	kg/ha	4,250 (680)
Mungbean	"	750 (120)
Yardlong bean	"	2,500 (400)
Chili (fresh)	"	4,375 (700)
Chinese kale	"	6,875 (1,100)
Short Cucumber	"	6,250 (1,000)
Pineapple	ton/ha	28.1 (4.5)

Note: (): shows kg or ton per rai.

Table-10 Crop Production (Bacho Area)

Crop	Area	Yield	Production	Remarks
	(rai)	(kg/rai)	(ton)	
Paddy rice	625	375	234	
Upland crops				
- Baby corn	213	680	145	Double Cropping
- Sweet corn	213	1,600	341	"
- Yardlong bean	213	400	85	"
- Mungbean	213	120	26	"
- Chili	213	700	149	"
- Chinese kale	213	1,100	243	"
- Short Cucumber	213	1,000	213	"
Tree crop				
- Pineapple	88	4,500	396	

Table-12 Target of Crop Yield (Mu No-Koknai Area)

Crops	Unit	Target	Remarks
Paddy			
Major rice (Local)	kg/ha	2,344 (375)	
Major rice (HYV, RD-13)*	"	3,000 (480)	
Second rice (Local)	"	2,720 (435)	
Second rice (HYV, RD-7)*	"	3,300 (528)	
Upland crops			
Sweet corn	ton/ha	11.25 (1.8)	
Baby corn	kg/ha	4,500 (720)	
Mungbean	"	900 (140)	
Groundnuts	"	1,250 (200)	
Yardlong bean	"	3,000 (480)	
Chili (fresh)	"	5,000 (800)	
Chinese kale	"	7,500 (1,200)	
Short cucumber	"	7,800 (1,250)	
Watermelon	ton/ha	25.0 (4.0)	
Tree crops			
Aromatic coconut			
5th year	kg/ha	2,500 (400)	
6th year	fruit/plant/ year	2,500 (400)	
7th year	"	3,125 (500)	
8th year	"	3,125 (500)	
9th year	"	3,125 (500)	
Pineapple	ton/ha	28.1 (4.5)	

Note: * : Applied after five years from cropping.

(): kg or ton per rai.

Table-13 Crop Production (Mu No-Koknai Area)

Crops	Area	Yield	Production
	(rai)	(kg or ton/rai)	(ton)
Paddy			
Major rice (Local)	2,158	375	809
Major rice (HYV, RD-13)	2,158	480	1,035
Second rice (Local)	647	435	282
Second rice (HYV, RD-13)	647	528	342
Upland crops			
Baby corn	225	720	162
Sweet corn	225	1,800	405
Yardlong bean	225	480	108
Mungbean	225	120	27
Groundnut	225	200	45
Chili	225	800	180
Chinese kale	225	1,200	270
Short cucumber	225	1,250	281
Watermelon	225	4,000	900
Tree crops			
Aromatic coconut*			
5th year	1,000	400	400,000
6th year	1,000	400	400,000
7th year	1,000	500	500,000
8th year	1,000	500	500,000
9th year	1,000	500	500,000
Pineapple	600	4.5	2,700

Note: * ; Yield is the number of fruit per plant. Production is the total number of fruit.

Table-14 Environmental Impact Estimation of Each Area

FACTORS	BACHO AREA		KAB DAENG AREA		MUNO-KORNAI AREA	
	Without Project	With Project	Without Project	With Project	Without Project	With Project
	Impact	Impact	Impact	Impact	Impact	Impact
A. SOCIAL						
1. Living Condition	-2	+2	-2	+2	+1	+2
2. Job Opportunity	-1	+1	-1	+1	0	+1
3. Social Security	0	+1	0	+1	0	0
4. Economic Condition	-1	+2	-1	+2	0	+2
5. Transportation	-1	+1	-1	+1	+1	+2
6. Infrastructure	-1	+1	-1	+1	0	+1
7. Recreation	0	+1	0	0	0	0
B. NATURAL						
1. Subsidence	-2	-1	0	0	0	0
2. Topography	0	+1	0	0	0	0
3. Geology	0	0	-1	+1	0	0
4. Soil	-1	+1	-1	+1	0	+1
5. Land Use	-1	+1	-1	+1	-1	+1
6. Surface Water	-1	+1	0	0	0	0
7. Ground Water	0	0	0	0	0	0
8. Flood Control	-1	+1	-1	+1	-1	+2
C. ECOLOGICAL						
1. Forest/Plant Community	0	-1	0	-1	-1	+1
2. Fish/Aquatic Animals	0	-1	0	0	-1	+1
3. Wild Life	0	0	0	0	0	0
4. Water Quality	-1	-1	-1	+1	0	0
5. Burning	-2	+2	0	0	0	0

Note : 0 = No impact 1, 2 = Degree of impact +, - = Positive, Negative

Table-15 Construction Quantity of Each Project Area

Description	Unit	Bacho	Kab Daeng	Muno-Koknai
1. Land Reclamation				
Mowing	ha	225	432	340
Stumping	//	180	346	340
Stumps Exclusion	//	180	346	340
Removal of Sundries	//	225	432	340
Burning	//	225	432	340
Readjust the Land	//	200	399	665
Plowing	//	—	—	403
Harrowing	//	—	—	403
2. Agricultural Infrastructure				
① Drainage Canal Improvement				
Canal Type I B=1.0m	m	—	4,600	5,300
Canal Type II B=2.0m	//	—	—	—
Canal Improvement	//	7,510	—	4,400
Check Gate 1.0×0.6×1	place	—	—	—
// 2.0×1.2×1	//	—	4	—
Culvert ϕ 300	m	—	—	189
// ϕ 500	//	—	45	—
// ϕ 600	//	—	—	10
// ϕ 1000	//	48	16	—
② Dike (Road)				
Type I B=3.0m H=1.0m :Peat	m	—	—	—
Type II B=3.0m H=1.0m :Acid	//	—	—	9,900
Type III B=3.0m H=1.8m :Peat	//	2,750	1,150	—
Type IV B=3.0m H=2.5m :Acid	//	—	—	4,000
Road Improvement	//	4,300	—	—
③ On Farm Facilities				
Ditch 30m Pitch	ha	200	298	167
Ditch 50m Pitch	//	—	—	220
Farm Road B=2.0m	m	6,560	7,800	—
Farm Turn Out	place	—	—	21
Weir	//	—	—	410
④ Water Control Facilities				
Intake Facility ϕ 1000	place	3	—	12
Check Gate 2.0×2.0×1	//	—	2	5
// 4.0×2.0×2	//	1	—	—
⑤ Inland Fishery Pond				
Type I 250m×90m: Peat	place	1	—	—
Type II 40m×40m: Peat	//	—	16	—
Type III 40m×40m: Acid	//	—	—	21
⑥ Liming				
	t	6,242	9,246	11,518

Table-16 Construction Cost of Bacho Area

Unit : 1,000 Baht

Description	(1st Year)		(2nd Year)		(3rd Year)		(4th Year)		(5th Year)		(6th Year)		Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	Total
Bacho F/S Area															
1. Construction Cost															
- Land Reclamation			1,286	1,487	2,144	2,479	857	991					4,287	4,957	9,244
- Agricultural Infrastructure			2,510	8,549	4,184	14,249	1,674	5,699					8,368	28,497	36,865
- Agricultural Supporting Facility			8,440										8,440		8,440
Sub Total			12,236	10,036	6,328	16,728	2,531	6,690					21,095	33,454	54,549
2. Project Administration	936	630	39	630	39	630	38	630					1,052	2,520	3,572
3. Consulting Services															
- Detailed Design	2,995		1,498		1,498		1,498						2,995		2,995
- Supervision			1,498		1,498		1,498						4,494		4,494
Sub Total	2,995		1,498		1,498		1,498						7,489		7,489
4. Agricultural Supporting Activity					4,031	162	4,031	162	4,031	162	4,032	162	16,125	648	16,773
Total (1-4)	3,931	630	13,773	10,666	11,896	17,520	8,098	7,482	4,031	162	4,032	162	45,761	36,622	82,383
5. Physical Contingency (1-4) × 10%	393	63	1,377	1,067	1,190	1,752	810	748	403	16	403	16	4,576	3,662	8,238
Total (1-5)	4,324	693	15,150	11,733	13,086	19,272	8,908	8,230	4,434	178	4,435	178	50,337	40,284	90,621
6. Price Escalation	43	35	305	1,203	397	3,038	362	1,774	226	49	273	61	1,606	6,160	7,766
Grand Total	4,367	728	15,455	12,936	13,483	22,310	9,270	10,004	4,660	227	4,708	239	51,943	46,444	98,387

Table-17 Construction Cost of Kab Daeng Area

Unit : 1,000 Baht

Description	(1st Year)		(2nd Year)		(3rd Year)		(4th Year)		(5th Year)		(6th Year)		Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	Total
kab Daeng F/S Area															
1. Construction Cost															
- Land Reclamation			3,347	3,835	5,020	5,752							8,387	9,587	17,954
- Agricultural Infrastructure			3,683	10,984	5,525	16,477							9,208	27,461	36,669
- Agricultural Supporting Facility			5,770										5,770		5,770
Sub Total			12,800	14,819	10,545	22,229							23,345	37,048	60,393
2. Project Administration	709	537	38	536	37	536							784	1,609	2,393
3. Consulting Services															
- Detailed Design	3,030												3,030		3,030
- Supervision			1,514		1,514		1,514						4,542		4,542
Sub Total	3,030		1,514		1,514		1,514						7,572		7,572
4. Agricultural Supporting Activity															
					4,213	97	4,213	97	4,213	98			12,639	292	12,931
Total (1-4)	3,739	537	14,352	15,355	16,309	22,862	5,727	97	4,213	98			44,340	38,949	83,289
5. Physical Contingency (1-4) × 10%															
			374	54	1,435	1,536	573	10	421	10			4,434	3,896	8,330
Total (1-5)	4,113	591	15,787	16,891	17,940	25,148	6,300	107	4,634	108			48,774	42,845	91,619
6. Price Escalation															
	41	30	317	1,731	544	3,964	256	23	236	30			1,394	5,778	7,172
Grand Total	4,154	621	16,104	18,622	18,484	29,112	6,556	130	4,870	138			50,168	48,623	98,791

Table-18 Construction Cost of Mu No-Koknai Area

Unit : 1,000 Baht

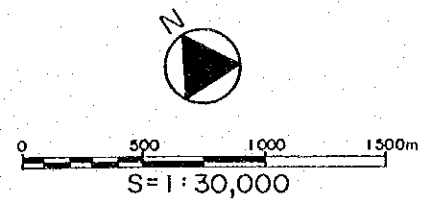
Description	(1st Year)		(2nd Year)		(3rd Year)		(4th Year)		(5th Year)		(6th Year)		Total		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	Total
Muno-Koknai F/S Area															
1. Construction Cost															
- Land Reclamation			3,423	2,739	5,706	4,564	2,282	1,826					11,411	9,129	20,540
- Agricultural Infrastructure			3,740	13,923	6,234	23,204	2,493	9,282					12,467	46,409	58,876
- Agricultural Supporting Facility			9,010										9,010		9,010
Sub Total			16,173	16,662	11,940	27,768	4,775	11,108					32,888	55,538	88,426
2. Project Administration	920	636	39	636	39	636	38	636					1,036	2,544	3,580
3. Consulting Services															
- Detailed Design	4,354				2,177		2,177						4,354		4,354
- Supervision			2,177		2,177		2,177						6,531		6,531
Sub Total	4,354		2,177		2,177		2,177						10,885		10,885
4. Agricultural Supporting Activity					4,031	180	4,031	180	4,031	180	4,031	180	16,124	720	16,844
Total (1-4)	5,274	636	18,389	17,298	18,187	28,584	11,021	11,924	180	4,031	180	4,031	60,933	58,802	119,735
5. Physical Contingency (1-4)×10%			527	1,730	1,819	2,858	1,102	1,192	18	403	18	403	6,093	5,880	11,973
Total (1-5)	5,801	700	20,228	19,028	20,006	31,442	12,123	13,116	198	4,434	198	4,434	67,026	64,682	131,708
6. Price Escalation	58	35	407	1,950	606	4,956	492	2,827	226	55	273	67	2,062	9,890	11,952
Grand Total	5,859	735	20,635	20,978	20,612	36,398	12,615	15,943	263	4,707	265	4,707	69,088	74,572	143,660



DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	WATER RETENTION AREA
	CONSERVATION AREA
	ROAD / DIKE
	FARM ROAD
	ROAD IMPROVEMENT
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	INTAKE CULVERT

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY

Figure-14 Alternative Land-use Plan of Case-1 in Bacho Area



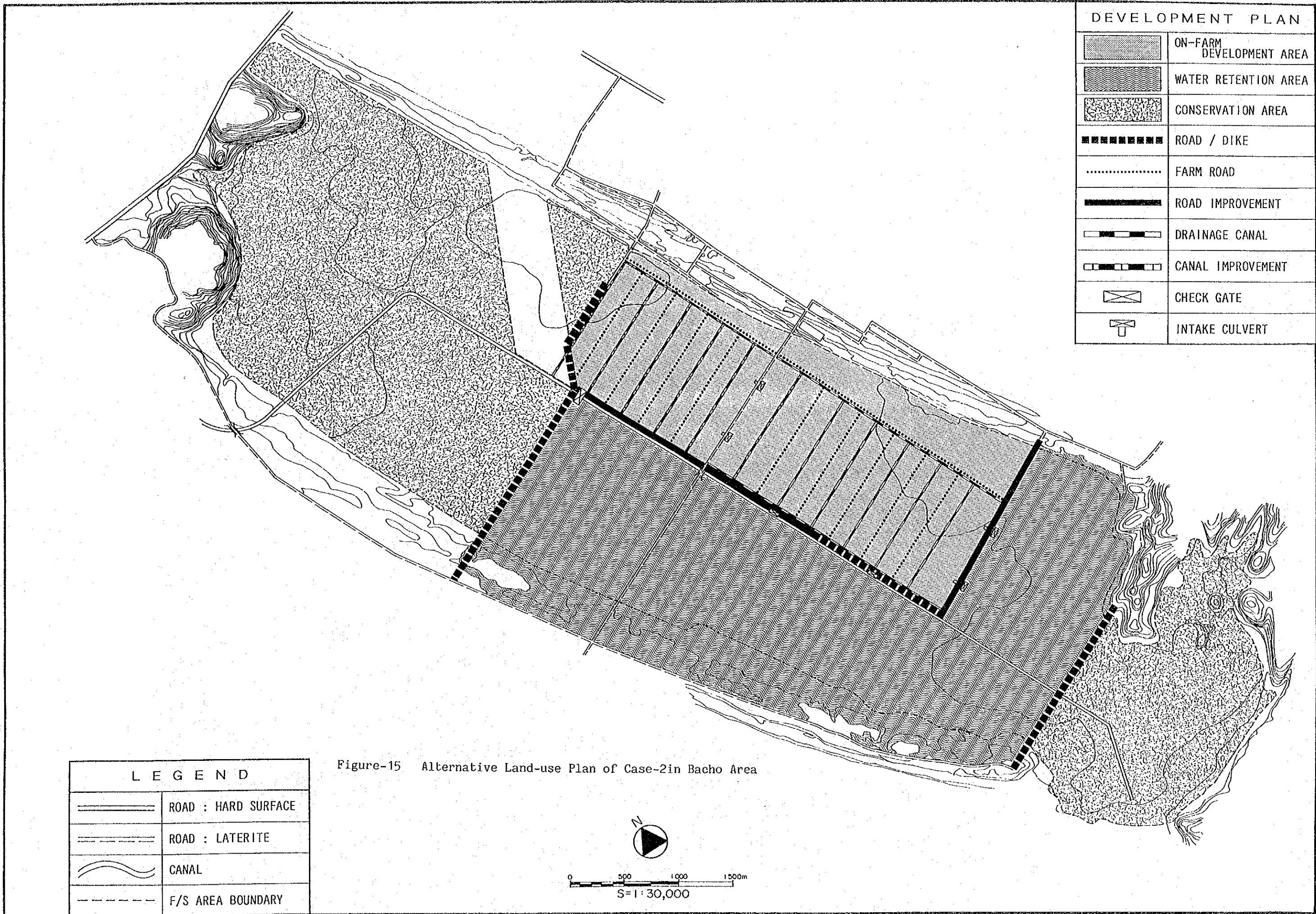
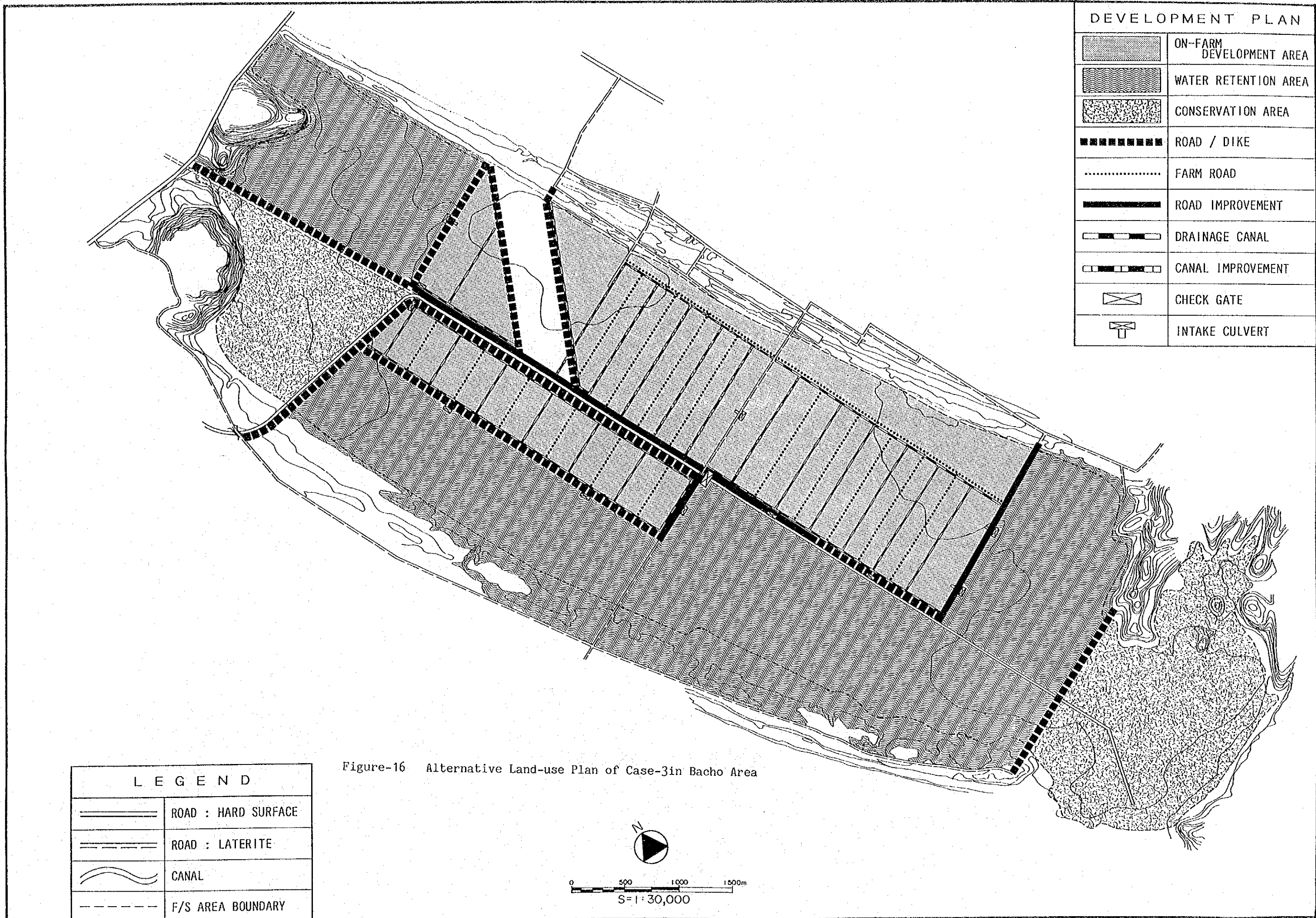


Figure-15 Alternative Land-use Plan of Case-2 in Bacho Area

L E G E N D	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY

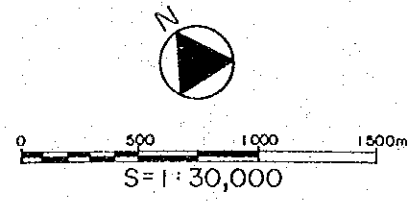
DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	WATER RETENTION AREA
	CONSERVATION AREA
	ROAD / DIKE
	FARM ROAD
	ROAD IMPROVEMENT
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	INTAKE CULVERT

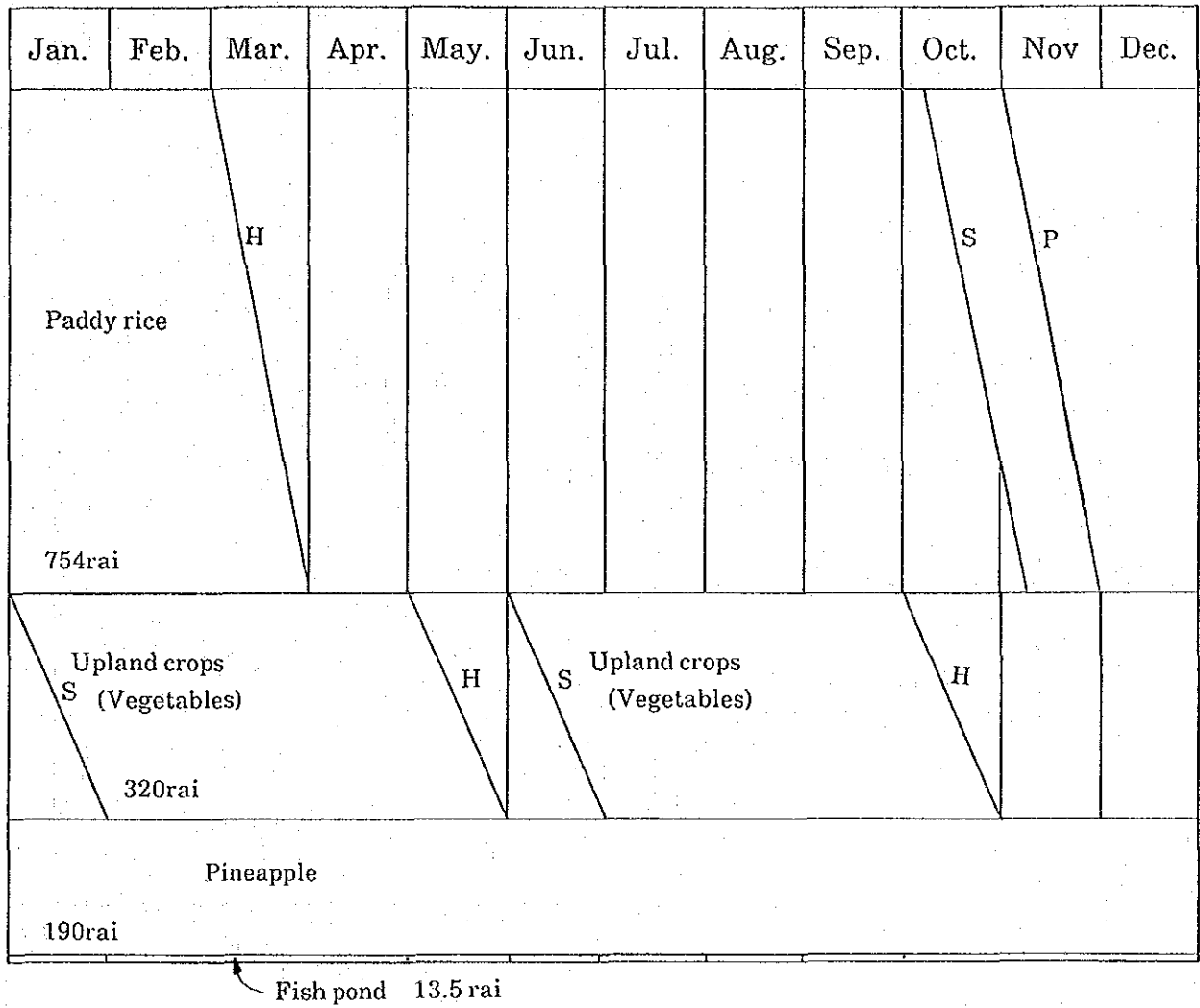


DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	WATER RETENTION AREA
	CONSERVATION AREA
	ROAD / DIKE
	FARM ROAD
	ROAD IMPROVEMENT
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	INTAKE CULVERT

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY

Figure-16 Alternative Land-use Plan of Case-3in Bacho Area





S : Sowing
 P : Planting
 H : Harvesting

Figure-17 Proposed Cropping Program (Bacho Area)

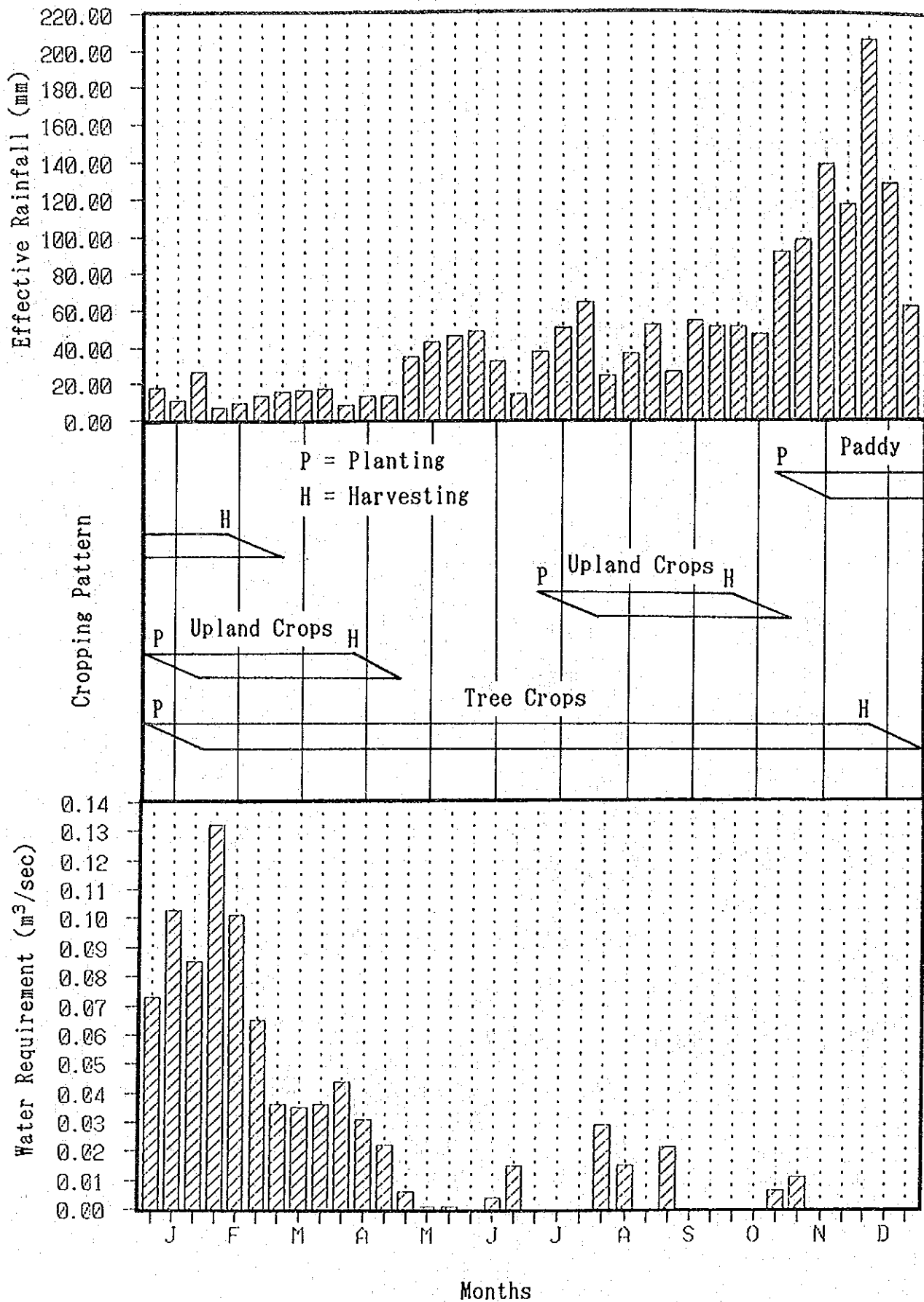
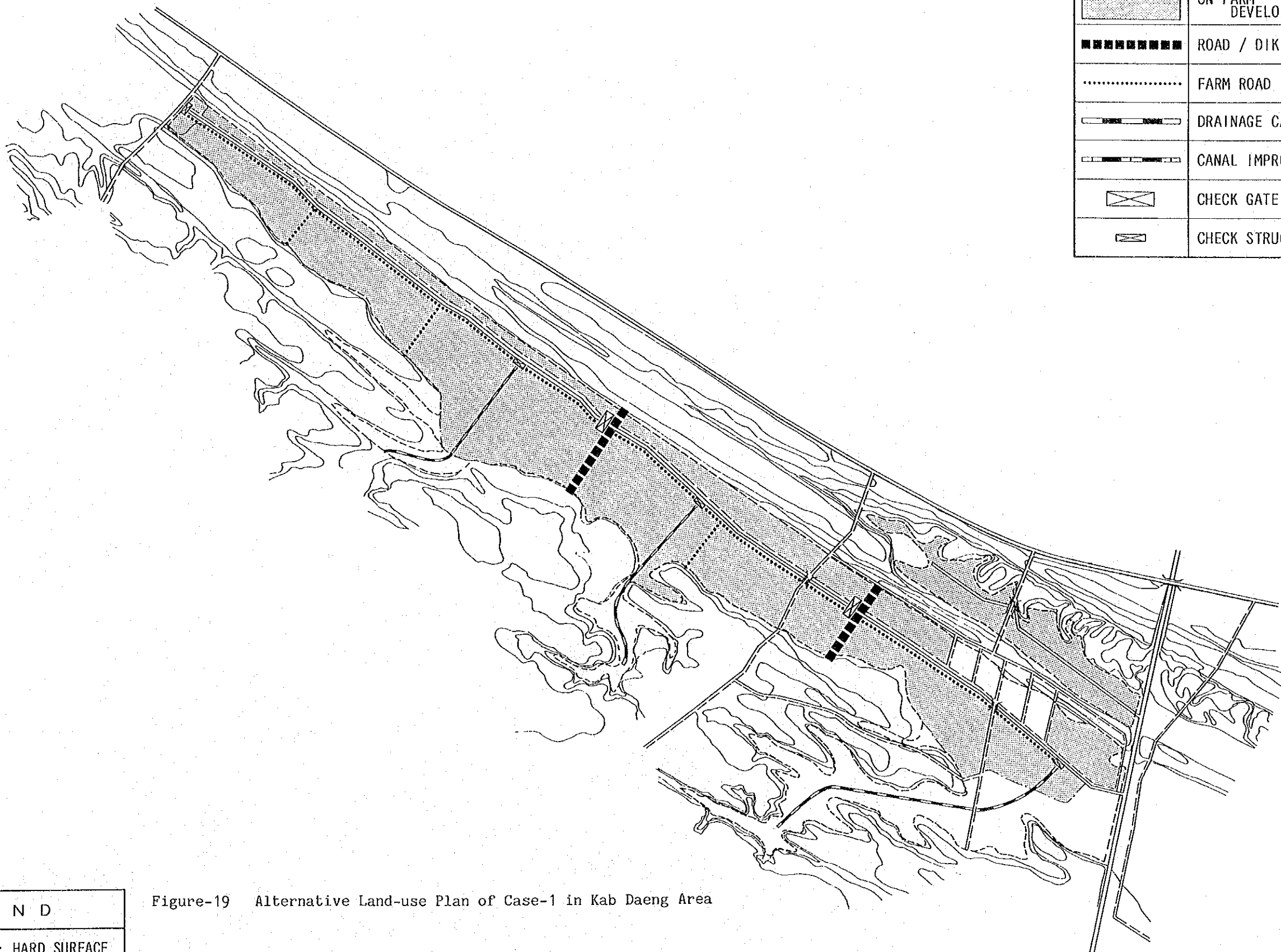


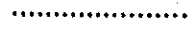
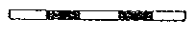
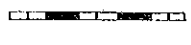




Figure-18 Seasonal Water Requirement (Bacho Area)



DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	ROAD / DIKE
	FARM ROAD
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	CHECK STRUCTURE

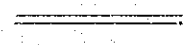
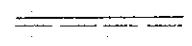

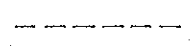
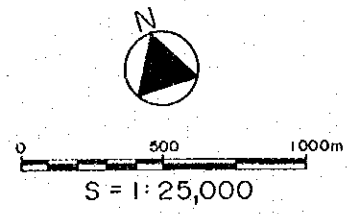
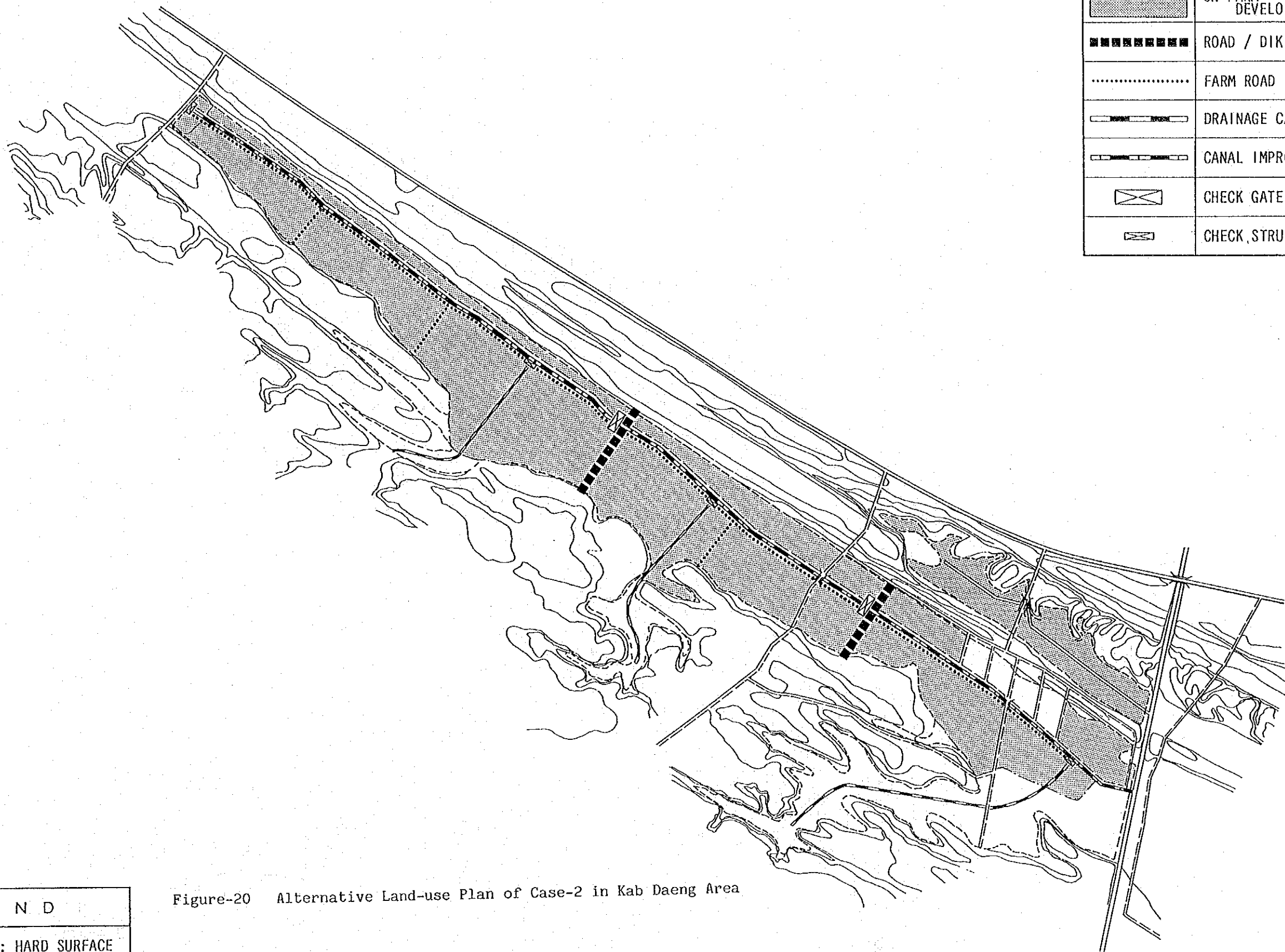
LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY

Figure-19 Alternative Land-use Plan of Case-1 in Kab Daeng Area

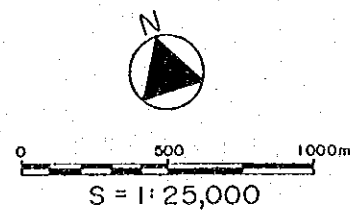


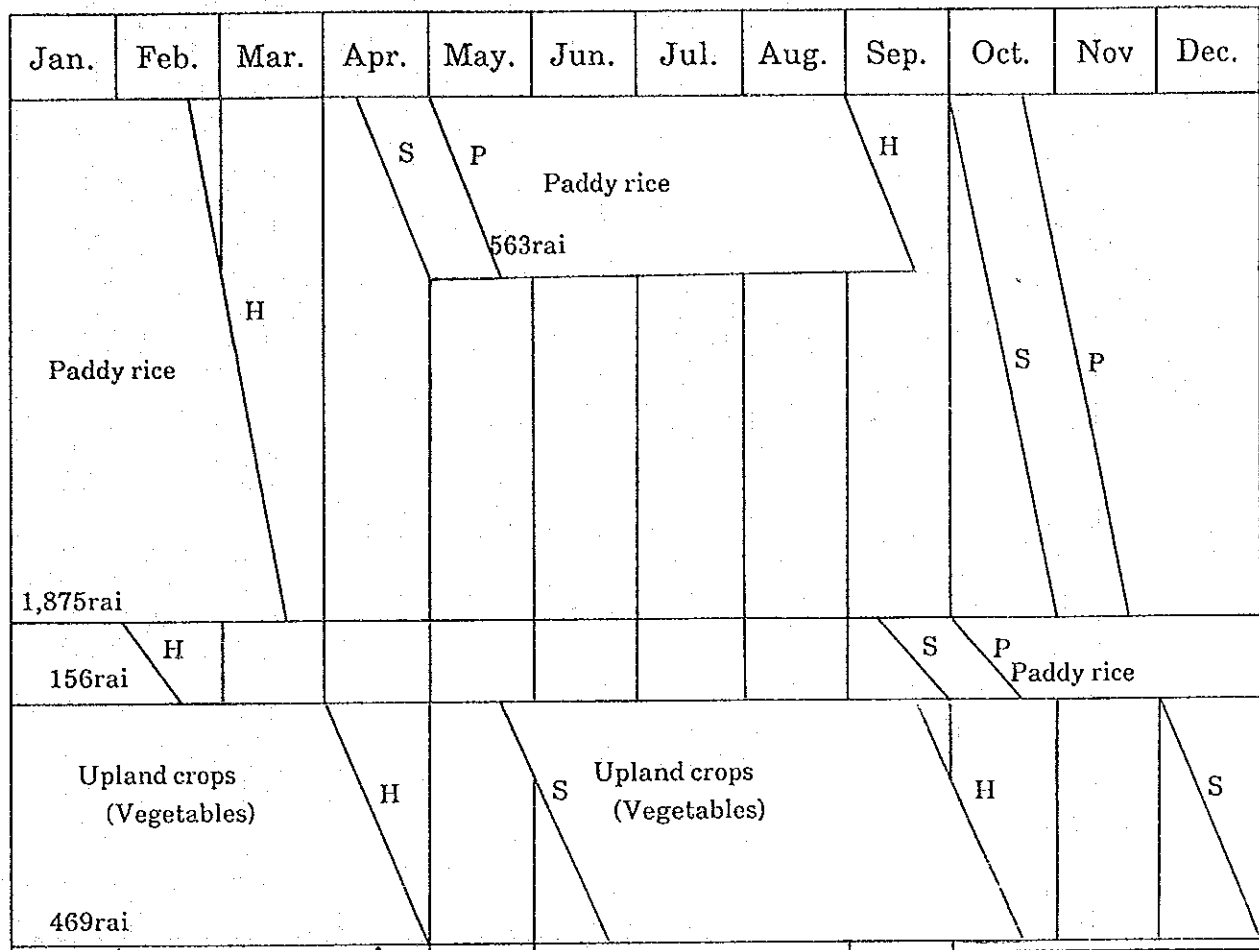


DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	ROAD / DIKE
	FARM ROAD
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	CHECK STRUCTURE

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY

Figure-20 Alternative Land-use Plan of Case-2 in Kab Daeng Area





Fish pond 12.5 rai

S : Sowing
P : Planting
H : Harvesting

Figure-21 Proposed Cropping Program (Kab Daeng Area)

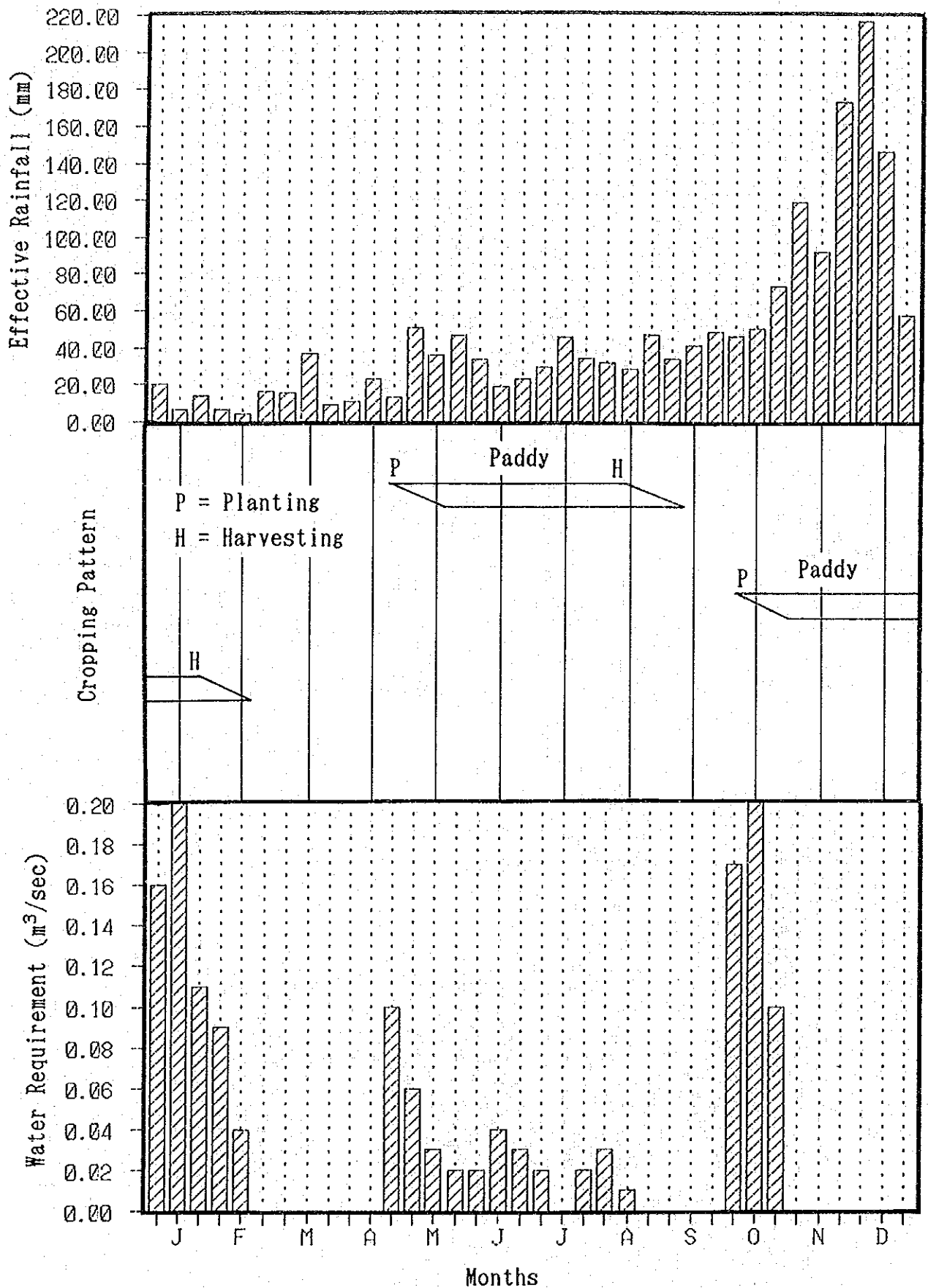



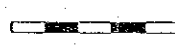





Figure-22 Seasonal Water Requirement (Kab Daeng Area)

DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	ROAD / DIKE
	FARM ROAD
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	GATE AND CULVERT

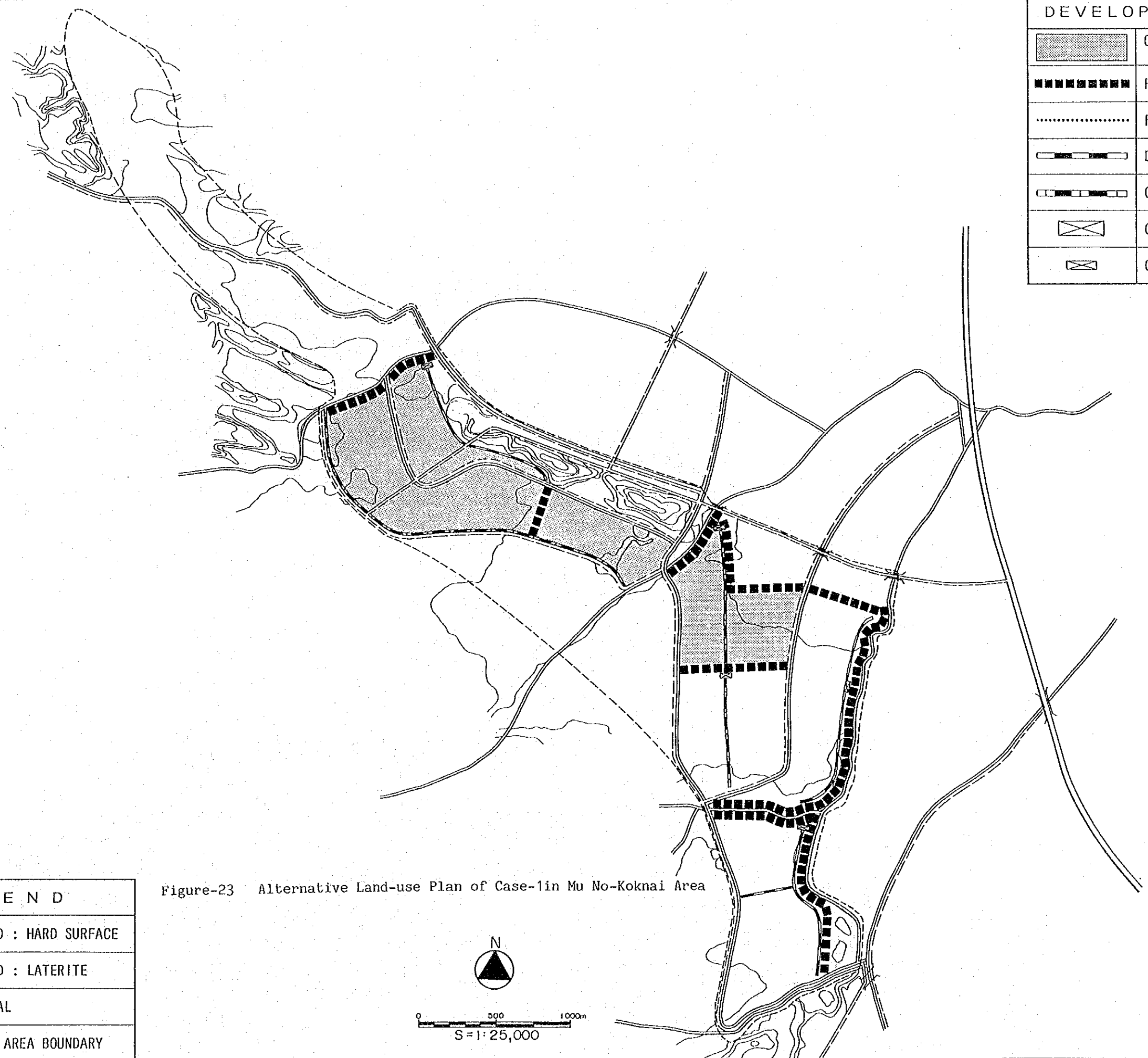
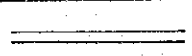
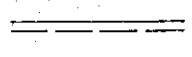

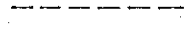
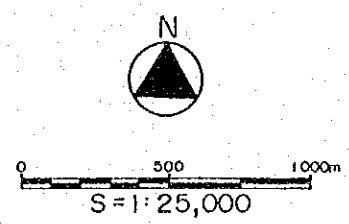
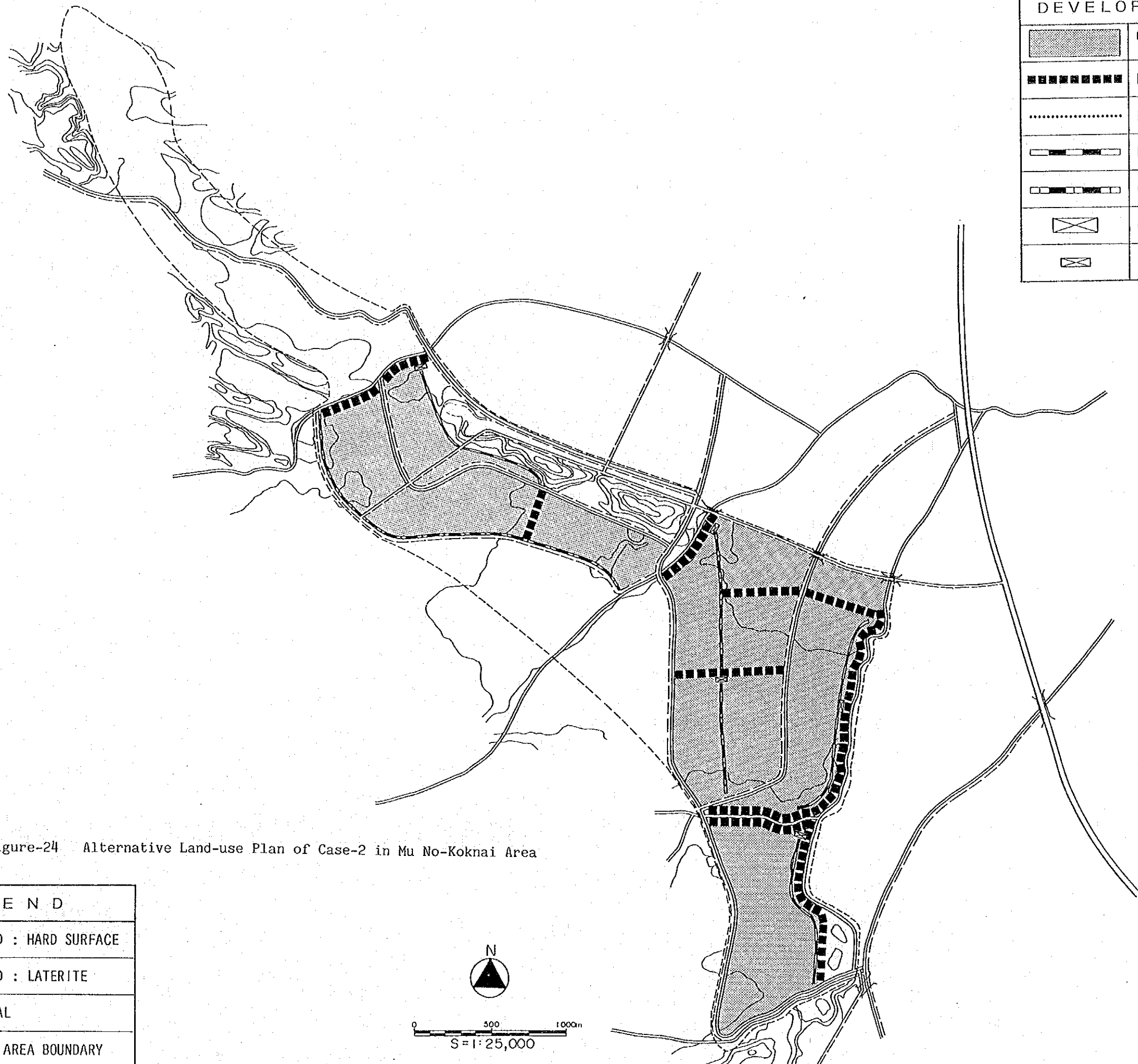


Figure-23 Alternative Land-use Plan of Case-1 in Mu No-Koknai Area

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY








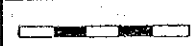



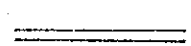
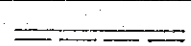

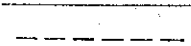
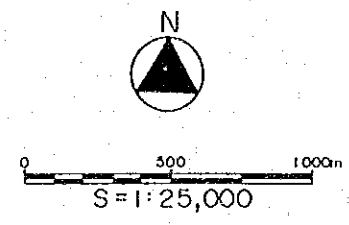
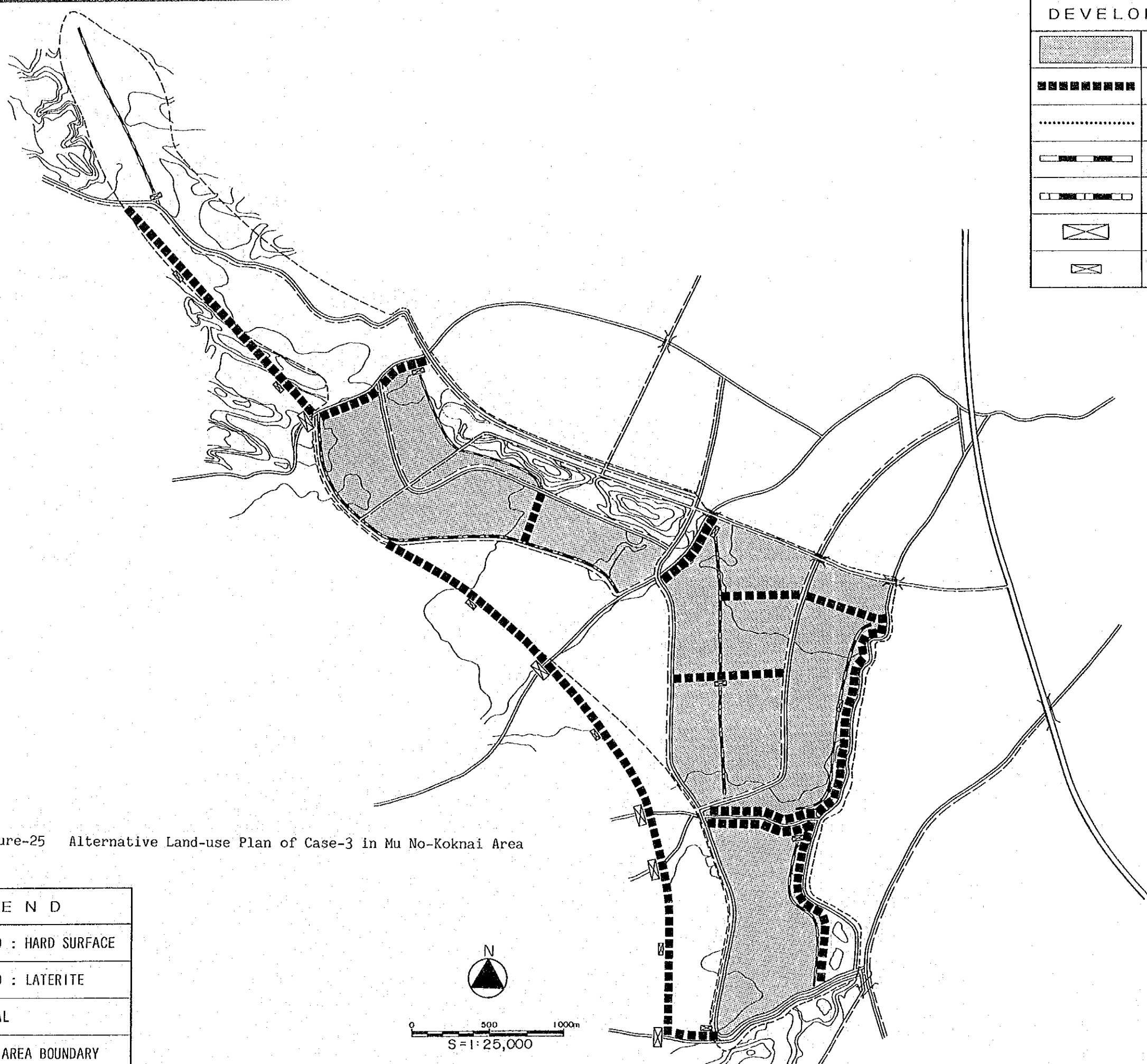
DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	ROAD / DIKE
	FARM ROAD
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	GATE AND CULVERT

Figure-24 Alternative Land-use Plan of Case-2 in Mu No-Koknai Area

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY





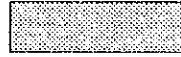



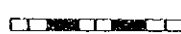
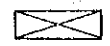
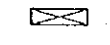
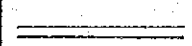
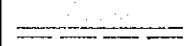
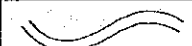
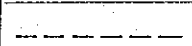
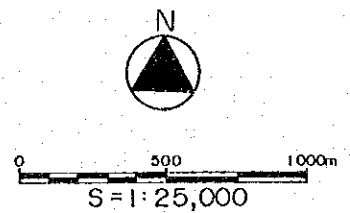
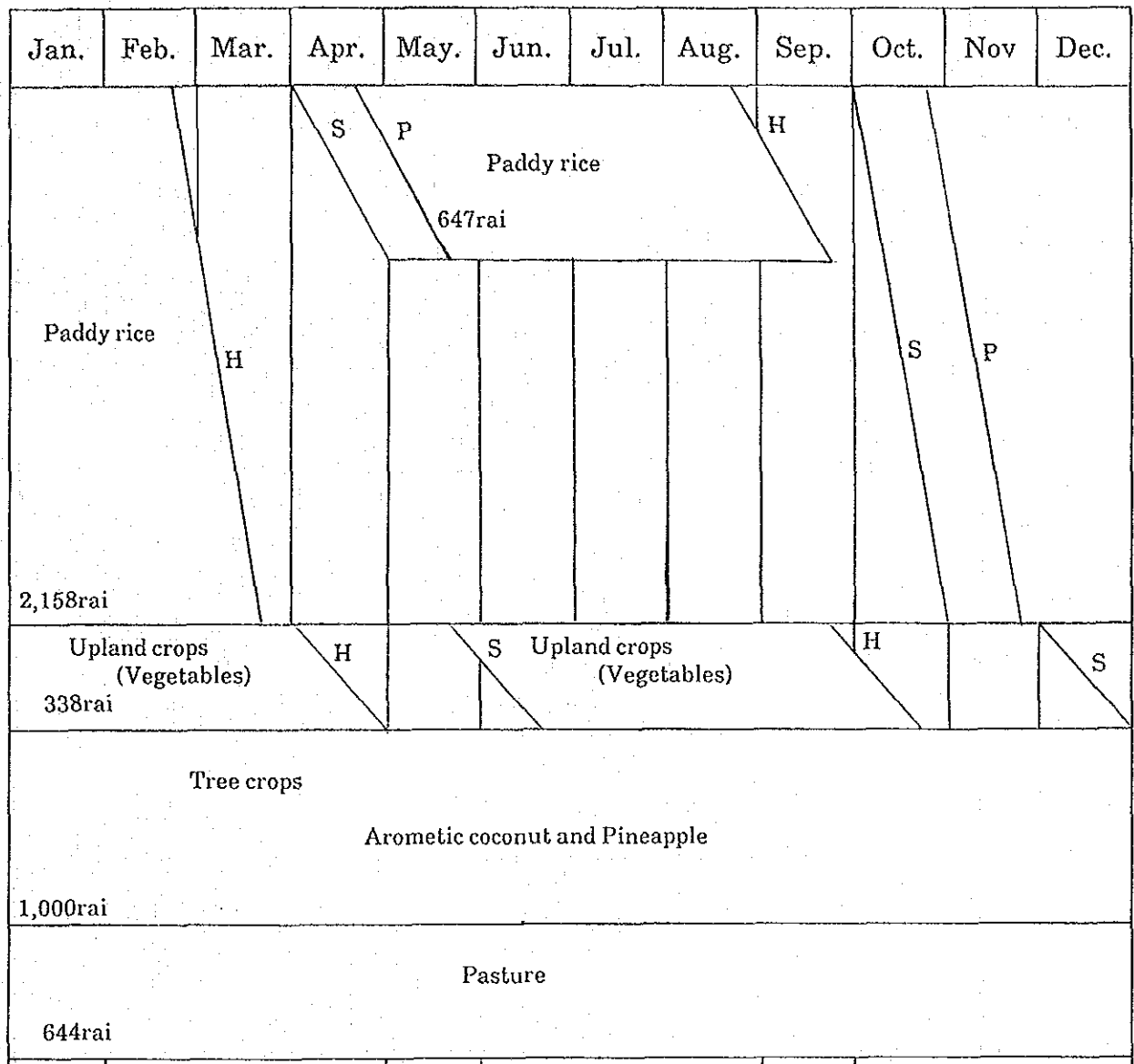
DEVELOPMENT PLAN	
	ON-FARM DEVELOPMENT AREA
	ROAD / DIKE
	FARM ROAD
	DRAINAGE CANAL
	CANAL IMPROVEMENT
	CHECK GATE
	GATE AND CULVERT

Figure-25 Alternative Land-use Plan of Case-3 in Mu No-Koknai Area

LEGEND	
	ROAD : HARD SURFACE
	ROAD : LATERITE
	CANAL
	F/S AREA BOUNDARY





Fish pond 16.25 rai

S : Sowing
P : Planting
H : Harvesting

Figure-26 Proposed Cropping Program (Mu No-Koknai Area)

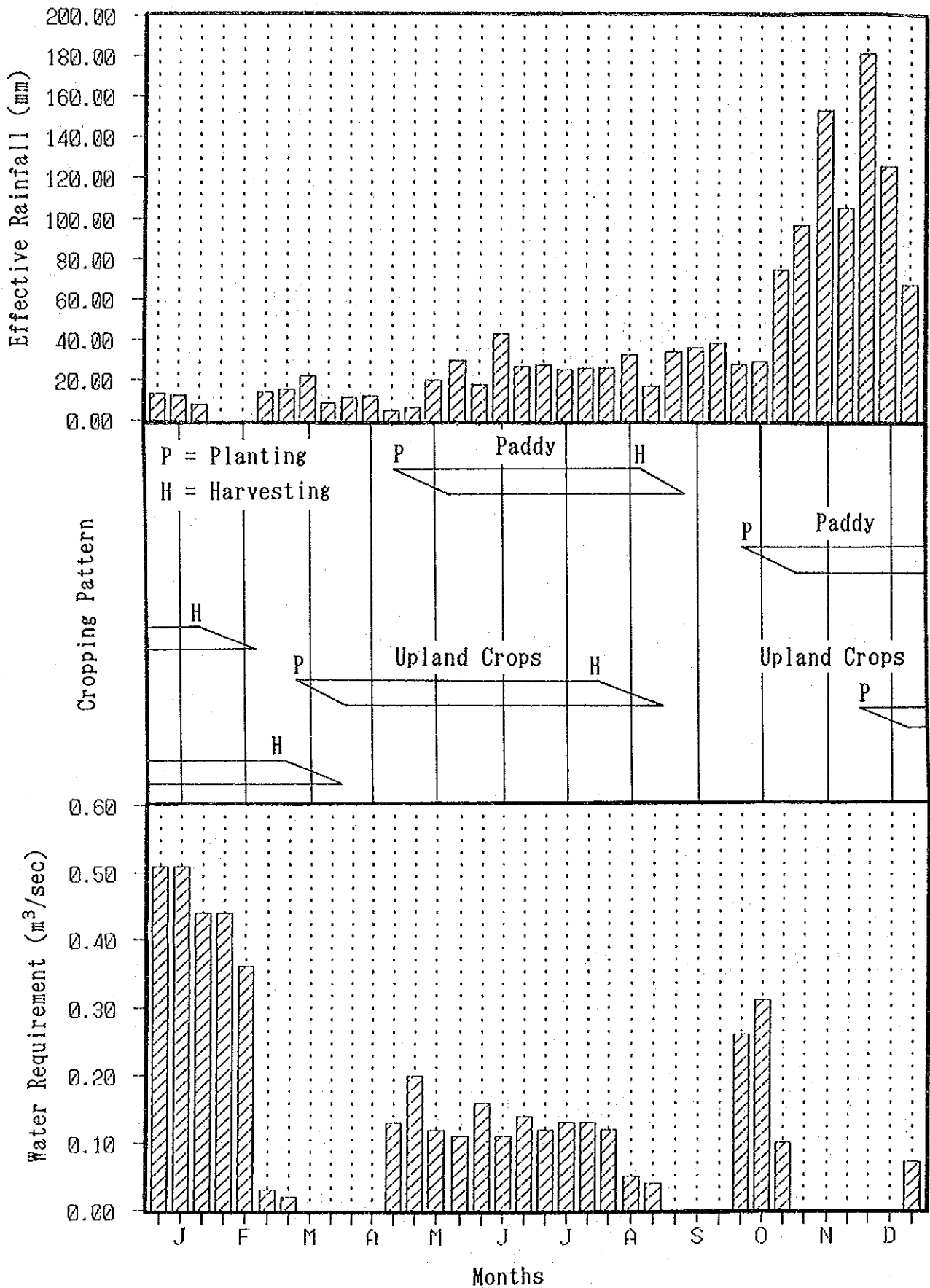


Figure-27 Seasonal Water Requirement (Mu No-Koknai Area)

CHAPTER 6

PROJECT IMPLEMENTATION PROGRAM

CHAPTER 6 PROJECT IMPLEMENTATION PROGRAM

6.1 Project Management and Implementation

6.1.1 Project Implementation Organization

(1) Project coordination and establishment of the related committee

Taking the historical background and difficulties of this kind of project into account, the Government agencies, including the provincial government, should organize a project coordination committee. In order to achieve this attempt to improve the provincial prosperity, DLD could not handle all the components, including the hardware and the software ones. Most of the components are under the management of the Ministry of Agriculture and Cooperatives. For the purpose of smoothly and successfully implementing these kinds of projects, the recommended committees should be organized at three levels of the Government, i.e., Project Executive Committee, Project Coordinating Committee and Project Working Committee, centering around the DLD and PRDSC. These committees basically will have the following functions:

- (a) to formulate policy and/or a program concerning the development of deserted swamp by forecasting the results for similar soil areas distributing in the southern region, and
- (b) to coordinate and solve various issues, and
- (c) to supervise progress of project implementation at various levels.

The details about the above mentioned ideas and a tentative composition and responsibility of those committees, are described in the Appendix B.

(2) Project executing agency

Under the Project Executive Committee, DLD shall be the executing agency with a project director, who shall work as a secretary of the Project Executive committee, and as a chairman of the Project Coordinating Committee. Under the project director, DLD shall be fully responsible for the all components by getting the support of PRDSC's committee members. In order to assist the project manager and the field project manager, it is planned to mobilize consultants, whose main activity is to provide technical assistance on preparation of the detailed design and supervision of the construction works.

On the other hand, it is also planned to mobilize a monitoring team, whose main activity is to monitor progress of project implementation and to review and solve problems and constraints hindering project implementation. Through the monitoring activity, valuable information can be obtained, which could contribute as a feedback system to the current project implementation as well as to similar projects in the future.

(3) Establishment of farmers' organization

Since the areas have not been used for farming so far. Regarding some attempted small scale projects, the development of Bacho land settlement cooperative area has failed except the sand dune portion, even though land allocation was done only to the certified settlers. By taking this fact and farmers with different religions and customs of life into consideration, farmers' organization must be established for Kab Daeng and Mu No-Koknai areas.

(a) Establishment of agricultural cooperatives

In order to play a vital role to extend improvement techniques and to aid inexperienced farming management, new cooperatives should be set up under the close cooperation and assistance of various organizations and agencies concerned.

A committee shall be formed of selected settlers by the Agricultural Promotion Department and/or PRDSC committee. The cooperative office dispatched from the Agricultural Cooperative Department shall be assigned as the chief of the cooperative, and the main staff of the office shall be appointed from the officers in Changwat and Amphoe.

The assigned officers should be trained at the Central Federation of Agricultural Cooperation in Bangkok and PRDSC about activities and services of the cooperatives.

The extension experts should join with the cooperative officers to organize the cooperative in the planning of the training program and its realization. The scope of services of the cooperative will be specified as follows:

- To promote the swamp development and the on-farm development smoothly
- To execute the water management
- To make timely and smooth supply of inputs materials and to rationalize the collection, storage, processing and marketing of the farm products

- To make a mechanization program and its realization by taking bearing capacity in the peat area into consideration, including operation and maintenance services
- To give guidance and training to the farmers about improved farming techniques
- To improve the overall farm management

As a sub-structure of the cooperative, it is planned to form some farming groups and organizations:

(b) Water Management Organization

Water management organization should be set up for all three project areas. In Bacho area, there is no irrigation system constructed by RID. On the other hand, Kab Daeng and Mu No-Koknai areas are expected to be irrigated in the near future. Therefore, activity programs for water management organizations are not the same. However, water management activity is very important, from the following viewpoints.

-In the peat area, bearing capacity is affected by the moisture contents of the soil.

-In the acid sulfate soil area, adequate leaching of acidity is indispensable for better farming.

Because of such reasons and in order to maintain and operate the related facilities, the water management organizations have a very important role. The organization should be set up by some unit groups formed by separating service areas under a main irrigation canal.

(c) Farm mechanization organization

In each area, agriculture development plan was formulated based on the current working level of farm mechanization. If intensive agriculture will be performed in the area in future, establishment of farm mechanization organization shall be examined, considering the following.

Lack of farmers' recognition and experience in farm mechanization inevitably will necessitate the organizing of farmers' groups and their management, so farmers can be given guidance on mechanized cropping and better utilization of the machines, as well as technical guidance and maintenance service.

In the first step of the mechanization, the farming machines will be employed in the model or trial farms for the purpose of testing its applicability and demonstrating its operation, which will be done under the intensive guidance of the experts concerned. It is recommended that the cooperative will process and manage the farming machines in the early stage of the mechanization; eventually, however, the farmers groups should take over the mechanized farming in the project areas.

6.1.2 Implementation Schedule

Project implementation schedule is planned for each area and programmed to allocate five to six years after completion of the feasibility study. It includes necessary procedure for fund arrangement, coordinating works, detailed design and tendering. Typical implementation schedule for each area is shown in Figure-28, 29 and 30.

6.2 Project Operation and Maintenance

6.2.1 Establishment of O/M Organization

(1) Organization

During the project implementation, agricultural supporting services will be carried out, in parallel with improvement and construction of infrastructures. Under the supporting service project, various activities for training on new agricultural skills are supposed to be carried out. Through their activities, it can be expected to establish operation and maintenance organizations by farmers themselves. In addition to such organizations, it is planned to establish an O/M organization from technical viewpoints, because it is required for further development in other similar soil areas to monitor progress of project and environmental change and to review problems and constraints against development. This organization will be established under the PRDSC. The required staff for this may be mobilized from proper governmental agencies under the leadership of DLD and PRDSC, if necessary.

(2) Management activities

Operation and maintenance will be carried out by established organization. The major tasks are as follows.

- To operate water management facilities in cooperation with RID.

- To rehabilitate constructed facilities such as road, canal, check structure etc.
- To monitor environmental effects.
- To review and arrange outcomes of the project.

(3) Required equipment and facilities

All of the equipment and facilities including office space can be taken over from agricultural supporting service project after completion of their services and construction works. The major ones are pick-up, tractor, trailer, hand sprayer, motor cycle and office.

6.2.2 Operation and Maintenance Cost

The operation and maintenance cost per annum are estimated as follows.

Bacho area	: 393,000 Baht
Kab Daeng area	: 323,000 "
Mu No-Koknai area	: 393,000 "

Item	Year	0	1	2	3	4	5	6	7
• Fund Arrangement		—							
• Project Coordinating Works		—	—						
- Land Expropriation		- - - -							
- Project Coordination		- - - -							
• Detailed Design		—							
• Tendering			—						
• Construction Works				—					
- Land Reclamation				- - - -					
- Infrastructure Facilities				- - - -					
- Supporting Service facilities				- - - -					
• Project Administration			—						
• Supporting Service Project					—				
• Consulting Service			—						
• Operation / Maintenance									- - - - ->

Figure-28 Typical Implementation Schedule (Bacho Area)

Item	Year	0	1	2	3	4	5	6	7
• Fund Arrangement		—							
• Project Coordinating Works		—	—						
- Land Expropriation		- - -	- - -						
- Project Coordination		- - -	- - -						
• Detailed Design		—	—						
• Tendering			—						
• Construction Works				—	—	—	—	—	—
- Land Reclamation				- - -	- - -	- - -	- - -	- - -	- - -
- Infrastructure Facilities				- - -	- - -	- - -	- - -	- - -	- - -
- Supporting Service facilities				- - -	- - -	- - -	- - -	- - -	- - -
• Project Administration			—						
• Supporting Service Project					—	—	—	—	—
• Consulting Service			—						
• Operation / Maintenance								- - -	→

Figure-29 Typical Implementation Schedule (Kab Daeng Area)

Item	Year	0	1	2	3	4	5	6	7
• Fund Arrangement		—							
• Project Coordinating Works		—	—						
- Land Expropriation		- - -	- - -						
- Project Coordination									
• Detailed Design		—	—						
• Tendering			—						
• Construction Works				—	—	—			
- Land Reclamation				- - -	- - -	- - -			
- Infrastructure Facilities				- - -	- - -	- - -			
- Supporting Service facilities				- - -	- - -	- - -			
• Project Administration			—						
• Supporting Service Project									
• Consulting Service			—						
• Operation / Maintenance									—>

Figure-30 Typical Implementation Schedule (Mu No-Koknai Area)

CHAPTER 7

PROJECT JUSTIFICATION

CHAPTER 7 PROJECT JUSTIFICATION

7.1 Basic Concept

The objective of this project is to promote agricultural development in the peat/acid sulfate soil areas that are widely distributed in the Narathiwat province. Generally speaking, the cost of this type of project to achieve some degree of agricultural production, is higher compared with projects in normal soil areas, making benefits from agricultural production low.

Improvement of peat/sulfate soil is a common theme in southern Thailand. Development of this type of land is considered as a basic condition, even in the Seventh National Development Plan, in order to achieve targeted growth rate in the agricultural sector. Expansion of cultivation areas in the past has caused a reduction in forest areas and has adversely affected the environment. In reconsidering this situation, the necessity of effectively using the problem soils with low productivity has become evident with national assistance.

Several soil problems are notable in the project area, such as farmers who do not possess land because of increased population pressures, an increase in the demand for agricultural land, and difficulties in stabilizing the civil administration, also existence of environmental problems such as swamp forest preservation and pollution by acid water. Considering the special characteristics of this area, the social benefits derived from the implementation of this agricultural development project are greater than the agricultural benefits. Therefore, the project is justified not only through its quantifiable benefits but also through a comprehensive perspective which considers the project's influence on the social economy and the environment.

In order to perform feasibility study (F/S) on the peat/sulfate soil area, the team selected three areas with different characteristics among the study areas and established a development plan for each area. These plans were created as development models which can be used in other similar soil areas. Pilot projects will be established for the three selected areas. After implementation of these projects, similar projects will be developed in similar soil areas based on the results of the implemented pilot projects. In this case, the most important issue for implementing sustainable agriculture is the establishment of adequate farming as parts of agricultural supporting services. Therefore, for the development projects in these three areas which is part of the initial developmental stage, a discussion of the economic viability which

includes agricultural supporting services is carried out. After the completion of the pilot projects, projects targeting the whole Narathiwat Province will be conducted in sequence, therefore the economic viability of implementing these projects is also discussed. Even though the investment for agricultural development in peat/sulfate soil is high compared with general agricultural development, this type of development will affect national land development, as it creates new economical land. However, it is difficult to quantify the benefits. So, this factor is not included.

7.2 Evaluation Method

Evaluation of the project's quantifiable benefits is judged through the following economic and financial analyses. The project's social benefits and influence on the environment are judged comprehensively through quantitative examinations.

7.2.1 Economic Evaluation

When implementing the project, economic evaluation is based on a cost-benefit comparison of how much the project contributes to the growth of the national economy. Analysis of the project's viability is expressed through economic indices such as the economic internal rate of return (EIRR), net present value (NPV), and benefit/cost ratio (B/C Ratio). As the initial investment is relatively large, the project will be judged by the economic internal rate of return.

7.2.2 Financial Evaluation

When implementing the project, the financial evaluation determines the financial viability of farm management by farmers who benefit directly from the project, and whether sustainable agriculture is possible. Current agricultural activities in the three F/S areas are negligible, so that the present production from these areas can be considered nil. Therefore, financial viability will be discussed, compared with the farms on the margin of the F/S areas. In order to do this, a model farm will be established for the study and judgment will be made through analyzing farm budgets when a model farm practices farming in the areas. As well, a loan repayment plan will be discussed for foreign currency borrowed from international financial institutions.

7.3 Project Benefits

7.3.1 Quantifiable Benefits

Direct benefits generated through the implementation of the project are viewed in terms of agricultural production benefits and benefits derived from inundation prevention. Agricultural production benefits consist of the production of crops and inland fisheries. In regard to benefits derived from inundation prevention, the number of inundated days where downstream paddy areas are flooded will be reduced by construction of a levee in the Mu No-Koknai area, which will also reduce inflow of acid water. The reduction of flooding period is considered a quantifiable benefit, since it gives stable condition for agricultural production. The same results are also expected in the Bacho and Kab Daeng areas. However, these two areas will not be quantified as it is difficult to determine the full extent of these effects.

7.3.2 Intangible Benefits

Non quantifiable and non quantified benefits will be generated through this project, along with the above quantifiable benefits, and these will be mentioned qualitatively.

7.4 Basic Evaluation Conditions

7.4.1 Evaluation Period

The project will be initiated in 1994, and the project life including the construction period is thirty years.

7.4.2 Initial Investment Period

As mentioned in Chapter 5, the initial investment period is six years for Bacho and Mu No-Koknai areas and five years for Kab Daeng area.

7.4.3 Opportunity Cost Rate of Capital

The opportunity cost rate of capital in Thailand is 10% to 15%. The same value is applied to this plan.

7.4.4 Price Level

The financial value is based on the 1992 market value.

7.4.5 Exchange Rate

The value of materials and services purchased with foreign currency is converted into Thai Baht. This is calculated by applying the October 1992 official foreign exchange currency ratio of US\$1.00=25 Baht.

7.4.6 Residual Value

The residual value after completion of the project will be trivial and is therefore ignored.

7.5 Economic Analysis

7.5.1 Economic Cost

The economic project cost consists of an initial investment which includes the costs of construction, project administration, agricultural supporting services, consulting services, and physical contingency. It also consists of operation and maintenance costs generated after the completion of construction. The agricultural production cost is not included as it is considered when quantifying benefits. The project cost is divided into foreign currency and local currency, and a conversion factor for construction of 0.88 is applied in order to convert local currency into an economic price. The following is the annual project cost for each area.

Annual Project Cost in the Bacho Area

(Unit : 1,000 Baht)

Year	Initial investment		O&M Cost		Total Cost	
	Financial	Economic	Financial	Economic	Financial	Economic
1994	5,017	4,934	0	0	5,017	4,934
1995	26,883	25,475	0	0	26,883	25,175
1996	32,358	30,045	0	0	32,358	30,045
1997	17,138	16,150	0	0	17,138	16,150
1998	4,612	4,591	0	0	4,612	4,591
1999	4,612	4,592	0	0	4,612	4,592
2000	0	0	323	284	323	284

Note: A conversion factor for construction 0.88 is applied in order to convert local currency into an economic price.

Annual Project Cost in the Kab Daeng Area

(Unit : 1,000 Baht)

Year	Initial investment		O&M Cost		Total Cost	
	Financial	Economic	Financial	Economic	Financial	Economic
1994	4,704	4,633	0	0	4,704	4,633
1995	32,678	30,132	0	0	32,678	30,132
1996	43,088	40,070	0	0	43,088	40,070
1997	6,407	6,394	0	0	6,407	6,394
1998	4,742	4,729	0	0	4,742	4,729
1999	0	0	393	346	393	346

Note: A conversion factor for construction 0.88 is applied in order to convert local currency into an economic price.

Annual Project Cost in the Mu No-Koknai Area

(Unit : 1,000 Baht)

Year	Initial investment		O&M Cost		Total Cost	
	Financial	Economic	Financial	Economic	Financial	Economic
1994	6,545	6,461	0	0	6,545	6,461
1995	39,457	37,289	0	0	39,457	37,289
1996	47,274	48,190	0	0	47,274	48,190
1997	25,474	23,879	0	0	25,474	23,877
1998	4,632	4,608	0	0	4,632	4,608
1999	4,632	4,608	0	0	4,632	4,608
2000	0	0	393	346	313	346

Note: A conversion factor for construction 0.88 is applied in order to convert local currency into an economic price.

7.5.2 Economic Benefits

The benefits of this projects lie in the increase of agricultural production as a result of irrigation and agricultural supporting services and reduction of damage from inundation prevention. An incremental benefit approach method, which compares areas where projects are implemented with where they are without, is used to calculate benefits. The benefits in this article are quantifiable as mentioned above, and intangible and non quantifiable benefits are not considered. Among the agricultural products and input, the

economic price is calculated based on the information from the International Bank for Reconstruction and Development related to the international trading goods. The conversion factor is applied to domestic trading products. The total economic benefits generated through the project are as follows.

Unit : 1,000 Baht

Items/Areas	Bacho	Kab Daeng	Mu No-Koknai
1. Agricultural Benefit	97,355	147,291	219,493
2. Fishery Benefit	12,183	13,924	18,275
3. Inundation presentation Benefit	0	0	11,948
Total Benefit	109,538	161,215	249,716

(1) Incremental Production Benefits for Agricultural Products

Incremental production benefits for agricultural products include benefits related to crops and fishery products. Insignificant crop cultivation can be seen at the present time in Mu No-Koknai and Kab Daeng, however, crop production benefits are expressed as the difference between total production of areas where the project is implemented and that of areas where it is not. The benefits for fishery products are calculated in the same manner as the crops.

When benefits reach the stable level, the incremental production benefits are expected to reach a value of 3,950 thousand Baht for Bacho, 5,906 thousand Baht for Kab Daeng and 9,391 thousand Baht for Mu No-Koknai (refer to Appendix I).

(2) Damage Reduction Benefits by Inundation Prevention

A dike to be constructed in the Mu No-Koknai area will reduce the number of inundated days in the downstream paddy fields located outside of the project area, and will also prevent pollution by acid water. A three to four days reduction is predicted to produce a 10% increase in rice production over the present level without dike. This reduction of flood damage is quantified as a agricultural benefit.(refer to Appendix I)

7.5.3 Intangible Benefits

Non quantifiable and non quantified benefits will be generated through implementation of the project and the following effects are expected.

(1) Bacho area

① Prevention from trespassing on the conservation and preservation zones.

Through the systematic development, it will be possible to prevent from trespassing on the conservation/preservation zones being caused by current disorganized development. As a result, it will help environmental conservation in the swamp area.

② Mitigation of acid water pollution

Acid water pollution in the downstream low-lying land will be mitigated by controlling outflow from the upstream area.

③ Control of excessive drainage

Inundation damage will be reduced in the downstream agricultural land by controlling excessive drainage, through temporary retention of rain water in the upstream area.

④ Prevention of undesirable burning and wastage of peat

New water conservation plan will keep the peat wet, which will prevent unexpected burning and wastage of peat.

⑤ Enlightenment for the conservation of swamp

Adequate farming practices and limitation of farming will be enlightened, which will conduct the conservation of swamp area.

(2) Kab Daeng area

① Prevention of disorganized development

The project will limit or even stop current random development and will prevent man-made environmental destruction through the introduction of systematic development and farming practices.

② Drainage control of acid water

Present drainage condition of acid water will be improved by introduction of better water management system.

(3) Mu No-Koknai area

① Prevention from trespassing on the To Daeng swamp

Proposed systematic development will stop farmers from disorganized attempts on the conservation and preservation zones, which is useful for conservation of valuable ecosystem in the To Daeng swamp.

② Recovery of the lost green

New proposed cropping system will compensate the lost green.

③ Propagation of new farming techniques for acid sulfate soil area

Adequate farming method and its limitation in the acid sulfate soil area will be enlightened through execution of the project.

(4) General effects for three areas

① Supply of new farm land

New land can be supplied to the farmers who do not have farmland.

② Stable Supply of Major Food Sources

The production of rice and vegetables will contribute to increasing the food self-sufficiency ratio in the regional society.

③ Promotion of Agricultural-related Industries

The promotion of agricultural-related industries such as sale of agricultural products and agricultural input materials/equipment are expected through the project.

④ Creation of Employment and Income Improvement

Fifty percent of the project cost will be supplied through local currency. An equivalent amount of local materials and machines will be purchased, and the resulting labor force related to construction will create employment opportunities and improve the levels of income.

⑤Effects of Agricultural Technology

Adequate farming will be established mainly in the project areas and a repercussion effect will be extended in the surrounding areas.

7.6 Economic Internal Rate of Return

The economic internal rate of return is judged through a comparison with the opportunity cost rate of capital. This is done in order to assess the contributions that the project can make to the national economy. While it is said that the opportunity cost rate of capital in Thailand is 10% to 15%, 10% is adequate for southern Thailand. The project's economic internal rate of return (E.I.R.R) is as follows.

Evaluation as a General Development Project

F/S Areas	E.I.R.R(%)
Bacho	1.3
Kab Daeng	4.7
Mu No-Koknai	5.4

The above values are fairly low compared with the opportunity cost rate of capital. Thorough water control and adequate farming, including the selection of crops, are the basis for agricultural development in peat/sulfate soil areas. Since the plan takes this basis into consideration, the improvement level for agricultural infrastructure is higher than ordinary agricultural development. As well, agricultural supporting services from the perspective of technology and management are incorporated to engage farmers in a sustainable agriculture. The services are necessary for the pilot project as a first approach. However, using the result of the pilot projects, the necessity of supporting activities for new projects in similar areas will diminish as outcomes from the first project become available. The economic viability for this case that do not include the cost for agricultural supporting services and develop into the whole development zone is also discussed.

For Cases that Exclude the Agricultural Supporting Service Cost

Development Types	E.I.R.R (%)
Bacho Type	6.6
Kab Daeng Type	8.9
Mu No-Koknai Type	9.7

As a result of calculations, the economic internal rate of return is 6.6% to 9.7%. Because of the special characteristics of the project, agricultural infrastructure development costs are 25% to 30% higher than usual. Therefore, the economic viability is low compared with the opportunity cost rate of capital.

7.7 Financial Analysis

The financial analysis of the project is discussed through an analysis of farm budgets and foreign loan repayment plan.

7.7.1 Farm Budget Analysis

Standard farm models for planning are made for three areas based on the surrounding agricultural condition due to no productive activities in the areas. The scale of land possession is determined based on a farm economic survey by each area. Major features of the standard models are shown in Appendix I. The farm economic surplus is calculated based on these features and production plan, as follows.

Farm Economic Surplus in the Bacho Area

Unit : Baht

Items	Without Project *1	With Project *2
1. Farm income	11,125	32,253
2. Non farm income	33,307	16,654
3. Total income	44,432	48,907
4. Farm household expenditure	30,925	30,925
5. Farm economic surplus	13,507	17,982

Farm Economic Surplus in the Kab Daeng Area

Unit : Baht

Items	Without Project *1	With Project *2
1. Farm income	11,744	42,368
2. Non farm income	35,960	17,980
3. Total income	47,704	60,348
4. Farm household expenditure	29,071	29,071
5. Farm economic surplus	18,633	31,277

Farm Economic Surplus in the Mu No-Koknai Area

Unit : Baht

Items	Without Project *1	With Project *2
1. Farm income	12,562	60,189
2. Non farm income	22,192	11,096
3. Total income	34,754	71,285
4. Farm household expenditure	29,751	29,751
5. Farm economic surplus	5,003	41,534

Note (*1) Farm economic survey

(*2) The figures at 7th year when the farm economy becomes stable.

As a result, the financial value of agricultural incomes will increase by approximately 21,000 to 48,000 Baht, and the farm economic surplus will increase by about 4,500 to 37,000 Baht, and farm management will be improved better than the present one, in regard to the farm management balance.

However, 18,000 to 26,000 Baht are necessary as management capital in any area for the initial year. In this case, it is predicted that the management fund will be borrowed from the Bank of Agriculture and Agricultural Cooperatives. It is possible for new settlers to return the money after a three years repayment period at a yearly interest rate of 12% (refer to Appendix I).

7.7.2 Foreign Currency Repayment Plan

The project's repayment plan for foreign currency borrowed from international financial institutions is shown in Appendix I. Total interest and principal repayment of three projects reach a maximum of 13.481 million Baht in the sixth year. This is equivalent to approximately 0.043% of the

1990/1991 budget of the Ministry of Agriculture and Agricultural Cooperative and approximately 1.1% of that of the DLD.

7.8 Comprehensive Evaluation

As a result of the economic evaluation, the economic viability of this project is considered low, suggesting that the project is not an appropriate investment. However, if appropriate agricultural supporting services and agricultural loans are obtained at the farmer's level, it will be possible to continue financially healthy agricultural operations. Furthermore, many social benefits and positive effects on the environment can be expected as non quantifiable benefits.

This project makes it possible to supply land to farmers who do not have agricultural land. This point is often spoken of as a social problem. It will also lead to the creation of agricultural employment opportunities. As well, the project contributes to the improvement of the self-sufficiency ratio in the Narathiwat Province, which depends on imports for its major foods, and stabilize its food supply.

In regard to environmental prospects, the project can stop random development by illegal settlers and can prevent man-made environmental destruction through systematic development. This implies that adequate farming practice and the limitation of farming will inform illegal settlers and farmers, which brings an enlightenment for the conservation of swamp area. In addition, flood damage inside and outside of the project area will be reduced by the construction of dikes, and the inflow /outflow of acid water will be controlled. While decomposition and subsidence of peat continues to progress, because of the constructed drainage channel earlier in the project area, it will be possible to control the water level in order to reduce this disappearance of natural resources. It will be expected to reduce the burning on a daily occurrence through nature and man. In Kab Daeng area, drainage water will flow into the Bang Nara river or into the ocean, and then the influence on the surrounding area will be small. As well, the project areas are selected from the development zone designated by the Thai government. Therefore, the negative impact in the surroundings, from the perspective of environmental preservation, is expected to be small.

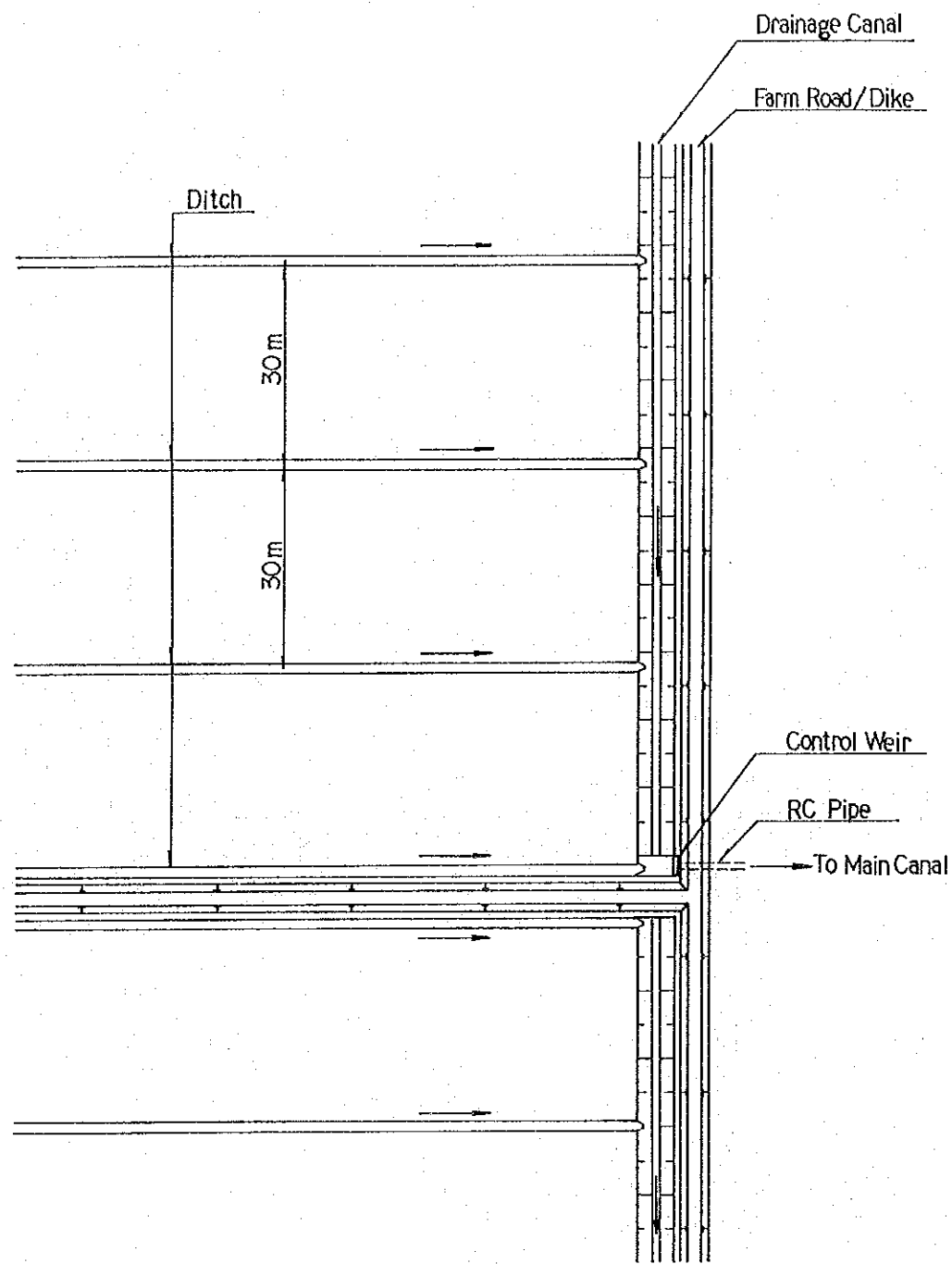
According to the National Development Plan, necessary budgetary measures for the utilization of waste land for agricultural expansion is an urgent issue. This project meets the aims of national development policy. Although

the economic viability in a quantifiable sense is low, the project will produce many social benefits such as response to an increase in the demand for agricultural land and the enlightenment on effects for the conservation of natural environment in agricultural land.

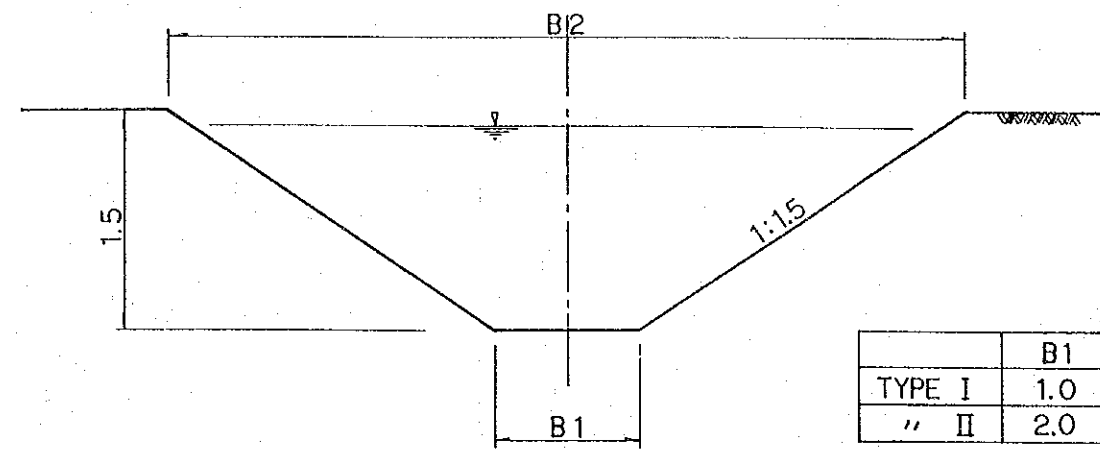
In this study, three areas with different characteristics were selected from the development zone in the swamp area, and development plans were formulated for each area. The development concepts derived from this study could be applicable to about 12,700 ha of other similar soil areas, as whole development zone after completion of the pioneer projects in the three areas, the project definitely could contribute to rural development for creation of new agricultural land, increase in agricultural production, stabilization of farmer's lives and conservation of regional environment. To that end, the agricultural supporting service activities should be launched early for study, research and training on farming practices.

The study team provided the test field in the Bacho and Mu No-Koknai areas for research on soil improvement method and carried out some examinations. The results are summarized in the Technical Guideline and Appendix J. These examinations should be succeeded as one of agricultural supporting services.

DRAWINGS

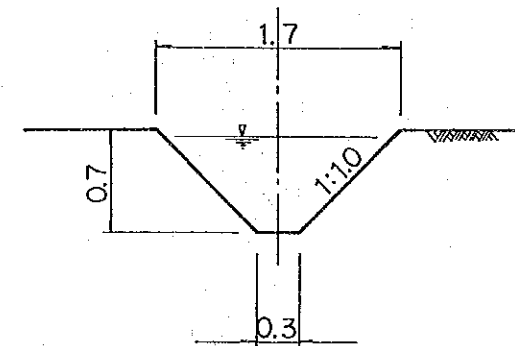


SCHEMATIC DIAGRAM OF ON-FARM DEVELOPMENT NETWORK/STRUCTURES



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DRAINAGE CANAL



DITCH

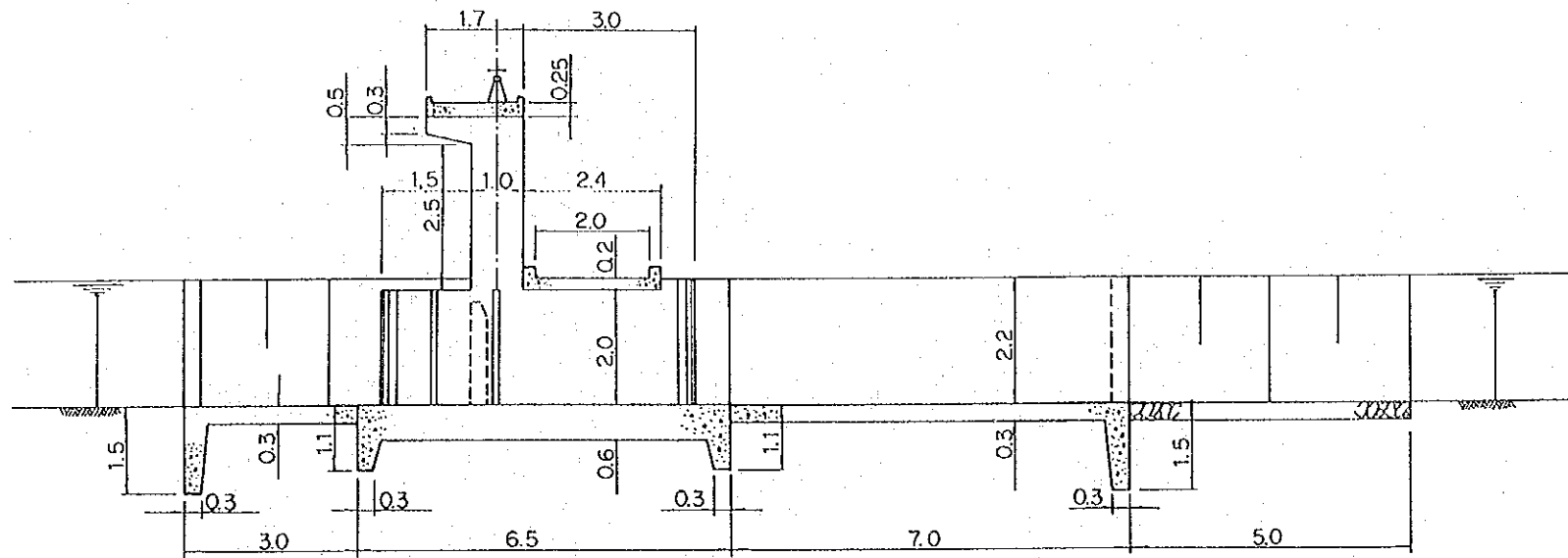
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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
FOR PEAT/ACID SULFATE SOIL AREAS
IN NARATHIWAT PROVINCE

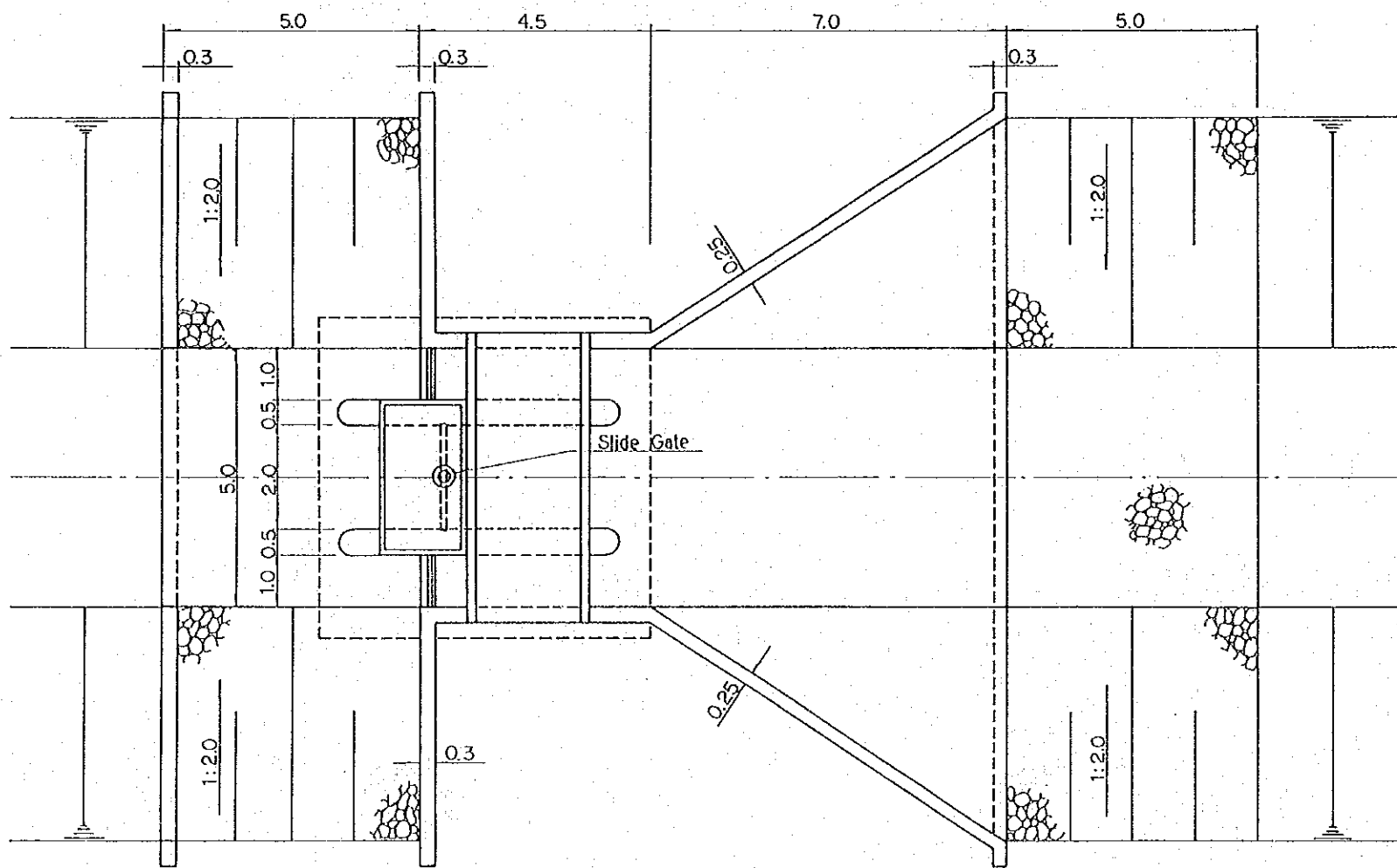
DRAINAGE CANAL, DITCH

DRAWING NO. 1 DATE

JAPAN INTERNATIONAL COOPERATION AGENCY



PROFILE



PLAN

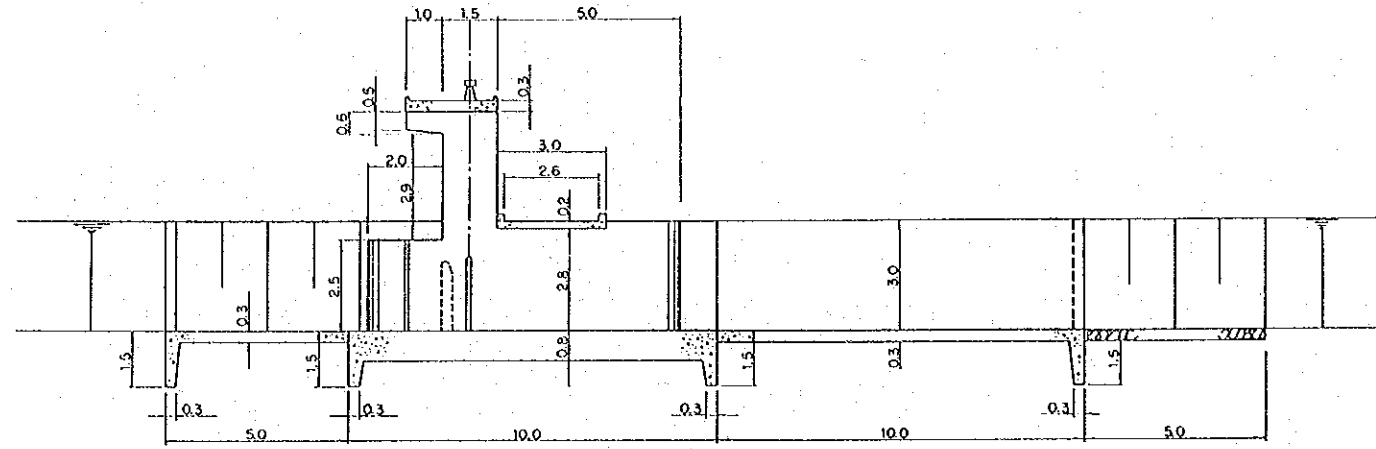
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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
FOR PEAT/ACID SULFATE SOIL AREAS
IN NARATHIWAT PROVINCE

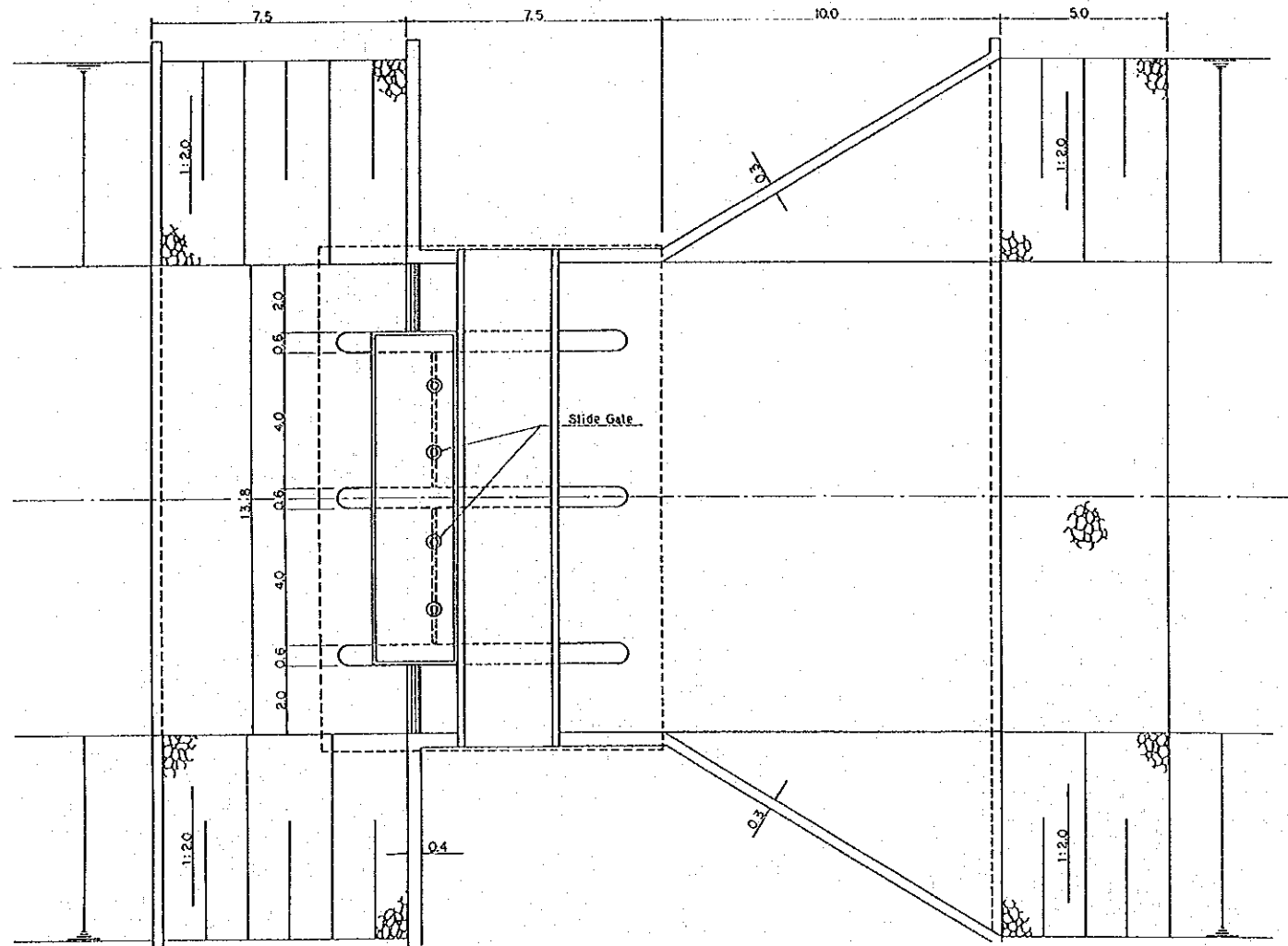
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DRAWING NO. 2 DATE

JAPAN INTERNATIONAL COOPERATION AGENCY



PROFILE



PLAN

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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
FOR PEAT/ACID SULFATE SOIL AREAS
IN NARATHIWAT PROVINCE

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DRAWING NO.	3	DATE	
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JAPAN INTERNATIONAL COOPERATION AGENCY

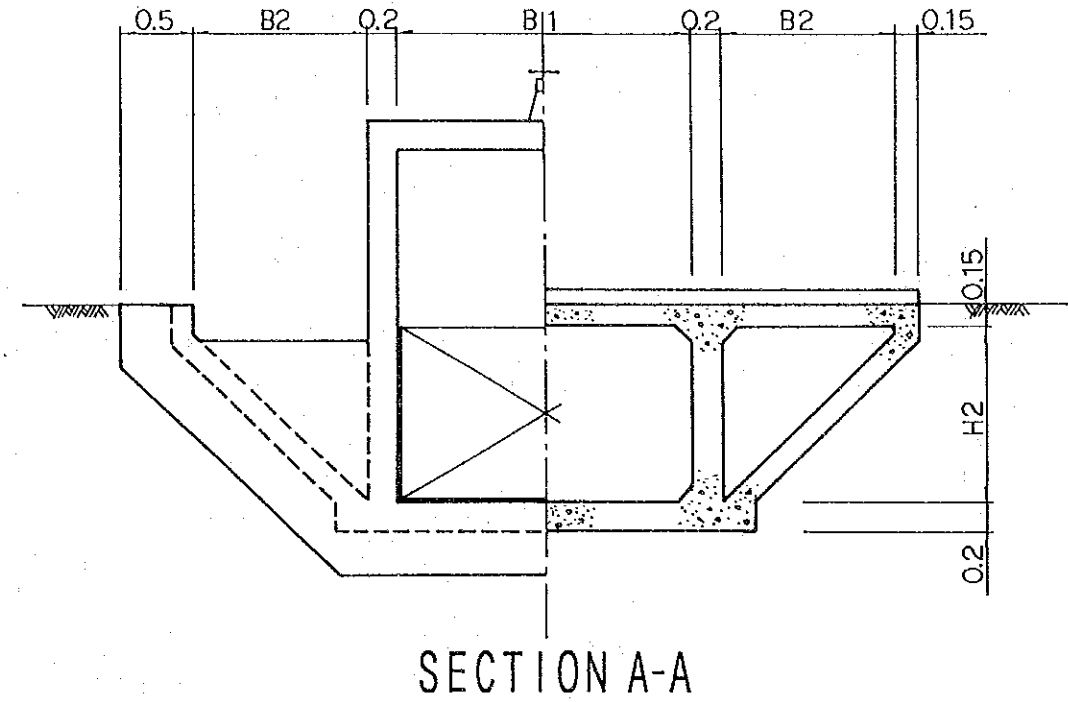
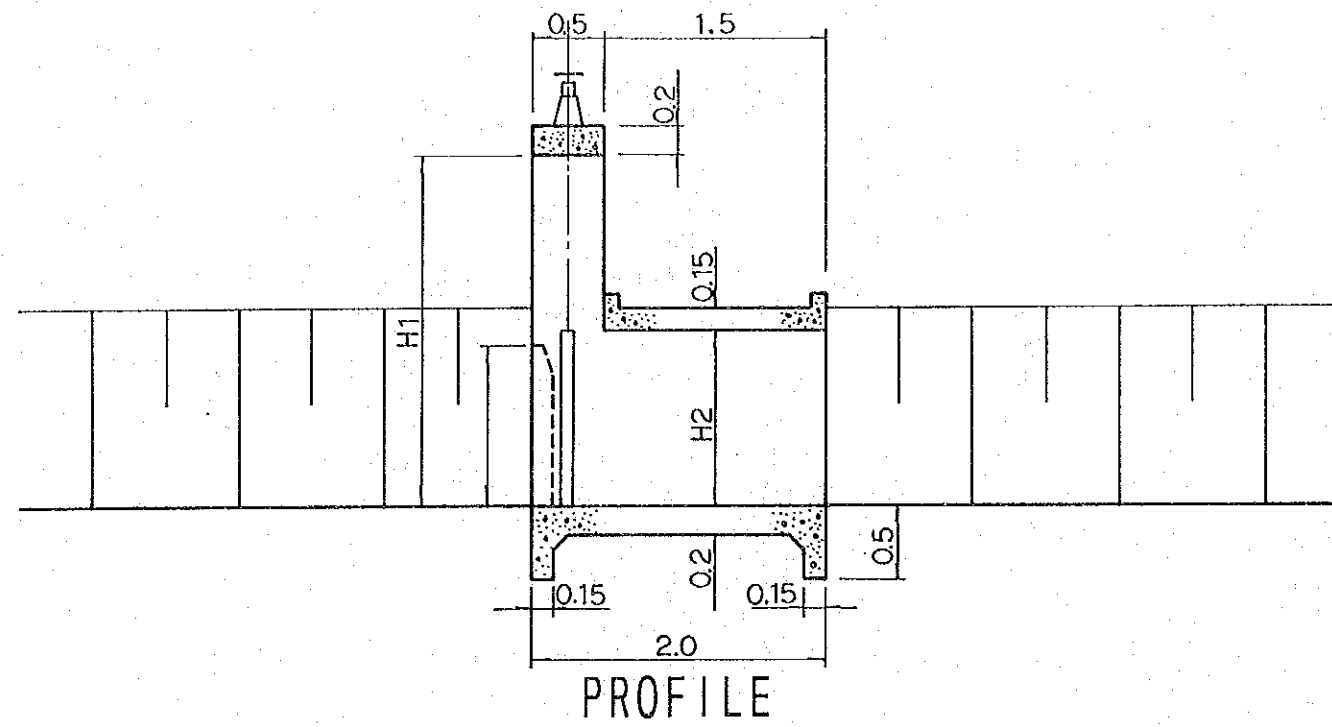
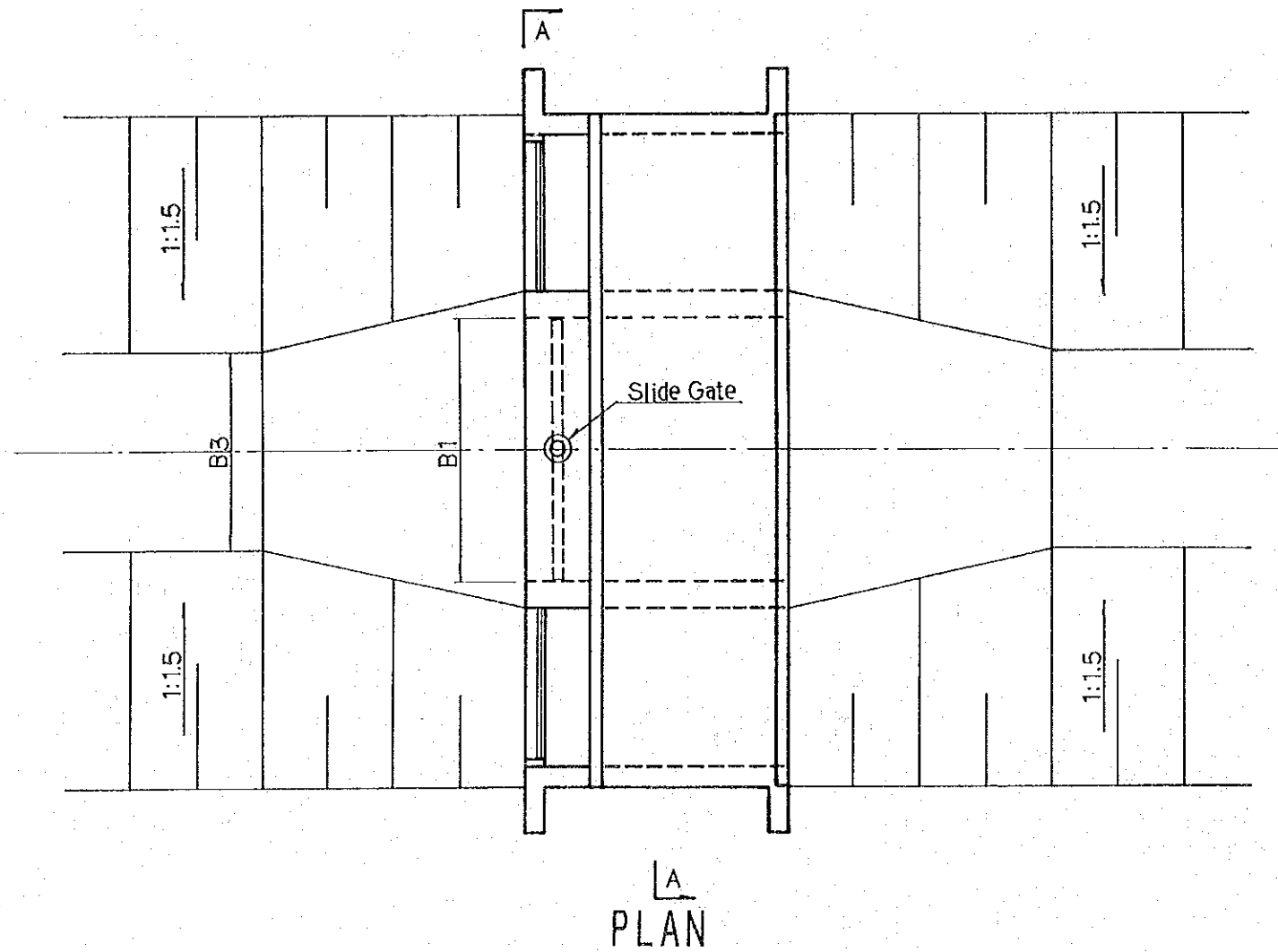


TABLE OF DIMENSIONS FOR CHECK STRUCTURE

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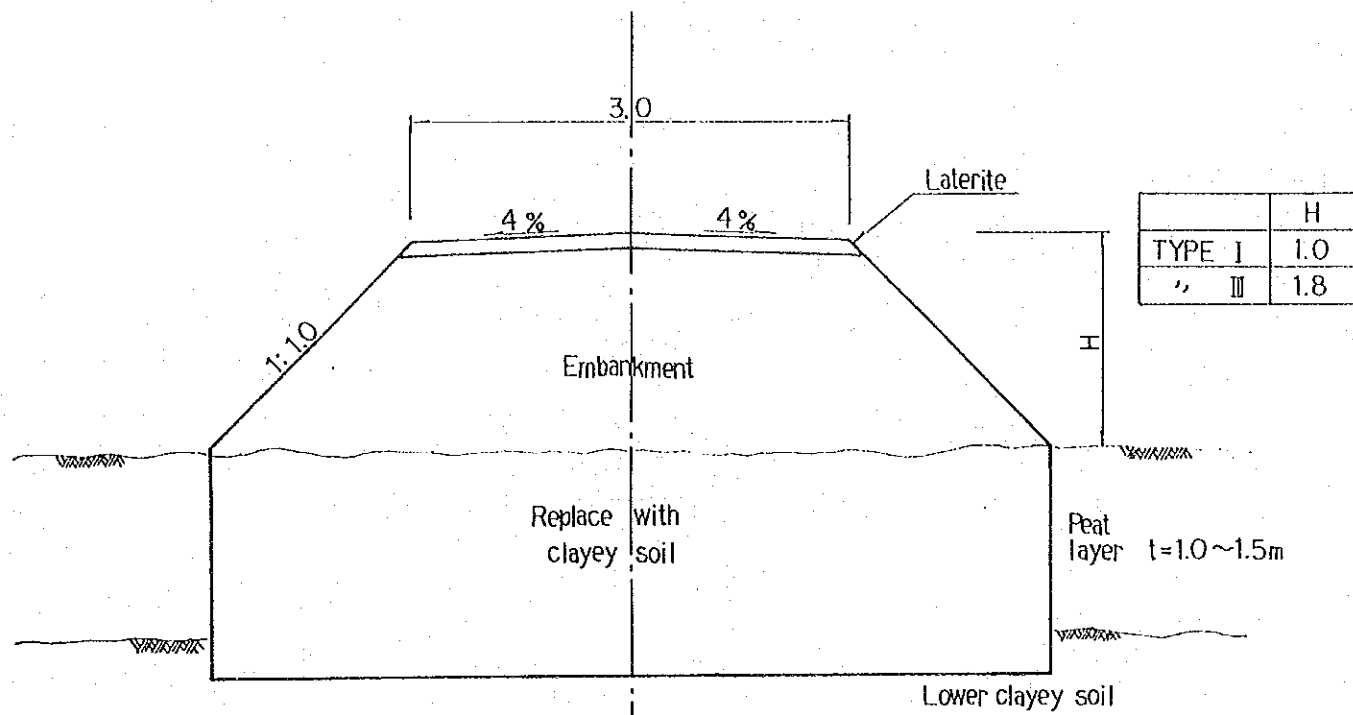
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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
FOR PEAT/ACID SULFATE SOIL AREAS
IN NARATHIWAT PROVINCE

CHECK STRUCTURE

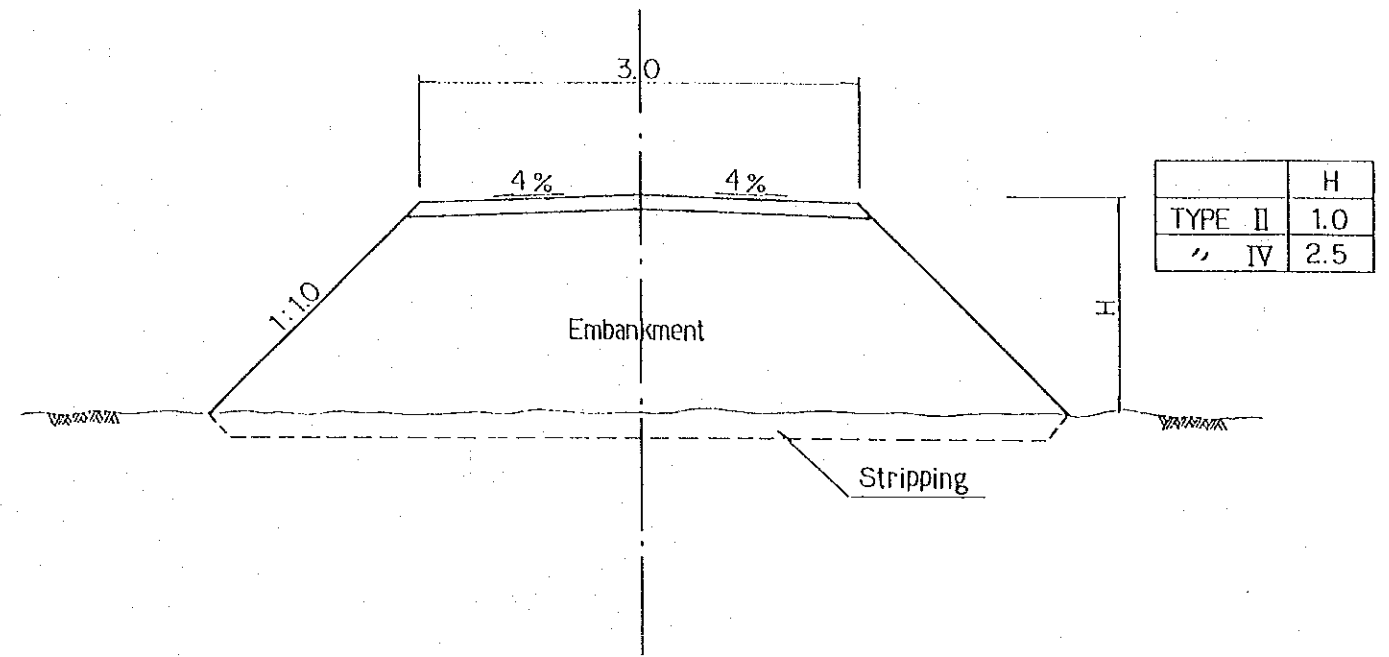
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JAPAN INTERNATIONAL COOPERATION AGENCY



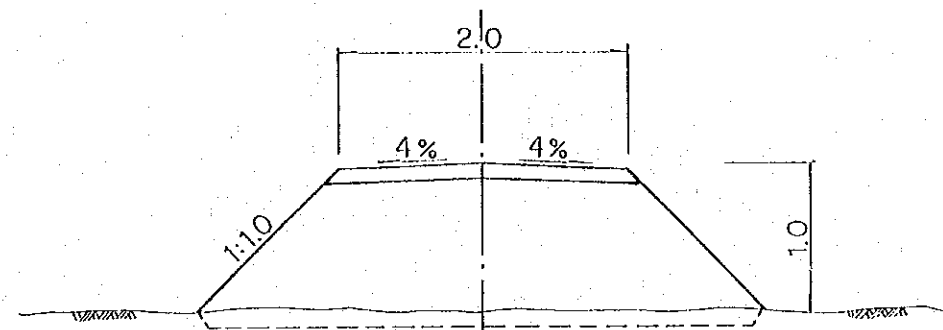
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TYPE I, III
FOR PEAT AREA



	H
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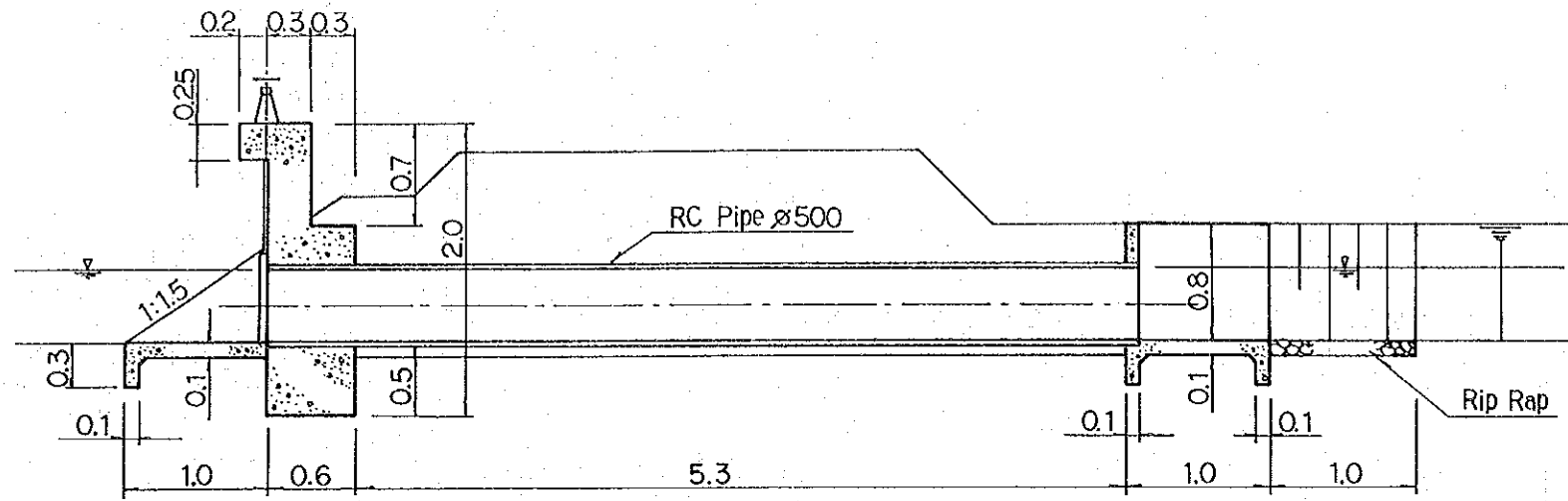
TYPE II, IV
FOR ACID AREA



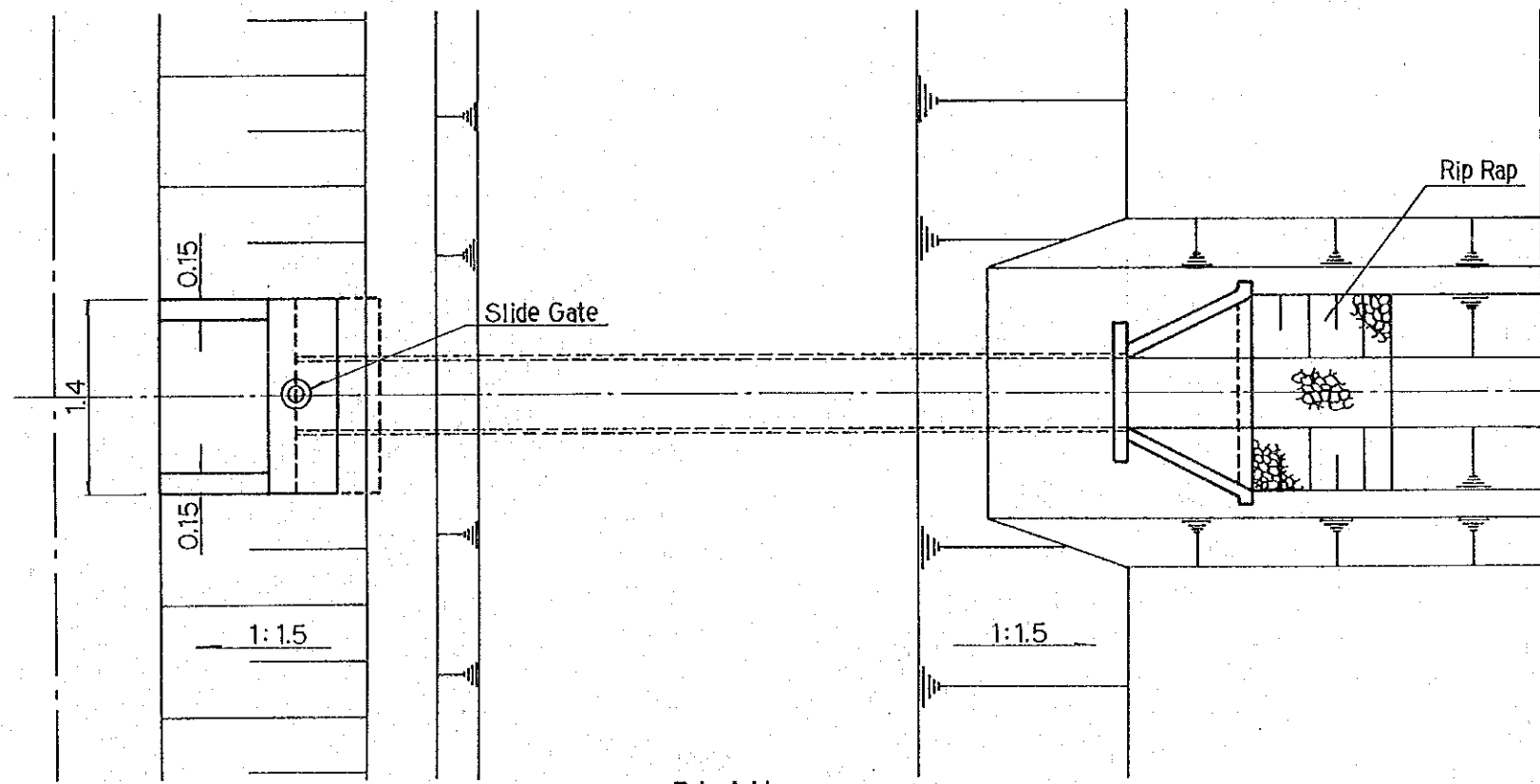
FARM ROAD

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THE STUDY ON THE AGRICULTURAL DEVELOPMENT FOR PEAT/ACID SULFATE SOIL AREAS IN NARATHIWAT PROVINCE			
ROAD/DIKE, FARM ROAD			
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JAPAN INTERNATIONAL COOPERATION AGENCY			



PROFILE



PLAN

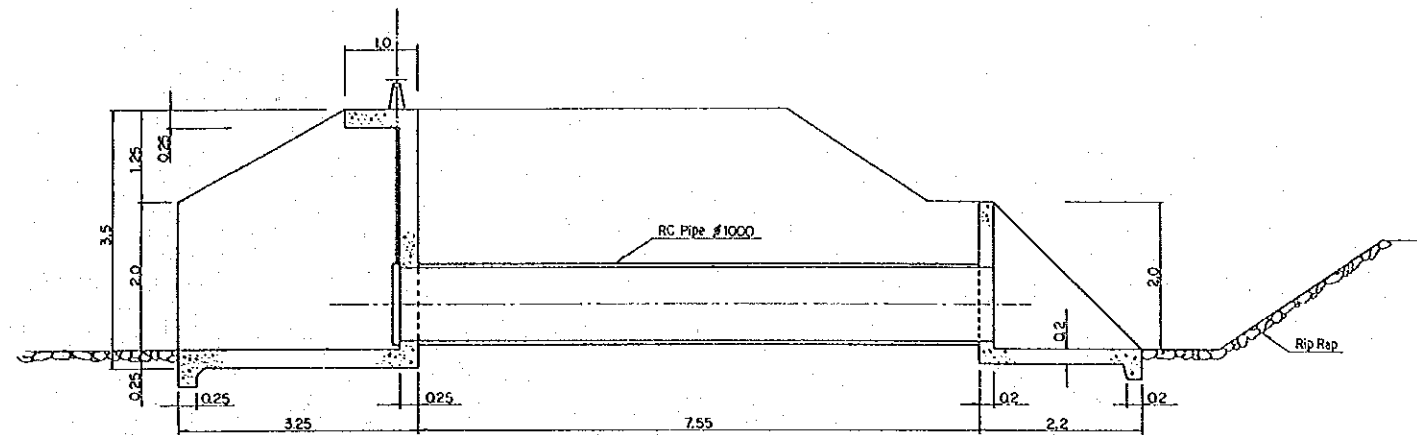
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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
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IN NARATHIWAT PROVINCE

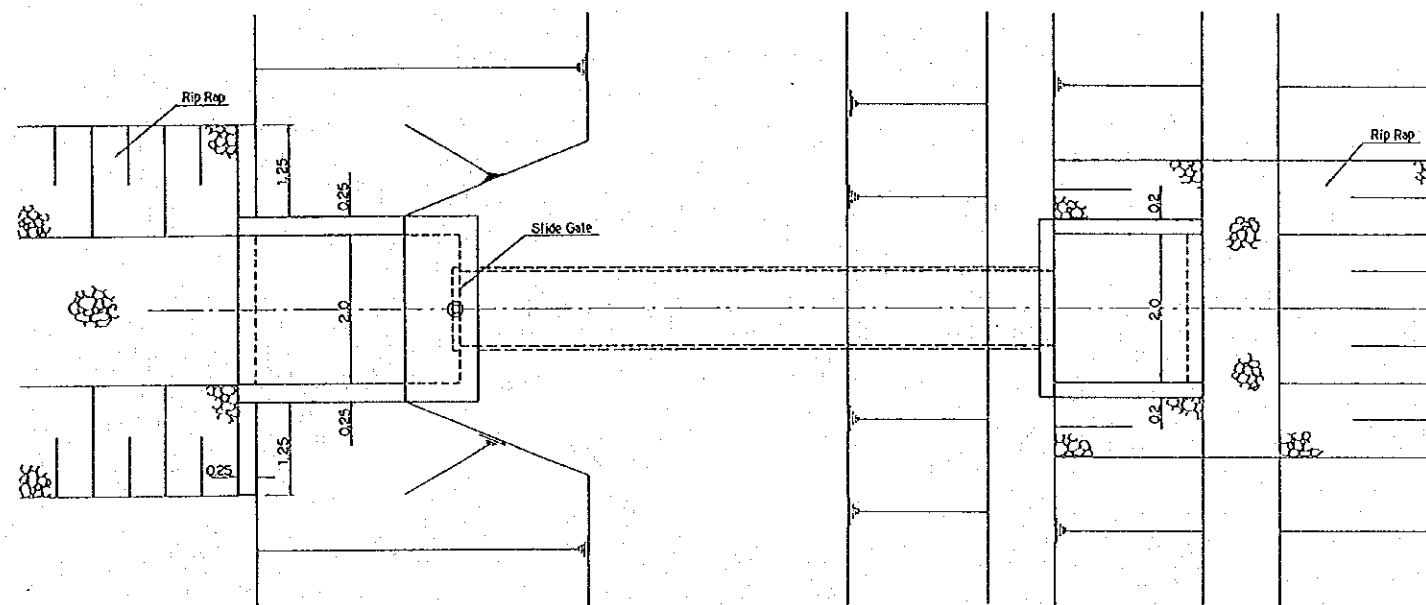
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JAPAN INTERNATIONAL COOPERATION AGENCY



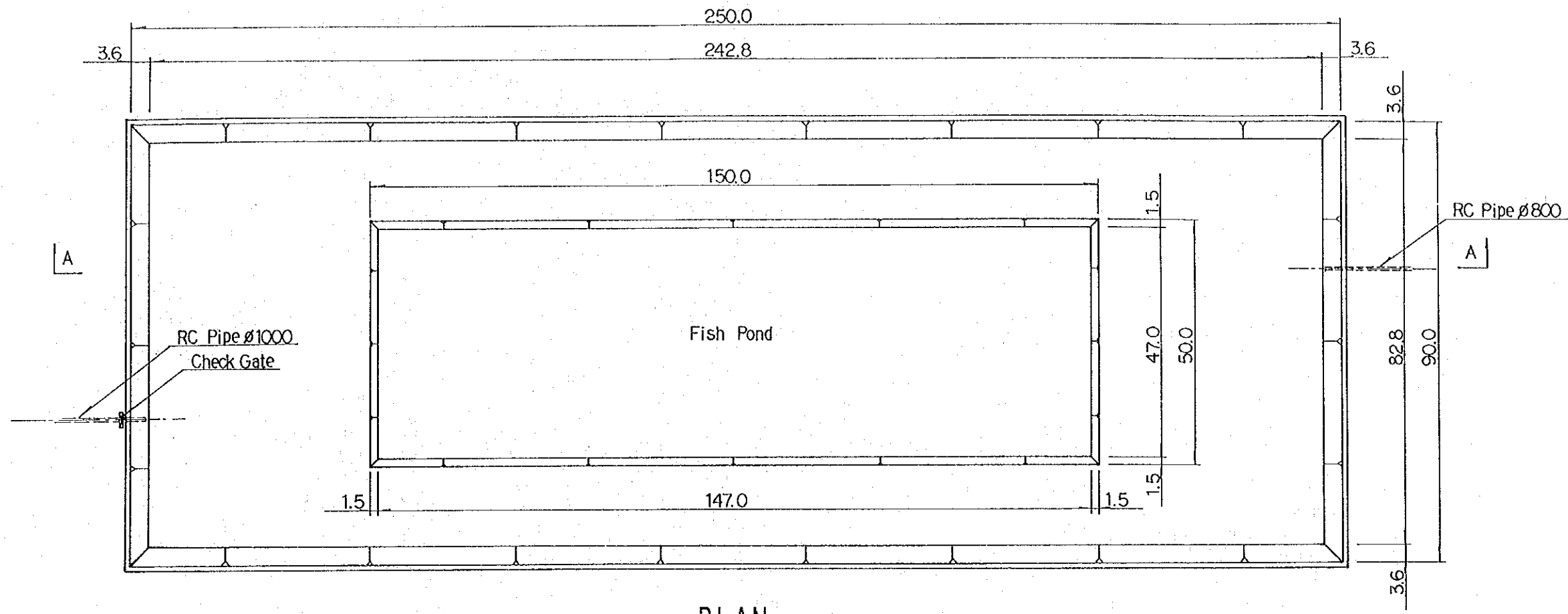
PROFILE



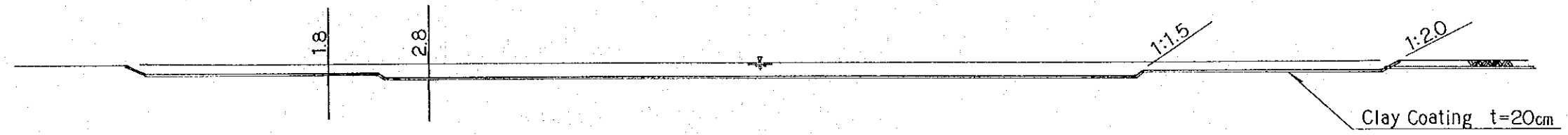
PLAN

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THE STUDY ON THE AGRICULTURAL DEVELOPMENT FOR PEAT/ACID SULFATE SOIL AREAS IN NARATHIWAT PROVINCE		
INTAKE CULVERT ϕ 1000		
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JAPAN INTERNATIONAL COOPERATION AGENCY		



PLAN

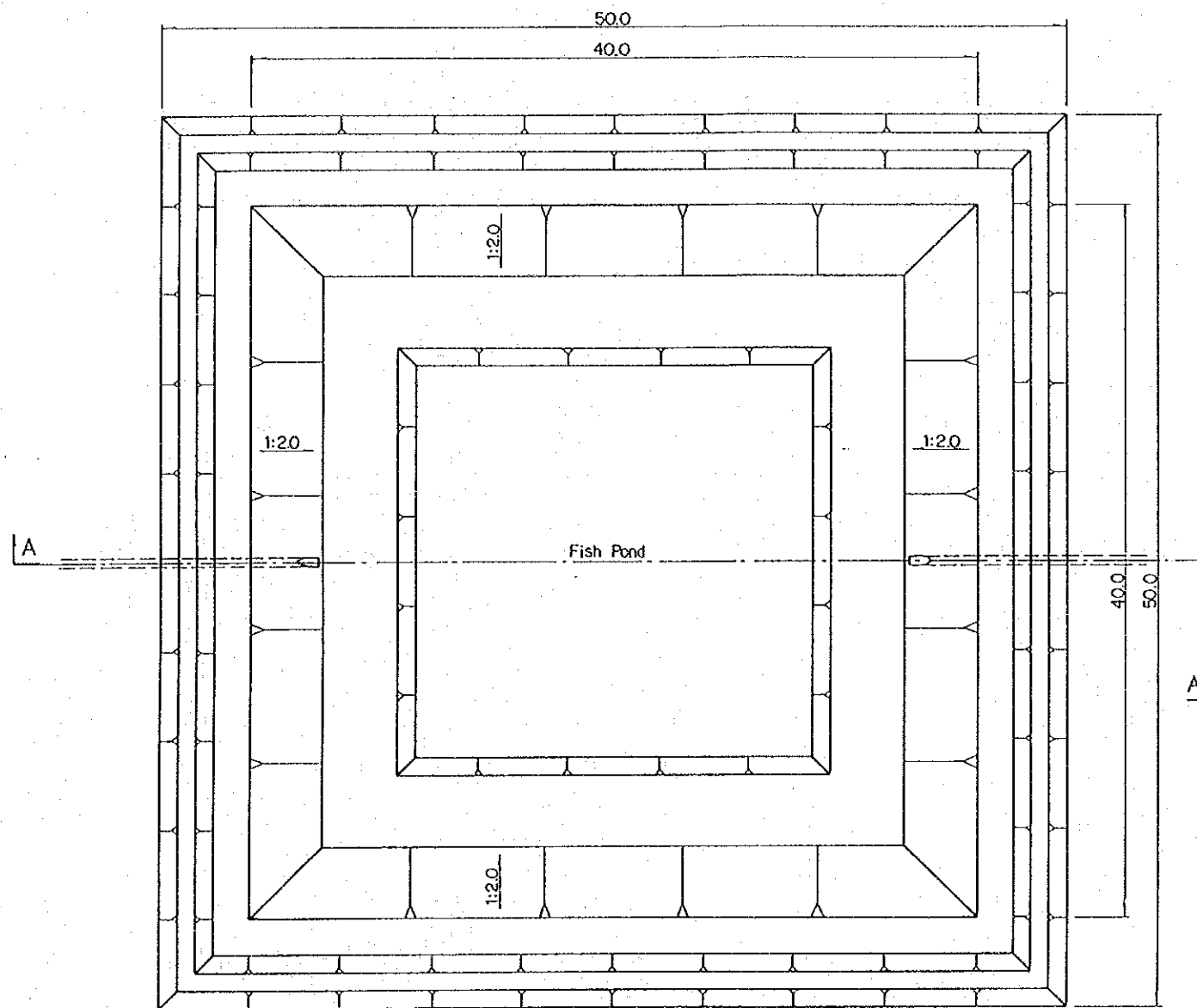


SECTION A-A

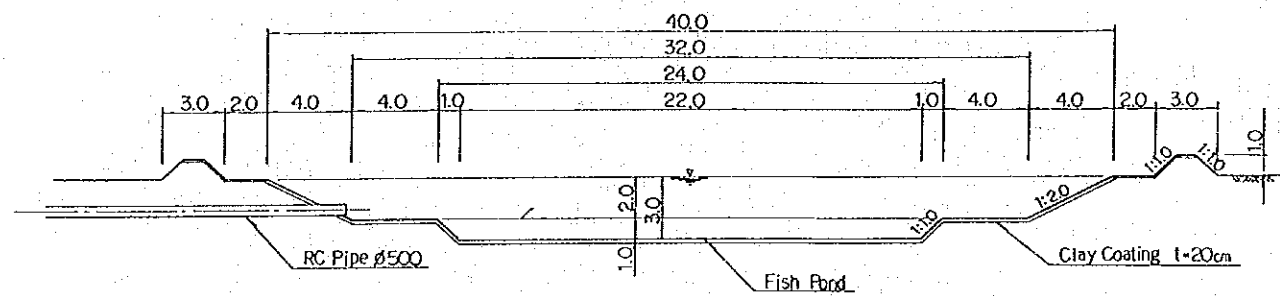
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THE STUDY ON THE AGRICULTURAL DEVELOPMENT FOR PEAT/ACID SULFATE SOIL AREAS IN NARATHIWAT PROVINCE			
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DRAWING NO.	8	DATE	
JAPAN INTERNATIONAL COOPERATION AGENCY			



PLAN



SECTION A-A

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THE STUDY ON THE AGRICULTURAL DEVELOPMENT
FOR PEAT/ACID SULFATE SOIL AREAS
IN NARATHIWAT PROVINCE

INLAND FISHERY POND
TYPE II, III

DRAWING NO. 9 DATE

JAPAN INTERNATIONAL COOPERATION AGENCY

**TECHNICAL GUIDELINE
FOR
IMPROVEMENT / CONSERVATION
OF
PEAT / ACID SULFATE SOIL AREAS
IN
NARATHIWAT PROVINCE**

PREFACE

This technical guideline covers various matters of agricultural development for peat and acid sulfate soil areas by making effective use of the experience of the Study Team.

Generally, this kind of technical guideline is useful as the basis of agricultural development attempts, such as implementing, monitoring, modifying and appraising the results of development activities in problem soil areas. In fact, no particular amendment/development techniques have been developed so far. Generally used techniques are dependent on the limited experimental results and similar returned projects. As the subject study was involved in variety soils, the Study Team carried out extensive soil tests in the laboratory and fields. In preparing this guideline, the Team used the results of those tests, practical experiences and materials collected on the subject. Therefore, the users should be prepared to revise/input this guideline that may be required in the future.

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CHAPTER 1 OVERVIEW

1.1 Scope Covered by the Guideline

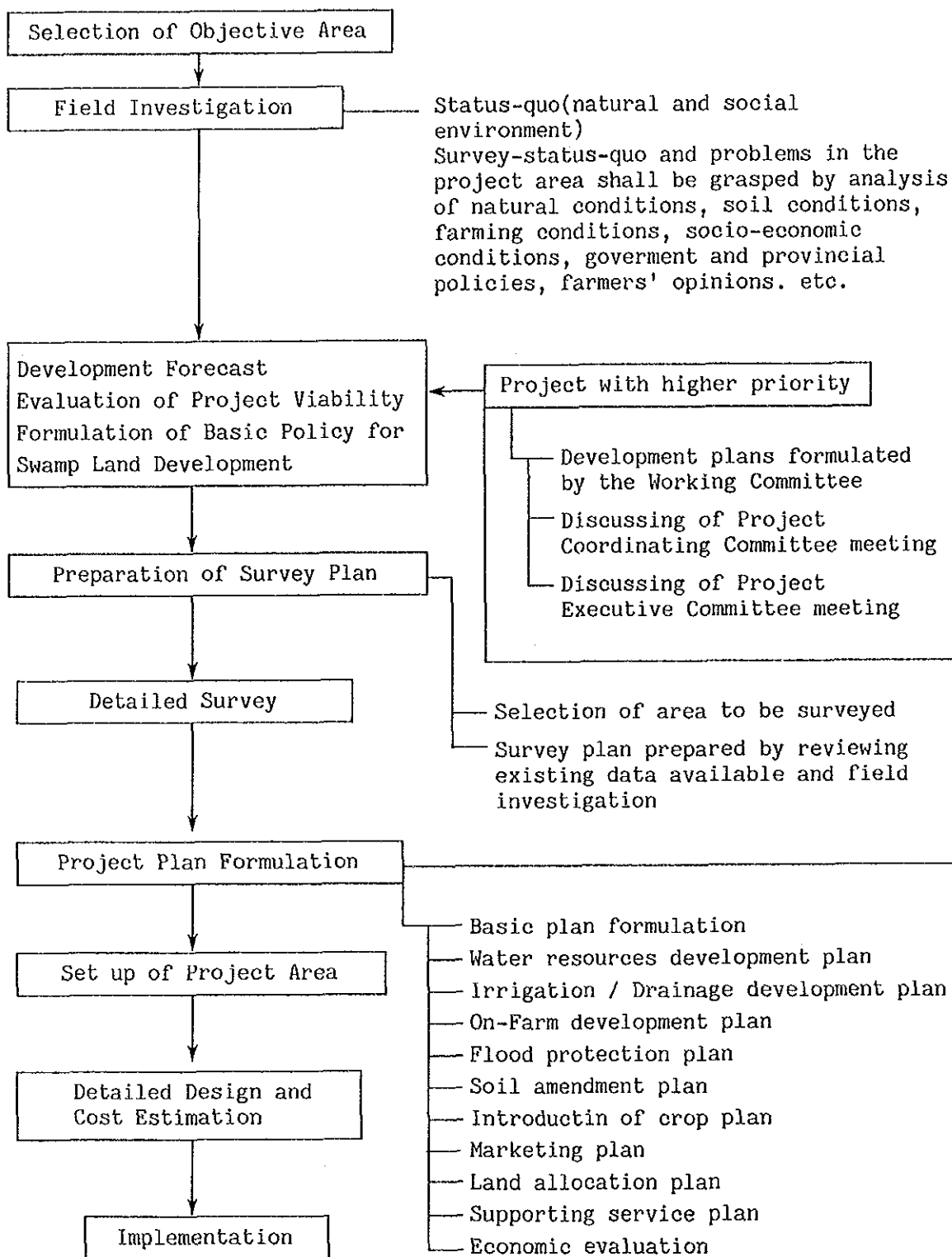
The technical guideline covers those matters of agricultural development for peat and acid sulfate soils areas distributed in the swamp land in the Southern Region of Thailand.

1.2 Basic Concept for Agricultural Development

The main objectives of agricultural development for peat and acid sulfate soil areas as a part of rural development, are to increase agricultural land for promoting regional agriculture through comprehensive soil amendment, development of irrigation, drainage and farm road systems and, if necessary, flood prevention. This is accomplished by considering environmental impact, provincial policy and inhabitants' needs. Development works should therefore be planned in due consideration of the following.

- 1) The project should satisfy forecasted agricultural targets and allow the establishment of effective and rational farming.
- 2) The project should contribute to establish favorable rural environment.

A general work flow of the project that related this guideline is presented below.



This guideline deals with some parts of survey and project plan formulation, putting stress on soil improvement/conservation techniques.