

Data 2.3.2.6- 1

**Soil and Land Resources Survey and
Interpretation (Soil Survey in the Proposed
Resettlement Area by BSWM)**

**SOIL AND LAND RESOURCES SURVEY
AND
INTERPRETATION**

**INFANTA RESETTLEMENT SITE
INFANTA, PANGASINAN**

Surveyed by:

**Staff of
Agricultural Land Management Evaluation Division
Bureau of Soils and Water Management**

Date Survey:

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**SOIL AND LAND RESOURCES SURVEY AND INTERPRETATION
INFANTA RESETTLEMENT SITE
INFANTA, PANGASINAN**

1.0 INTRODUCTION

As an input in the development planning for the Infanta Resettlement in Doliman, Infanta, Pangasinan, a soil/land resources survey was conducted. The result was used in rating the suitability of the area to various crops that are thought to be relevant. Also, the result of the study will be helpful in the formulation of farm development plan that will assure long term sustainability.

The soil characteristics observed were slope, soil erosion, soil depth, dark of A horizon, texture, color, presence/absence of gravels and rock outcrops and consistency.

Soil samples were taken from the A and B horizon. Laboratory test for pH, particle size (texture, nitrogen content or organic matter, available phosphorous, potassium, cation exchange capacity (CEC), percentage of base saturation were done at the soil laboratory of the Bureau of Soils and Water Management (BSWM) in Quezon City.

2.0 LOCATION AND EXTENT

The Infanta resettlement project is geographically located in Barangay Doliman, Infanta, Pangasinan. It lies between 15°49'13" and 15°50'17" north latitude and 119°57'30" and 119°58'40" east longitude.

The total land area surveyed is 240 hectares of pyroclastic plateau (76.73%), colluvial terrace (10.83%), and miscellaneous land type such as creek scarpment (10.45%) and rockland (1.99%).

3.0 OBJECTIVE AND SCOPE

The soil/land resource survey of Infanta Resettlement Project conducted by the Bureau of Soils and Water Management (BSWM) aims to generate and update resource data which could serve as guide for various developmental and planning activities particularly in assessing the overall agricultural potential of the resettlement area.

Consequently, various factor of the land such as those pertaining to the landform, land degradation, existing land use and protected vegetation were looked into to have a comprehensive characterization of the physical environment.

Finally, the development possibilities of different land type and areas were presented as land use. Alternative land use were ranked according to varying degree of suitability. On the basis of the information about the spatial distribution of the land available for development.

4.0 SOIL AND PHYSIOGRAPHY (Landform of the Area)

There are four (4) physiographic land unit were recognized in the area and these are presented in Figure 1. The area distribution of these land units are the following:

Table 1 . Area (Ha.) Distribution of Soil Physiography

Mapping Symbols	Descriptions	Area (Ha.)	Area (%)
Pp	Pyroclastic Plateau	184.16	76.73
Ct	Colu-alluvial terrace	25.98	10.83
Ce	Creek escarpment	25.09	10.45
Rl	Rockland	4.77	1.99
Total		240.00	100.00

4.1 PYROCLASTIC PLATEAU

This land mapping unit is composed of nearly level to gently sloping plateau with steep sideslope along escarpment or depression. This is the most extensive in the area.

The soil is shallow to moderately deep ranging from 20-60 cm. deep, brown to dark brown, to dark yellowish brown clay loam to sandy clayloam, well to excessively well drained. The crops grown are mango, paddy rice, root crops such as gabi, sweet potato, cassava, duhat and few tree species. Few to common gravel and stone at the ground surface.

Natural fertility of the soil is low due to uncontrolled soil erosion. Elevation is 60-70 meter above mean sea level. Total area of the land management is approximately 184.16 hectares in extent.

4.2 COLLU-ALLUVIAL TERRACE (Ct)

Collu-alluvial terrace are bench like landform which mostly occur along the course of the major creek in the area. Such landform was curved by the creek itself during various stages of development.

The soil is about 30-80 cm. deep, very dark grayish brown clayloam to silty clay with pale brown partially weathered pyroclastic material usually encountered below 80 cm. deep.

The land use is partially developed terraced rainfed and irrigated rice paddies devoted to rice farming. The total area of this land unit is approximately 25.98 hectares.

4.3 CREEK ESCARPMENT

Creek escarpment is a miscellaneous landtype that dissected the pyroclastic plateau of the project area. The slope of the land type ranges from undulating, rolling to steep landform. Present use of the land is low density forests which are remnant of the former primary forest that once dominated the area.

4.4 ROCKLAND

These are miscellaneous landtype that are barely rock exposed in area. No vegetation except few species of grasses.

5.0 SOILS OF THE AREA SURVEYED

Two (2) soil groups were observed in the area. These are classified at the subgroup level of USDA Soil Taxonomy.

5.1 AQUIC EUTROPEPT ASSOCIATED WITH AERIC TROPAQUEPT

These group of soils are mostly grayish brown to gray clayey soil. They have poor to somewhat poor drainage and are moderately deep to deep. They have an isohyperthermic soil moisture regime. They occur on the very gently sloping terrain mostly in the collu-alluvial terrace and usually planted to paddy rice.

5.2 LITHIC USTROPEPT

The Lithic Eutropept soil group are most extensive in the area. These are shallow, well to excessively well drained, loamy skeletal, mixed acid, and have an isohyperthermic moisture regime. They occur in the pyroclastic plateau and creek escarpment. Presently, part of the area was grown to mango (bearing, and non-bearing), and cultivated for upland crops such as camote, cassava and gabi. Most of the area are covered with grasses, shrubs and low density forests.

6.0 PRESENT LAND USE AND VEGETATION

Land use and vegetation studies are important in natural resource survey for it provide vital information in the preparation of an effective development plan. Such plan is intended to uplift the present socio-economic condition of the area. The present land use of the area is presented in the Appendix Figure 10.1b. and the area distribution is presented in Table 3.

Table 2. Area (Ha.) Distribution of Land Use/Vegetation

Mapping Symbols	Descriptions	Area	
		(Ha.)	(%)
1	Paddy rice (irrigated/rainfed)	12.54	5.23
2	Fruit trees and upland crops	15.28	6.37
3	Grasses, shrubs and low density forests	207.41	86.42
4	Rockland	4.77	1.99
Total		240.00	100.00

6.1 IRRIGATED/RAINFED PADDY RICE

The cultivation of the paddy rice is mostly confined in the collu-alluvial terrace. Rice are grown twice a year. Some patches of rainfed paddy rice are within the plateau cultivated once a year. Existing paddy rice in the settlement site is approximately 12.54 hectares or 5.22% of the total land area.

6.2 FRUIT TREES (Mango) UPLAND CROPS

Mango trees are also grown in the area of about 1,000 plant are presently bearing. The non-bearing are grafted carabao and are newly planted as an expansion of the bearing mangoes trees. The extent of the mango plantation is about 12.28 hectares or 6.37% of the total area of the proposed settlement. Some patches of upland crop such as gabi, camote, and cassava also grown in the area but negligible in extent.

6.3 GRASSES, SHRUBS AND LOW DENSITY FOREST

Grasses and shrubs are most extensive vegetation cover in the area. The low density forests are remnant of the primary forest that once dominated the area. Grasses/shrub uses are often subject to annual burning to provide better grass growth for grazing. Shrubs are openly associated with grasses.

6.4 LOW DENSITY FOREST

The low density forest are remnant of the former primary forest that once dominated the areas. They generally occur in the creek escarpment mostly on undulating, rolling to steep slopes. It covers an area of 25.09 hectares or 10.45% of the land area of the settlement project area.

6.5 ROCKLANDS

This is miscellaneous land use which are barely no soil development. The rockland has been exposed so many years. It covers 4.77 hectare or 1.99% of the land area of the settlement area.

Table 3. Soil and Land Characteristics and Qualities

Characteristics	Mapping Symbols				Rockland
	Pp	Ct	Ce	Rl	
	Descriptions				
	Pyroclastic Plateau	Collu-Alluvial Terrace	Creek Escarpment		
Slope (%)	0-8	0-8	>8		n.d.
Drainage	Well drained	Moderately well drained to well drained	Well drained		n.d.
Texture	Medium	Medium	Medium		n.d.
Soil Depth	Shallow	Shallow to moderately deep	Shallow		n.d.
Elevation (m)	<70	<60	<70		n.d.
Erosion	None to slight	None to slight	Moderate		n.d.
Rock Outcrops	Common to many	Common	Many		n.d.
Flooding	None	None	None		n.d.
Inherent Fertility	Low	Low to medium	Low		n.d.
pH H_2O 1:1	5.9 - 6.7	6.7	5.9		n.d.

7.0 DEVELOPMENT POTENTIAL

The suitability maps which are presented from Figure 4, 5 & 6 were prepared. This will served as an input in the formulation of sustainable development plan in the area. This suitability classification took into account the various soil and land characteristics of the area as well as the crops requirements.

7.1 CONSTRUCTION OF SMALL WATER IMPOUNDING DAMS

The topography of the area which is nearly level, gently sloping to undulating favors the construction of small dam for storing water that could be used for irrigating high value crops during the dry season. The raising of high value crops like vegetables root crops will mean a better utilization of water. Rice consumes more water than upland crops. The small water farm reservoirs could also be utilized to culture fresh water fish like tilapia, mudfish, and catfish.

7.2 BETTER CROPPING PATTERN

Better cropping pattern should be introduced to maximize the benefit from the water impounding dams. Vegetables and rootcrops should be grown after harvesting rice. Corn be grown in between the fruit tree plantation (mango).

7.3 SOIL FERTILITY MANAGEMENT

The most limiting fertility factor for sustained production in the area are the three major elements such as nitrogen, phosphorous and potassium. This is especially true for the soil with very low base saturation.

The application of nitrogen, phosphorous and potassium will be essential for higher productivity. To improve the long term fertility of the area, the application of indigenously produced organic fertilizer should be introduce. The high soil acidity should be corrected by liming. Stones, gravels, and boulders on the surface should be gathered to ease the cultivation of the area.

7.4 SOIL CONSERVATION

The implementation of different soil conservation practices in the area is essential since soil erosion and presence of stones, gravel, and boulders on the surface are the main limitations.

- a) Low lying areas are recommended for the development of Small Farm Reservoirs (SFR).
- b) Contour terracing is recommended for slope 3 to 8 % if used for corn and other upland crops.
- c) Planting cover crops on the fruit tree or tree farming to protect the moisture content of the soil especially during dry season.
- d) Other fast growing high value tree such as gemelina, mahogany, eucalyptus, acacia, and bamboo could also be considered to be planted along the creek escarpments.

8.0 PRODUCTION POTENTIAL AND LIMITATION

The potential and limitations are discussed by landform.

8.1 COLLU-ALLUVIAL PLAIN AND TERRACE

These are best suited for paddy rice because of poor to somewhat poor soil drainage and clayey soil. Rice is usually grown twice a year from July to November and November to February. On the upper portion of the collu-alluvial terrace, upland crops is usually grown from April to August.

One serious limitations is the presence of stones, cobbles gravel and boulders on the surface of the area which will prevent the ease of cultivation by animal drawn plow.

Poor drainage, sticky soils and waterlogging during rainy season precludes the use of the area for tree crop and upland crops.

8.2 PYROCLASTIC PLATEAU

This is the area where tree crops, upland crops and forest can be grown. At present, it is used to grow mango plantation and other upland crops. Most of the area are under grasses, shrubs and secondary forest. After cleaning the area, root crops or upland crops may be grown during the first three years. Ultimately it should be developed for perennial crops.

8.3 CREEK ESCARPMENT

Highly erodible soil, rolling to steep slope and low fertility are the main limitation of the area. The present used of tree areas are mixture of secondary forest, shrubs and grasses. This area should be utilized mainly for tree crops and forest trees.

8.4 ROCKLAND

This should be quarry as an aggregate for the resettlement site.

9.0 FURTHER STUDY

9.1 DETERMINING LIME REQUIREMENTS

Some soil acidity has been identified as a major production constraints. A study should be conducted by elaborate laboratory analysis and field trials to determine the soil lime requirements.

9.2 DETAILED FARM DESIGN

To properly demonstrate land use technology for marginal and sloping areas, detailed farm layout of model farmers must be planned and implemented. Such farm should incorporate the appropriate crop and the method of cultivation as well as soil fertility management. Responsible and influential farmers who could be role model in the area should be chosen.

Table 4. Site Requirements of Selected Crops

Crops	Optimum Crop Requirements						Environmental Requirements					
	Texture	Soil Depth	Soil Drainage	pH	Fertility	Erosion	Boulders, Rock Out-crops	Terrain Parameter		Climate		Temperature Min.-Max. (Degree-C)
								Slope	Elevation (MASL)	Annual Rainfall	Dry Month Tolerance	
Paddy rice	SU-CL	>50	WD-PD	5.5-7.2	Moderate to high	None	10%	<3	<3	NA	NA	20-38
Legumes ^{1/}	SC-CL	>50	WD-MWD	6.0-7.1	Moderate to high	None	<30%	<5	>500	2050-3500	3-5 mos.	20-30
Non-Legumes ^{2/}	All except sandy, loamy sand, & heavy clay	>50	WD-MWD	5.5-7.1	Medium to high	None	<30%	<3	>500	2050-3000	3-5 mos.	20-30
Rootcrops ^{3/}	All except sandy, loamy sand, & heavy clay	>50	WD-MWD	5.5-7.0	Medium to high	None	<30%	<5	>500	2050-3500	3-5 mos.	20-30
Fruit trees ^{4/}	All except sandy, loamy sand	>50	WD-MWD	5.5-6.8 (5.5-7.0) ^{**}	Medium to high	None	<30%	<12	<500	1500-2000	5 mos.	20-37

NA - Not applicable

^{**} - Applies only to mango & avocado^{1/} - Includes mango, peanut, soybean, & stringbean^{2/} - Includes eggplant, okra, yam, squash, & tomato^{3/} - Includes sweet potato, cassava, & yam^{4/} - Includes mango, papaya, cashew, tamarind, jackfruit, guava, & papaya

Table 5.
Suitability Classes and Sub-Classes of Soil Physiography Unit for Selected Crops

Crops	Land Form			
	Residual Plateau	Collu-Alluvial	Miscellaneous	
	Rp	Ct	Ce	Rl
Paddy rice	S3	S1/S2b	NS	NS
Legumes	S3	S2b	NS	NS
Non-legumes	S3	S2b	NS	NS
Rootcrops	S3	S2d	NS	NS
Fruit trees	S1/S3ab	S2	NS	NS

Nature of limitations:

- a - soil depth
- b - rock outcrop
- c - erosion
- d - drainage
- e - fertility

Symbols:

- S1 - Highly suitable
- S2 - Moderately suitable
- S3 - Marginally suitable
- NS - Not suitable

Table 6. Area (Ha.) Distribution of Slope Classes

Mapping Symbols	Slope Range (%)	Descriptions	Area (Ha.)	(%)
A	0-3	Level to gently sloping	135.24	56.35
B	3-8	Gently sloping to undulating	79.67	33.20
C	8-18	Undulating to rolling	25.09	10.45
Total			240.00	100.00

Table 7.
Suitability Table for Rice, Infanta Resettlement Area
Infanta, Pangasinan

Mapping Symbol	Description	Area	
		Hectare	%
S1	Highly suitable	12.54	5.23
S2	Moderately suitable	17.74	7.39
S3	Marginally suitable	156.10	65.04
NS	Not suitable	29.86	12.44
Other areas 1/:			
Ma	Existing mango area	15.28	6.37
Ha	Proposed housing area	8.48	3.53
Total		240.00	100.00

1/ Proposed housing and existing mango areas are not subject to suitability classification.

Table 8.
Suitability Table for Vegetables/Rootcrops
Infanta Resettlement Area, Infanta Pangasinan

Mapping Symbol	Description	Area	
		Hectare	%
S2	Moderately suitable	17.74	7.39
S3	Marginally suitable	156.10	65.04
NS	Not suitable	29.86	12.44
Other areas 1/:			
Ra	Existing rice area	12.54	5.23
Ma	Existing mango area	15.28	6.37
Ha	Proposed housing area	8.48	3.53
Total		240.00	100.00

1/ Proposed housing and existing agricultural areas (rice & mango) areas are not subject to suitability classification.

Table 9
Suitability Table for Fruitrees and Upland Crops
Infanta Resettlement Area
Infanta, Pangasinan

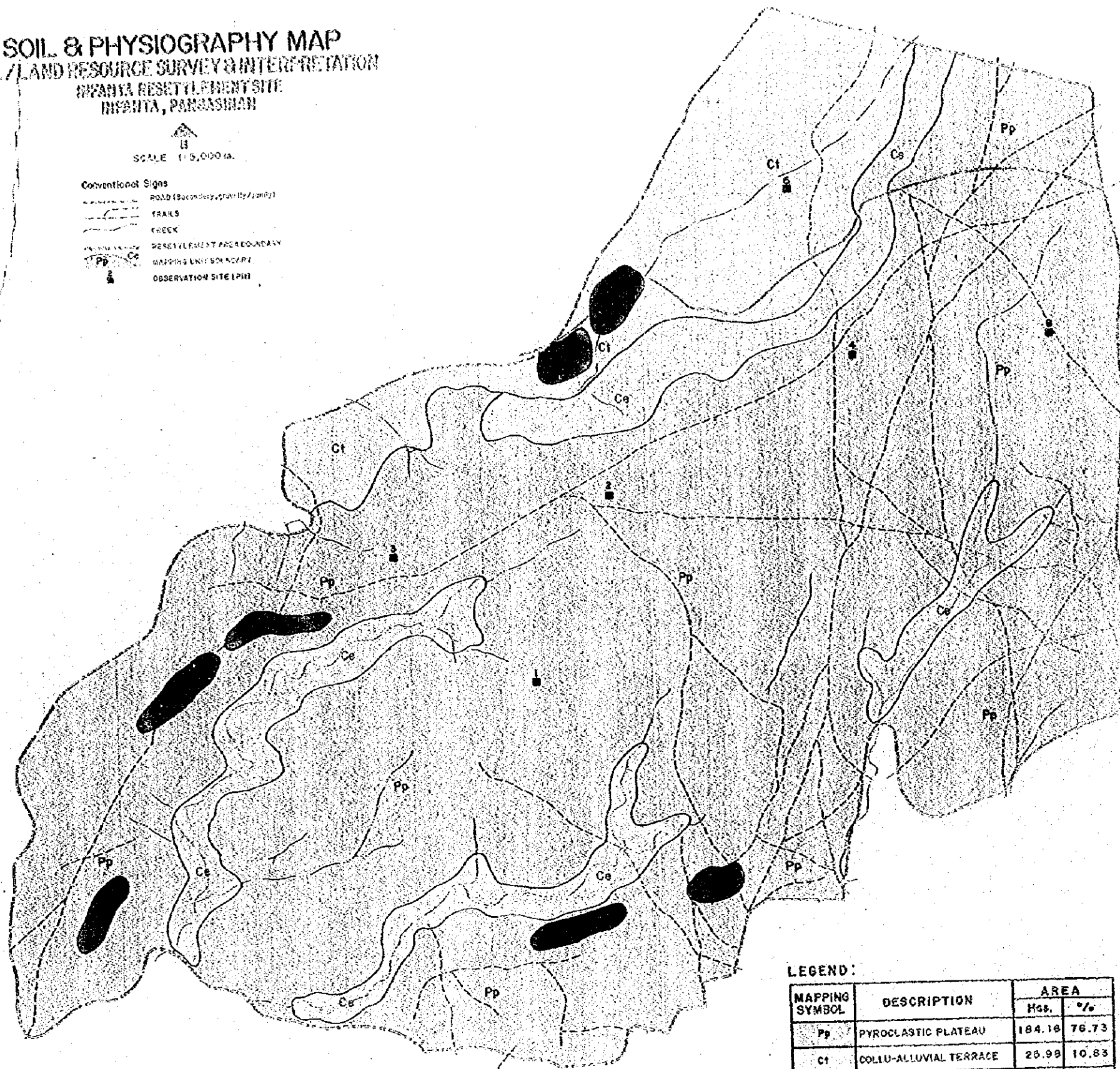
Mapping Symbol	Description	Area	
		Hectare	%
S1	Highly suitable	15.28	6.37
S2	Moderately suitable	17.74	7.39
S3	Marginally suitable	156.10	65.04
NS	Not suitable	29.86	12.44
Other areas 1/:			
Ma	Existing rice area	12.54	5.23
Ha	Proposed housing area	8.48	3.53
Total		240.00	100.00

1/ Proposed housing and existing rice areas are not subject to suitability classification.

SOIL & PHYSIOGRAPHY MAP
 SOIL / LAND RESOURCE SURVEY & INTERPRETATION
 WYANJA RESETTLEMENT SITE
 INFANTA, PANGASIHAN

SCALE 1:5,000

- Conventional Signs
- ROAD (Secondary, priority 2/lanes)
 - TRAILS
 - CREEK
 - RESETTLEMENT AREA BOUNDARY
 - WASHING UNIT BOUNDARY
 - OBSERVATION SITE (PHI)



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA	
		Hec.	%
Pp	PYROCLASTIC PLATEAU	184.16	76.73
Ct	COLLU-ALLUVIAL TERRACE	28.99	10.83
Ce	CREEK ESCARPMENT	25.03	10.45
R	ROCKLAND	4.77	1.99
TOTAL		243.95	100.00

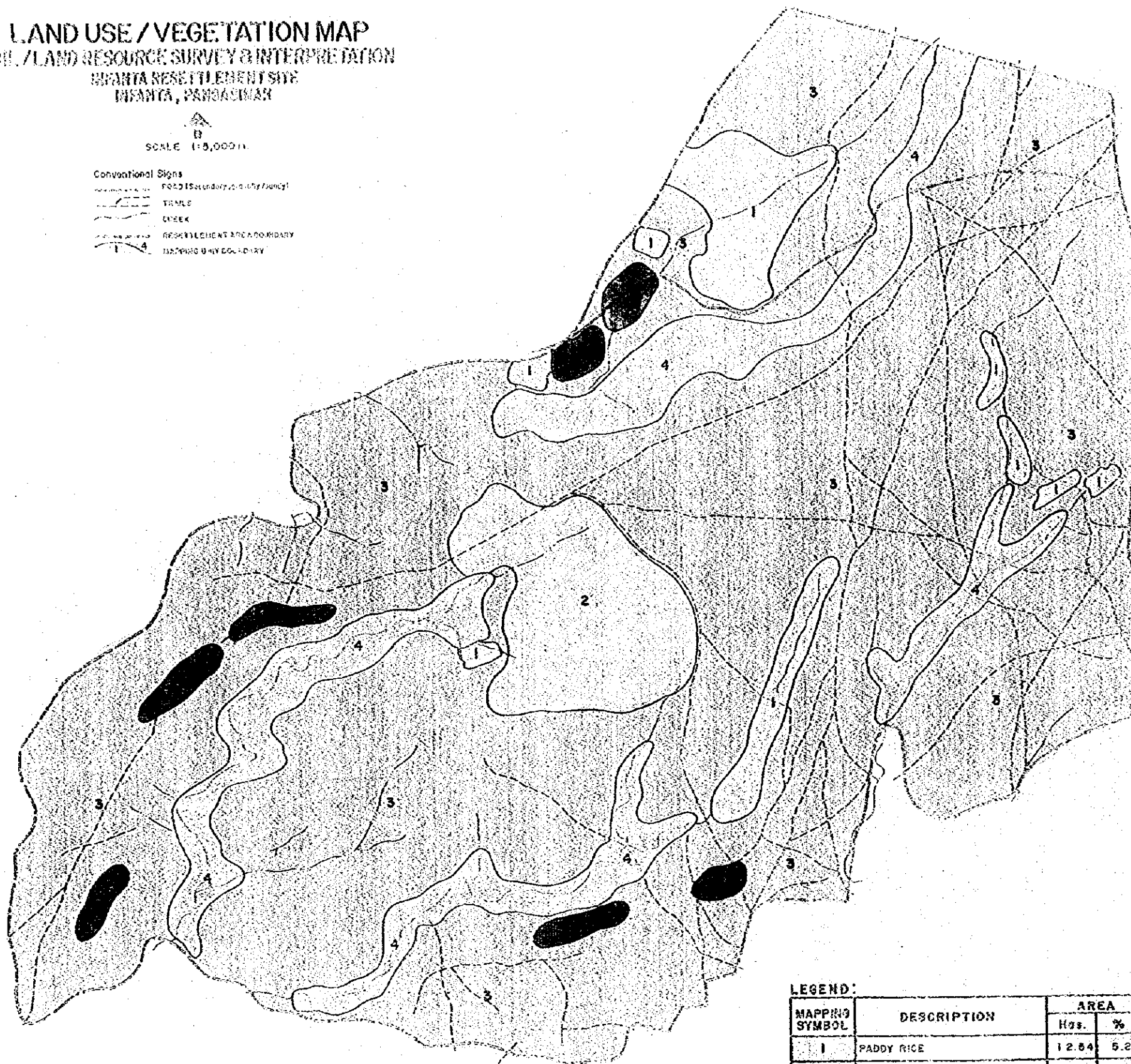
図1 土壤地形図

記号	記号
Pp	火山降層物台地
Ct	崩積 - 沖積段丘
Ce	クリ-クの急斜面
R	岩石地

LAND USE / VEGETATION MAP
 SOIL / LAND RESOURCE SURVEY & INTERPRETATION
 UPANTA RESETTLEMENT SITE
 UPANTA, PANGASINAN

SCALE 1:5,000

- Conventional Signs
- FOOD (Secondary road, city, town)
 - TRAIL
 - CRACK
 - RESETTLEMENT AREA BOUNDARY
 - MAPPING UNIT BOUNDARY



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA	
		Hzs.	%
1	PADDY RICE	12.84	5.22
2	MANGO	16.29	6.37
3	Grasses 93% and low density forest 3%	182.32	75.97
4	LOW DENSITY FOREST TREES	25.09	10.43
5	ROCKLAND	4.77	1.99

TOTAL 240.00 100.00

图2 土地利用/植生图

記	載
1	水稻
2	芒果 (77%)、烟作物
3	草·灌木 (93%)、疏林 (3%)
4	疏林
5	岩石地

SLOPE MAP
 SOIL/LAND RESOURCE SURVEY & INTERPRETATION
 INFANTA RESETTLEMENT SITE
 INFANTA, PANGASINAN

SCALE 1:8,000 m.

Conventional Signs
 (Symbol) (Description)
 (Symbol) TRAILS
 (Symbol) CREEK
 (Symbol) RESETTLEMENT AND ADJACENT
 (Symbol) MAPPING UNIT BOUNDARY

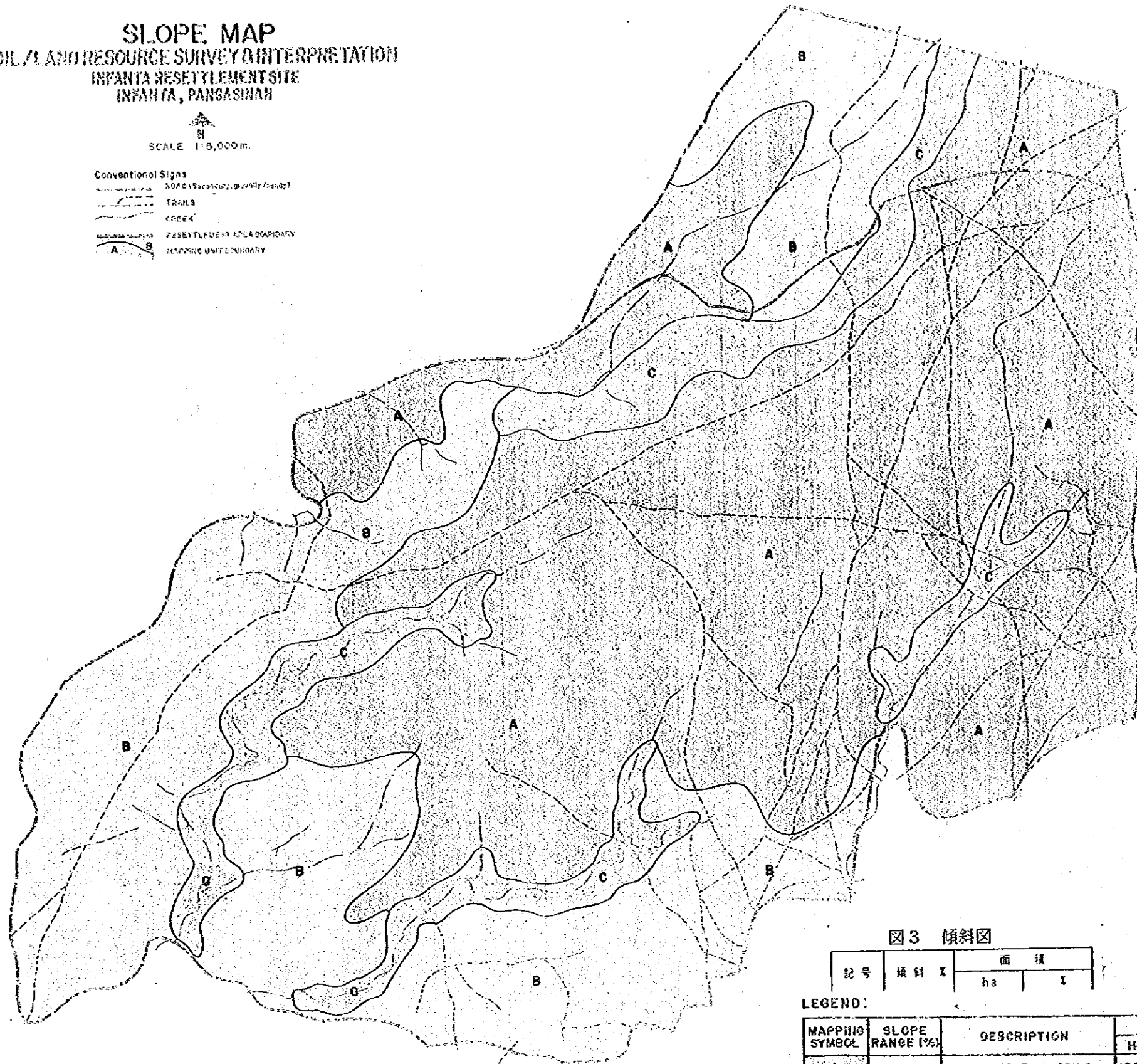


図3 傾斜図

記号	傾斜 %	面積	
		ha	%

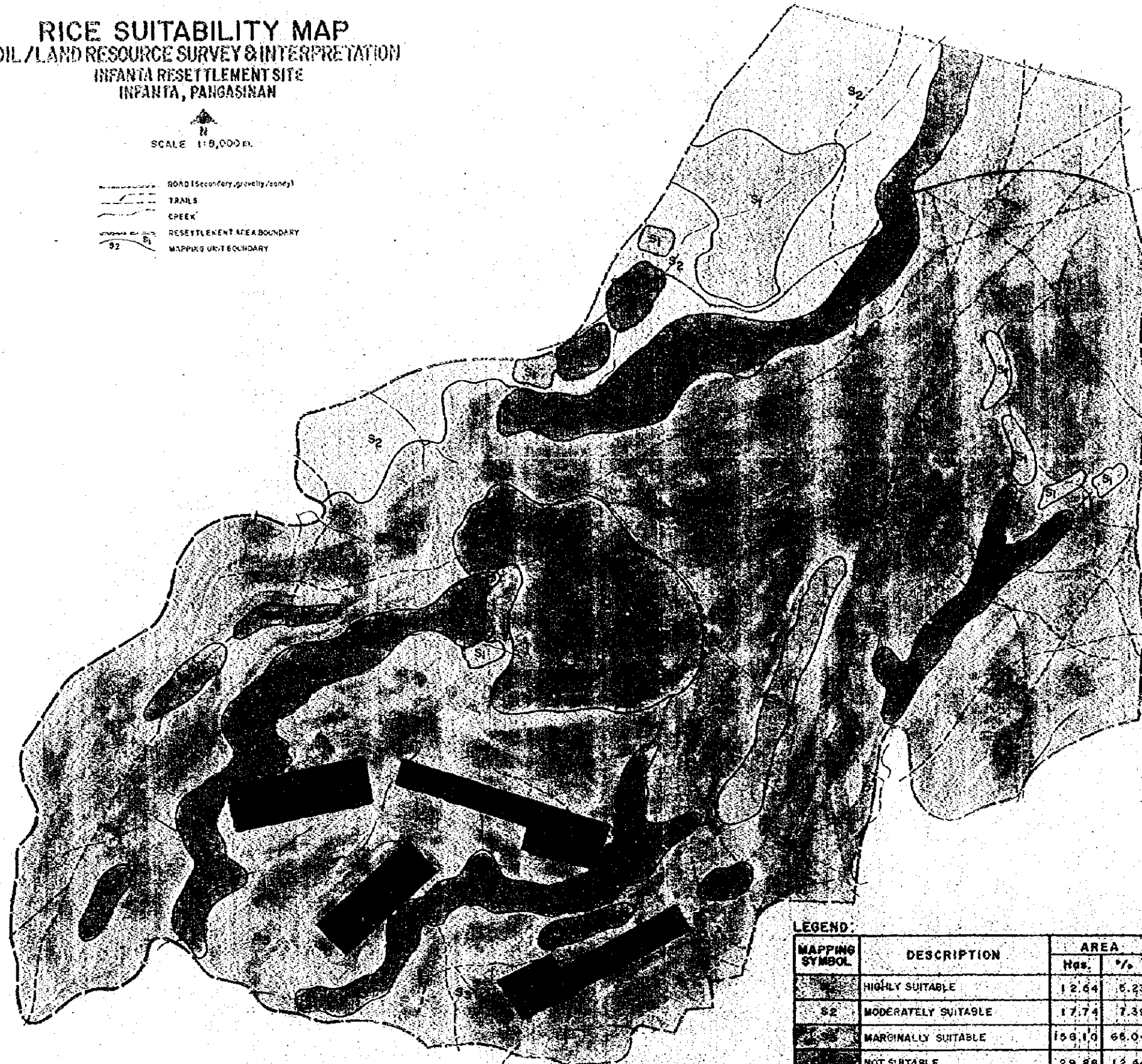
LEGEND:

MAPPING SYMBOL	SLOPE RANGE (%)	DESCRIPTION	AREA	
			Has.	%
A	0-3	LEVEL TO GENTLY SLOPING	135.24	56.35
B	3-8	GENTLY SLOPING TO UNDULATING	79.67	33.20
C	8-19	UNDULATING TO ROLLING	25.09	10.45
TOTAL			240.00	100.00

RICE SUITABILITY MAP
 SOIL/LAND RESOURCE SURVEY & INTERPRETATION
 INFANTA RESETTLEMENT SITE
 INFANTA, PANGASINAN

SCALE 1:8,000

- ROAD (Secondary, gravelly/sandy)
- TRAILS
- CREEK
- RESETTLEMENT AREA BOUNDARY
- MAPPING UNIT BOUNDARY



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA	
		Has.	%
	HIGHLY SUITABLE	12.44	5.23
S2	MODERATELY SUITABLE	17.74	7.39
	MARGINALLY SUITABLE	156.10	66.04
	NOT SUITABLE	29.86	12.44

OTHER AREA

	EXISTING MANGO AREA	15.28	6.37
	PROPOSED HOUSING AREA	8.48	3.53

TOTAL 249.00 100.00

Proposed housing and existing mango areas are not subject to suitability classification.

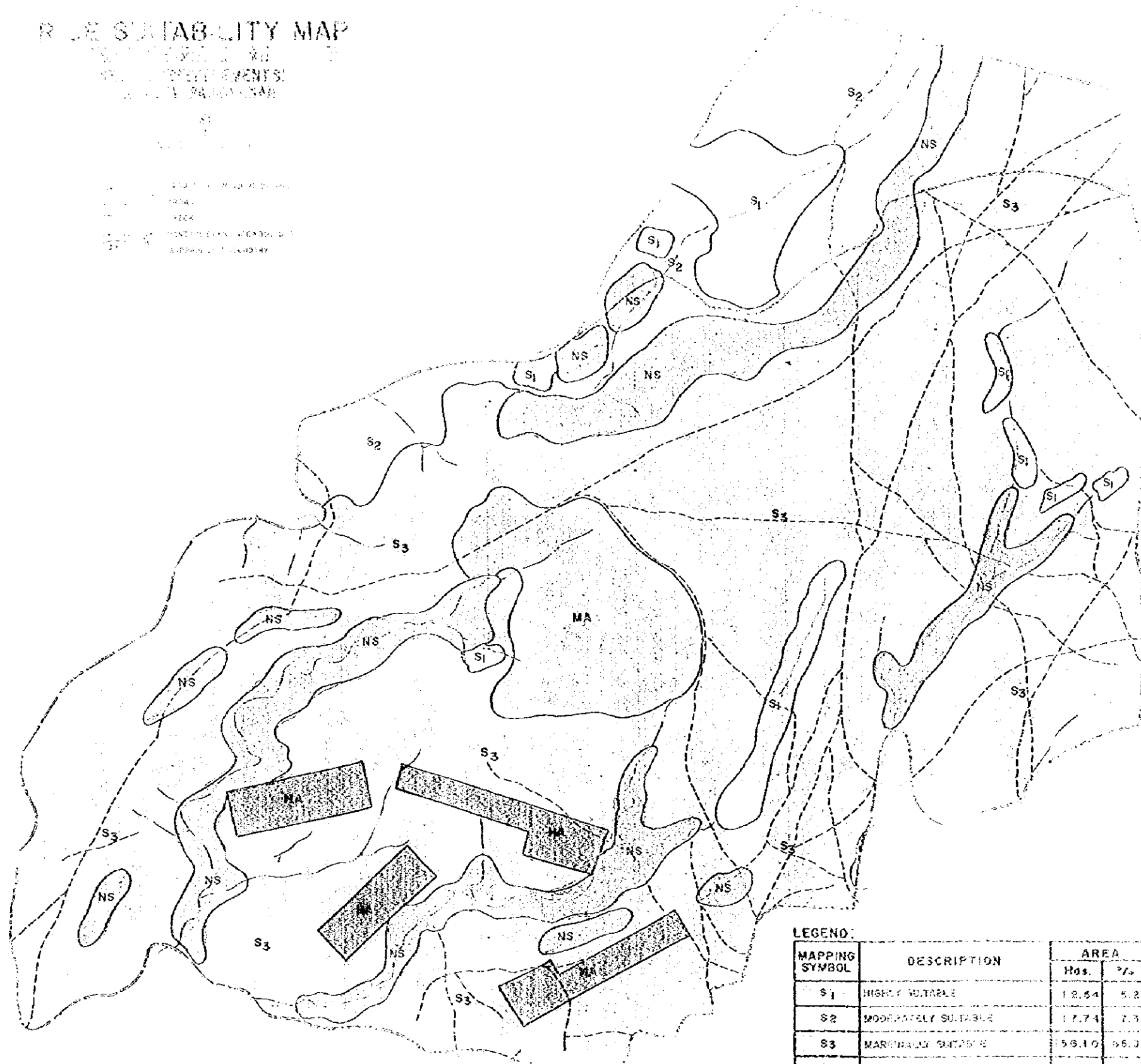
図4 米作適性図

記号	面積	
	ha	%
著しく適	12.54	5.23
中度に適	17.74	7.39
僅かに適	156.10	65.04
不適	29.86	12.44

RICE SUITABILITY MAP

PROJECT NO. 20
 REGIONAL DEVELOPMENT
 1961-1962

SCALE: 1:50,000
 DATE: 1962
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 APPROVED BY: [Name]



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA	
		Has.	%
S1	HIGHLY SUITABLE	12.54	5.23
S2	MODERATELY SUITABLE	17.74	7.39
S3	MARGINALLY SUITABLE	156.10	65.04
NS	NOT SUITABLE	29.85	12.44

OTHER AREA

MA	EXISTING MANGO AREA	3.28	1.37
MA	PROPOSED MANGO AREA	3.43	1.43

TOTAL 210.00 87.00

Proposed mangos and other crops to be developed subject to suitability development.

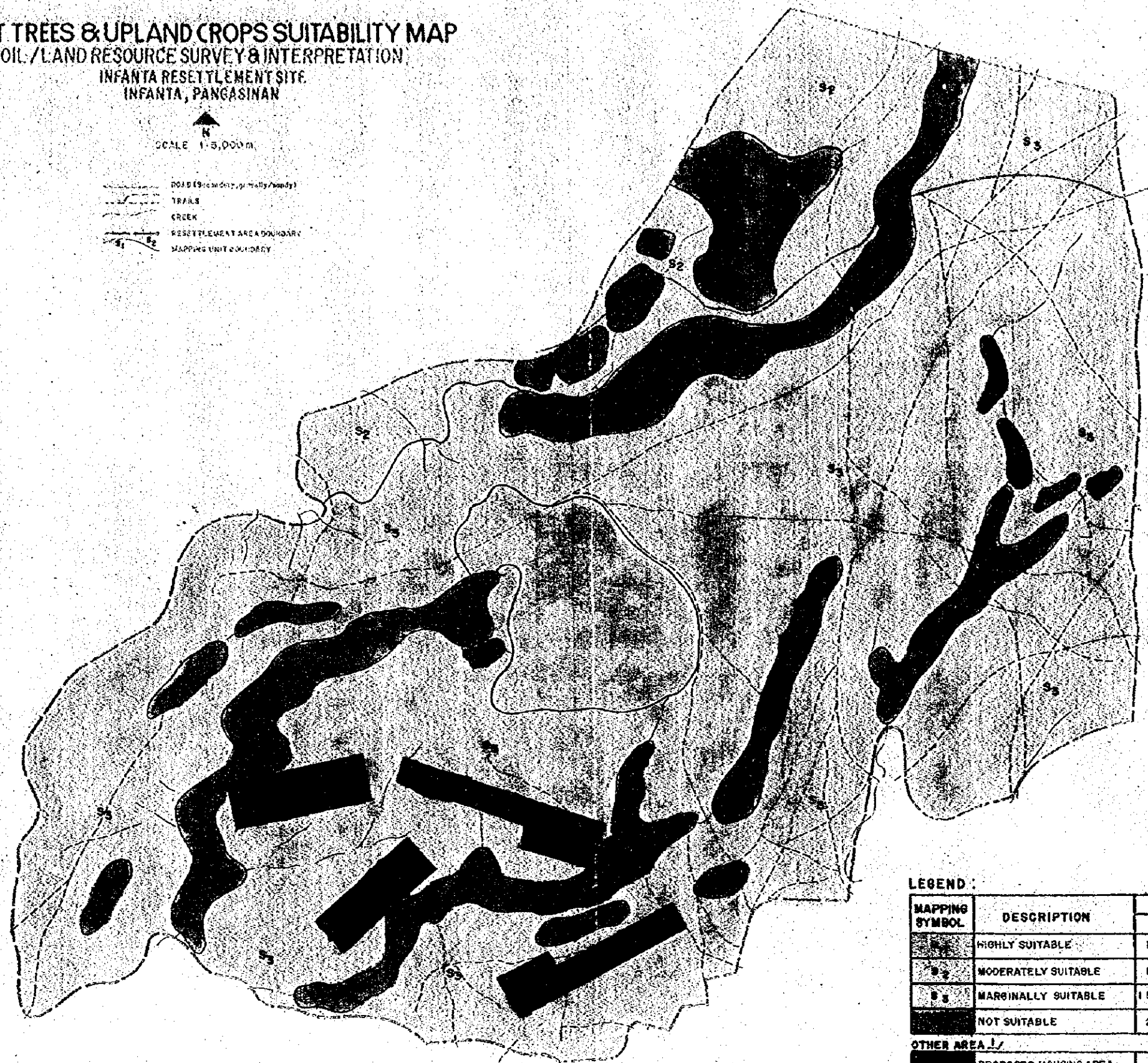
図4 米作適性図

記号	面積	
	ha	%
高しく適	12.54	5.23
中々に適	17.74	7.39
僅かに適	156.10	65.04
不適	29.85	12.44

FRUIT TREES & UPLAND CROPS SUITABILITY MAP
 SOIL / LAND RESOURCE SURVEY & INTERPRETATION
 INFANTA RESETTLEMENT SITE
 INFANTA, PANGASINAN

SCALE 1:5,000 M

- ROADS (road width, gravelly / sandy)
- TRAILS
- CREEK
- RESETTLEMENT AREA BOUNDARY
- MAPPING UNIT BOUNDARY



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA		記数	面積	
		Hec.	%		ha	%
	HIGHLY SUITABLE	16.28	6.37	著しく適	15.28	6.37
	MODERATELY SUITABLE	17.74	7.39	中度に適	17.74	7.39
	MARGINALLY SUITABLE	155.10	65.04	僅かに適	155.10	65.04
	NOT SUITABLE	29.88	12.44	不適	29.86	12.44
OTHER AREA I/						
	PROPOSED HOUSING AREA	8.46	3.53			
	EXISTING RICE AREA	12.54	5.23			
		TOTAL	240.00	100.00		

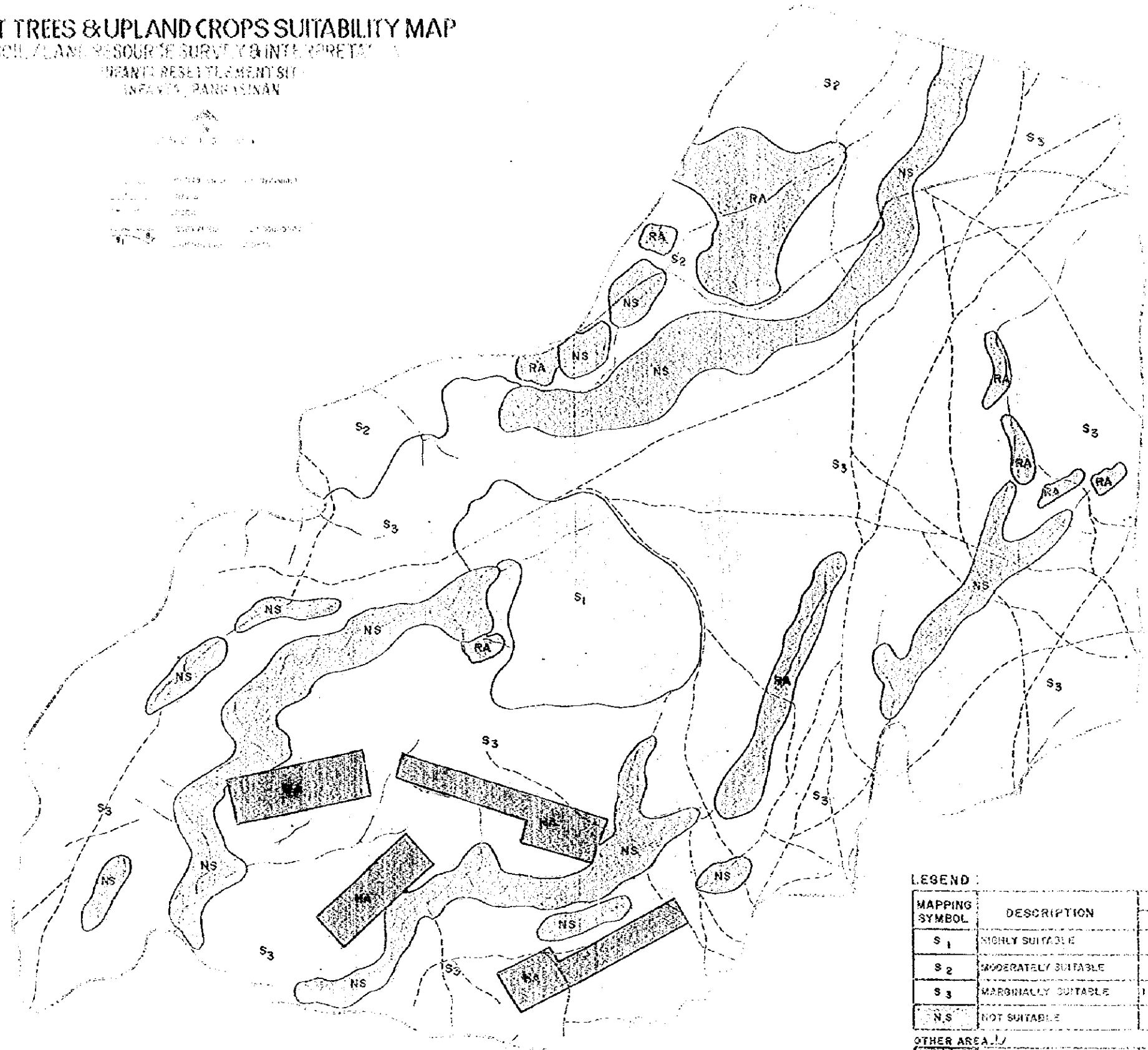
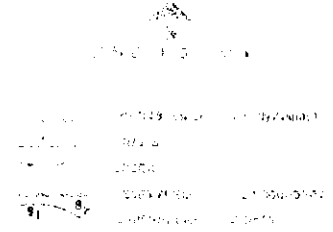
I/... Proposed housing and existing rice areas are not subject to suitability classification.

図5 果樹類及び畑作物適性図

FRUIT TREES & UPLAND CROPS SUITABILITY MAP

SOIL/LAND RESOURCE SURVEY & INTERPRETATION

UPLAND RESETTLEMENT SITE
INFANTA, PANGASINAN



LEGEND:

MAPPING SYMBOL	DESCRIPTION	AREA		記号	面積	
		Haa.	%		ha	%
S 1	HIGHLY SUITABLE	15.28	6.37	高しく適	15.28	6.37
S 2	MODERATELY SUITABLE	17.74	7.39	中低しく適	17.74	7.39
S 3	MARGINALLY SUITABLE	133.10	58.04	僅かに適	133.10	58.04
NS	NOT SUITABLE	29.88	12.44	不適	29.88	12.44
OTHER AREA (1)						
MA	PROPOSED HOUSING AREA	8.43	3.53			
RA	EXISTING RICE AREA	12.54	5.23			
TOTAL		240.00	100.00			

1) Proposed housing and existing rice areas are not subject to soil suitability classification.

図5 果樹類及び畑作物適性図

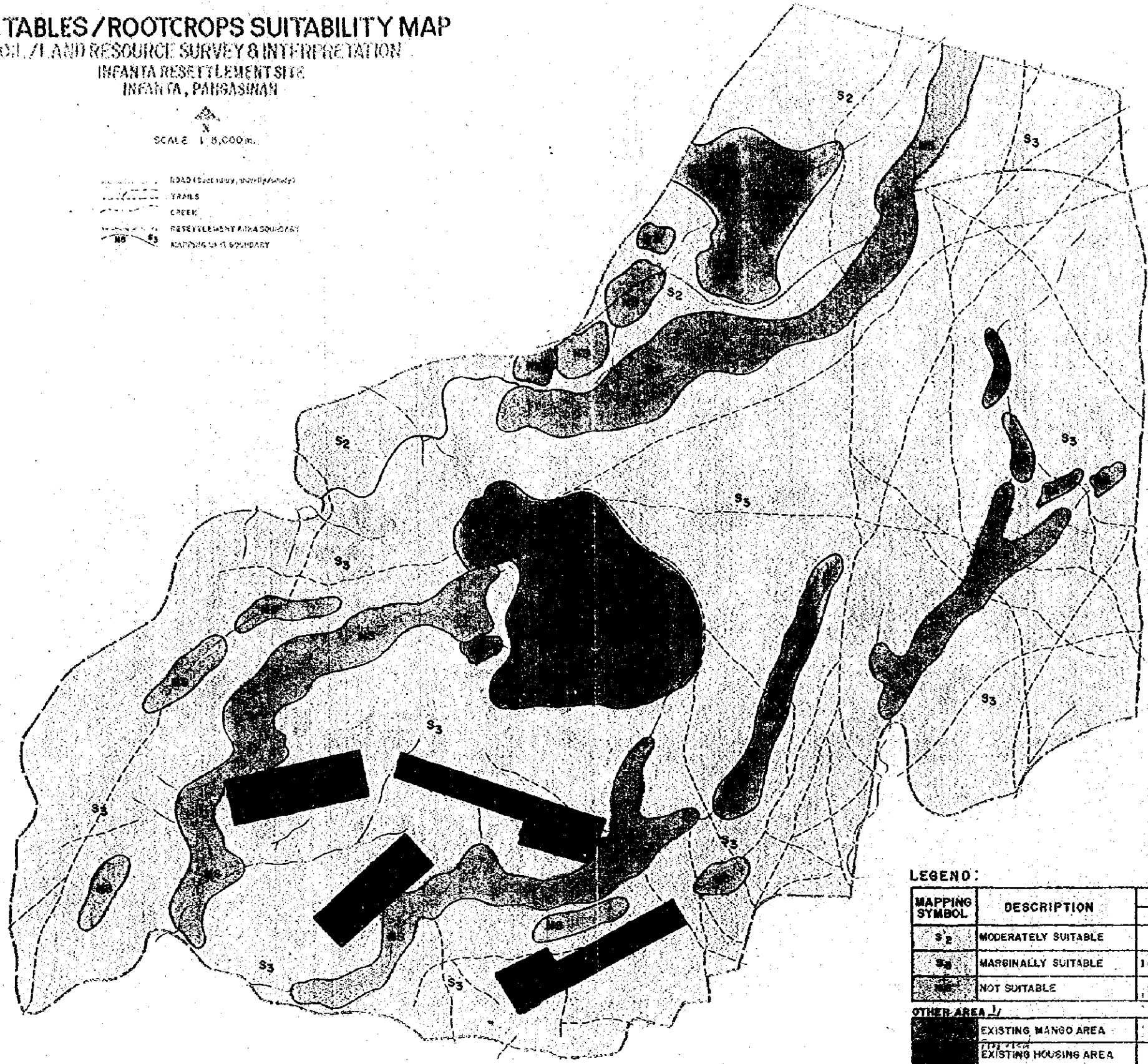
VEGETABLES/ROOTCROPS SUITABILITY MAP

SOL 7/ LAND RESOURCE SURVEY & INTERPRETATION

INFANTA RESETTLEMENT SITE
INFANTA, PANGASINAN

SCALE 1:8,000 m.

- ROAD (GRADE 100, 120, 140, 160)
- TRAILS
- CREEK
- RESETTLEMENT ALLOTMENT
- MAPPING UNIT BOUNDARY



LEGEND:

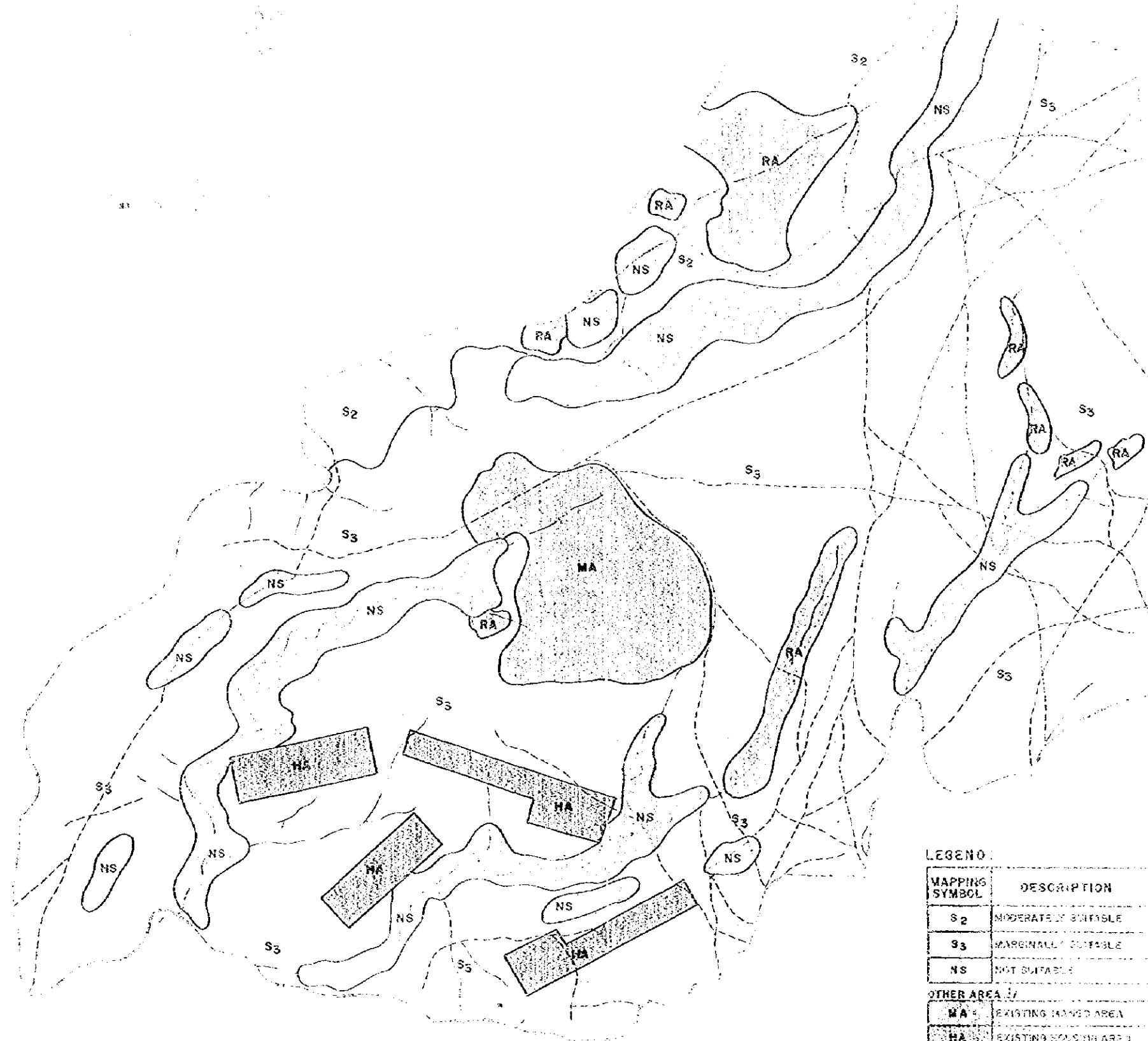
MAPPING SYMBOL	DESCRIPTION	AREA	
		Hds.	%
S ₂	MODERATELY SUITABLE	17.74	7.39
S ₃	MARGINALLY SUITABLE	186.10	82.04
	NOT SUITABLE	29.86	12.44
OTHER AREA			
	EXISTING MANGO AREA	16.28	6.37
	EXISTING HOUSING AREA	8.48	3.53
	EXISTING RICE AREA	12.64	5.23
		TOTAL	240.00 100.00

Existing housing and existing agricultural areas are not subject to suitability classification.

図6 野菜類/根菜類適性図

記註	面積	
	ha	%
中度に適	17.74	7.39
僅かに適	186.10	82.04
不適	29.86	12.44

VEGETABLES/ROOTCROPS SUITABILITY MAP



LEGEND

MAPPING SYMBOL	DESCRIPTION	AREA		記号	面積	
		Has.	%		ha	%
S ₂	MODERATELY SUITABLE	17.74	7.39	中度合適	17.74	7.39
S ₃	MARGINALLY SUITABLE	153.10	65.04	僅か合適	153.10	65.04
NS	NOT SUITABLE	29.86	12.44	不適	29.86	12.44
OTHER AREA						
MA	EXISTING MARKET AREA	13.28	5.52			
HA	EXISTING HOUSING AREA 1	9.43	3.93			
RA	EXISTING ROAD AREA	12.54	5.23			
		TOTAL	240.00	100.00		

図6 野菜類/根菜類適性図

Proposed housing and existing agricultural areas are not subject to suitability classification.

GENERAL INFORMATION

Pit Number: 1 Location: Dolnan, Infanta, Pangasinan Physiography: Pyroclastic plateau Land Mapping Unit: Pp Land Use: Mango plantation, Rootcrops, Grasses (sedges) Slope range: 0-3 % Coordinate: Longitude: 119°58'02" Latitude: 15°49'35"		Drainage: Well drained Erosion: Slight Rock Outcrops: Few (0-5%) Soil Depth: 30 cm. Taxonomic classification: Lithic ustropept Date: 8/26/97 Author: Emiliano Sibolboro, Joven Espineli, Godofredo Ramos
Horizon	Depth (cm.)	Description
A	0-10 cm.	Brown to dark brown (10yr4/3) moist, clay loam, few, fine, distinct, clear, dark yellowish brown (10yr3/6) mottles; weak coarse regular parting to sub-angular blocky and granular structure. very friable when moist, slightly sticky, slightly plastic when moist; few fine in mediam roots, clear wavy boundary pH.
BC	10-30 cm.	Dark yellowish brown (10yr 4/6) concretionary clay loam, weak coarse granular structure, very friable, non-sticky, non-plastic when wet; gradual wavy boundary, pH _____.
R	30 cm. below	Layers of weather and partially weathered gravel and stones.

GENERAL INFORMATION

Pit Number: 2		Drainage: Well drained
Location: Dolman, Infanta, Pangasinan		Erosion: None to slight
Physiography: Pyroclastic plateau		Rock Outcrops: Few (0-5%)
Land Mapping Unit: Pp		Soil Depth: 24 cm.
Land Use: Grasses and few non-commercial tree		Taxonomic classification: Lithic ustropept
Slope range: 0-3 %		Date: 8/26/97
Coordinate: Longitude: 119°58'06"		Author: Emiliano Sibolboro, Joven Espineli,
Latitude: 15°49'47"		Godofredo Ramos
Horizon	Depth (cm.)	Description
A	0-12 cm.	Dark brown (10yr4/3) moist, sandy clay loam, few, fine, distinct, clear, yellowish brown (10yr4/4) mottles; slightly sticky, slightly plastic, friable; moderate to weak fine angular blocky structure, few fine and medium roots; clear wavy boundary, pH.
B	12-24 cm.	Dark yellowish brown (10yr 4/4) moist, sandy clay loam, few fine distinct clear yellowish brown (10 yr5/0) mottles, nonsticky, non plastic, friable, weak coarse granular structure, many, small rounded gravel; gradual wavy boundary, pH_____.
R	24 cm. below	Many highly weathered gravel and stones.

GENERAL INFORMATION

Pit Number: 3 Location: Dolman, Infanta, Pangasinan Physiography: Pyroclastic plateau Land Mapping Unit: Pp Land Use: Grasses, newly planted to mango, duhat and commercial trees. Slope range: 0-3 % Coordinate: Longitude: 119°57'53" Latitude: 15°49'43"		Edaphic Drainage: Well drained Erosion: None to slight Rock Outcrops: Common Soil Depth: 28 cm. Taxonomic classification: Lithic ustropept Date: 8/27/97 Author: Emiliano Sibolboro, Joven Espineli, Godofredo Ramos
Horizon	Depth (cm.)	Description
A	0-9 cm.	Brown to dark brown (7.5yr 4/3) moist, clay loam, few, fine, distinct, clear, yellowish brown (10yr 5/4) mottles; slightly sticky, slightly plastic, friable when moist; weak fine and medium subangular parting granular structure, few fine and medium roots; clear wavy boundary, pH.
B	9-28 cm.	Brown to dark brown (7.5yr 4/4) moist, clay loam, many, small rounded mangrove and iron concretion; Clear wavy boundary; pH_____.
R	28 cm. below	Presence of partially weathered gravel and stones and gravel pyroclastic materials.

GENERAL INFORMATION

Pit Number: 4 Location: Dolman, Infanta, Pangasinan Physiography: Pyroclastic plateau Land Mapping Unit: Pp Land Use: Grasses (sedges), few duhat and Arrosep (local name). Slope range: 0-3 % Coordinate: Longitude: 119°58'22" Latitude: 15°49'55"		Edaphic Drainage: Well drained Erosion: Slightly eroded Rock Outcrops: Common gravel & stones Soil Depth: 63 cm. Taxonomic classification: Lithic ustropept Date: 8/27/97 Author: Emiliano Sibolboro, Joven Espineli, Godofredo Ramos
Horizon	Depth (cm.)	Description
A	0-11 cm.	Dark yellowish brown (10yr 4/0) moist, clay loam, no mottles, slightly sticky, slightly plastic, friable; weak fine and medium subangular parting to granular structure, few fine roots; clear wavy boundary, pH__.
B	11-30 cm.	Strong brown (7.5yr 5/0) moist, clay loam, no mottles, slightly sticky, slightly plastic, friable; weak fine granular structure, many, small gravel in the horizon; clear wavy boundary, pH_____.
C	30-63 cm.	Yellowish brown (10yr 5/6) clay loam, no mottles, slightly sticky, slightly plastic, friable; weak fine granular structure, many gravel partially pyroclastic materials.
	63 cm. below	Presence of partially weathered pyroclastic materials.

GENERAL INFORMATION

Pit Number: 5 Location: Dolman, Infanta, Pangasinan Physiography: Collu-alluvial terrace Land Mapping Unit: Ct Land Use: Paddy rice irrigated and rainfed. Slope range: 0-8 % Coordinate: Longitude: 119°58'18" Latitude: 15°50'07"		Soil Drainage: Somewhat poorly drained to moderately well drained Erosion: None to slightly eroded Rock Outcrops: Few & files as a bind Soil Depth: 80 cm. Taxonomic Classification: Aquic Eutropept associated with Aeric Tropept Date: 8/27/97 Author: Emiliano Sibolboro, Joven Espineli, Godofredo Ramos
Horizon	Depth (cm.)	Description
Apg	0-20 cm.	Gray (10yr 5/1) moist, clay, few fine distinct clear dark yellowish brown (10yr 5/4) mottles, sticky, plastic, few, moderate weak, fine and medium, angular structure; gradual wavy boundary, pH__.
B21	20-50 cm.	Dark yellowish brown (10yr 3/4) moist, clay loam, few fine distinct clear yellowish brown (10yr 5/4) mottles, sticky, plastic, firm; weak fine and severe subangular parting granular structure, few partially weathered gravel in the horizon; pH_____.
B22	50-80 cm.	Brownish yellow (10yr 6/8) moist clay loam, no mottles, slightly sticky, slightly plastic, friable; presence of weathered gravel and stones in the horizon. Clear wavy boundary.
C	80 cm. below	Presence of highly weathered shale, sandstone and pyroclastic materials.

GENERAL INFORMATION

Pit Number: 6 Location: Dolman, Infanta, Pangasinan Physiography: Pyroclastic plateau Land Mapping Unit: Pp Land Use: Grasses and low density forest. Slope range: 0-3 % Coordinate: Longitude: 119°58'18" Latitude: 15°49'56"		Edaphic Drainage: Well to excessively well drained Erosion: Slight to moderately eroded Rock Outcrops: Common to many Soil Depth: 20 cm. Taxonomic classification: Lithic ustropept Date: 8/27/97 Author: Emiliano Sibolboro, Joven Espineli, Godofredo Ramos
Horizon	Depth (cm.)	Description
AB	0-20 cm.	Dark reddish brown (5yr 4/5) moist, clay, no mottles, slightly sticky, slightly plastic, friable; weak fine to granular structure, few fine roots; gradual wavy boundary, pH 6.2
	20 cm. below	Presence of gravel, stones and pyroclastic materials.

Republic of the Philippines
Department of Agriculture
BUREAU OF SOILS AND WATER MANAGEMENT
Diliman, Quezon City

CHEMICAL ANALYSIS SECTION

Name : MR. EMILIANO N. SIBOLBORO
Address : ALMED

Location : INFANTA RESETTLEMENT,
PANGASINAN

Results on Oven-dry basis

LAB. NO.	HORI-ZON	DEPTH Em	MOIST FACT	LINE TEST	CaCO3 %	pH			CC %	OM %	Total N %	ECmbos/cm	
						H2O 1:1	CaCl2 1:2	P con				1:1	1STD.EXT
IPit No. 4													
IS - 4416		10-11	-	-	-	5.9	4.9	0.9	0.99	1.70	-	0.01	-
4417		11-31	-	-	-	6.0	5.1	0.5	0.97	1.67	-	0.01	-
4418		31-63	-	-	-	6.3	5.7	0.4	0.55	0.95	-	0.01	-
IPit No. 5													
IS - 4419		10-20	-	-	-	6.7	6.0	1.5	1.01	1.74	-	0.10	-
4420		20-50	-	-	-	6.7	6.0	0.8	0.97	1.67	-	0.05	-
4421		50-80	-	0	-	7.6	7.1	-	0.37	0.64	-	0.21	-
IPit No. 6													
IS - 4422		10-20	-	-	• -	6.2	5.4	1.4	1.47	2.53	-	0.01	-

HORI-ZON	DEPTH	MILLI EQUIVALENTS/100g SOIL EXCHANGEABLE BASES				Sum	EXCH ACID	CEC Sum	BASE SATN % SUM	CEC am/Ac OTHER	BASE SATN% on CEC	EXTR AL eq	FREE Fe2O3 %
		Ca	Mg	Na	K								
		IS - 4416		0.6	0.5								
4417		1.5	0.9	Trace	Trace	2.4	8.5	10.9	22	6.7	35	-	-
4418		2.8	1.9	Trace	Trace	4.7	7.6	12.3	38	8.1	58	-	-
IS - 4419		6.3	8.3	0.1	Trace	14.7	8.5	23.2	63	19.8	74	-	-
4420		5.3	6.9	0.1	Trace	12.3	9.1	21.4	57	18.2	68	-	-
4421		12.0	15.6	0.1	Trace	27.7	7.7	35.4	78	34.6	89	-	-
IS - 4422		0.7	0.6	Trace	0.1	1.4	11.6	13.0	11	7.0	20	-	-

Date Sub. September 29, 1997
Date Comp. October 20, 1997

Laboratory Supervisor

Luz Divina E. Sibon
LUZ DIVINA E. SIBON

Chief, Lab. Services Div.

Nora B. Inciong, Ph.D.
NORA B. INCIONG, Ph.D.

Republic of the Philippines
Department of Agriculture
BUREAU OF SOILS AND WATER MANAGEMENT
Diliman, Quezon City

CHEMICAL ANALYSIS SECTION

Name : MR. EMILIANO N. SISOLBORDO
Address : ALMED

Location : INFANTA RESETTLEMENT,
PANGASINAN

Results on Oven-dry basis

LAB. NO.	HORI-ZON	DEPTH Cm	MOIST FACT	LINE TEST	CaCO3 %	pH				DC %	OM %	Total		ECmbos/cm	
						H2O 1:1	CaCl2 1:2	P ppm				N %		1:1	1:10,EXT
Pit No. 1															
IS - 4410		10-10	-	-	-	6.4	5.4	0.6	1.06	1.82	-	0.01	-		
4411		10-30	-	-	-	5.2	5.4	0.8	0.80	1.38	-	0.03	-		
Pit No. 2															
IS - 4412		10-12	-	-	-	6.3	5.3	0.7	0.65	1.12	-	0.01	-		
4413		12-24	-	-	-	6.4	5.5	0.4	0.56	0.96	-	0.01	-		
Pit No. 3															
IS - 4414		10-9	-	-	-	6.1	5.2	0.7	0.56	0.96	-	0.01	-		
4415		19-20	-	-	-	6.2	5.4	0.7	0.50	0.86	-	0.01	-		

HORI-ZON	DEPTH	MILLI EQUIVALENTS/100g SOIL EXCHANGEABLE BASES				Sum	EXCH ACID	CEC Sum	BASE SATN % SUM	CEC am/Ac OTHER	BASE SATN% on CEC	EXTR AL eq	FREE Fe2O3 %
		Ca	Mg	Na	K								
IS - 4410		2.2	2.1	Trace	Trace	4.3	10.6	14.9	29	10.0	43	-	-
4411		3.4	3.3	0.1	Trace	6.8	9.7	16.5	41	13.1	52	-	-
IS - 4412		1.4	1.0	Trace	Trace	2.4	6.7	9.1	26	5.3	45	-	-
4413		1.5	1.4	Trace	Trace	2.9	6.3	9.2	31	5.6	52	-	-
IS - 4414		0.9	0.8	Trace	0.1	1.8	3.4	10.2	18	5.3	34	-	-
4415		1.4	1.2	Trace	Trace	2.6	10.6	13.2	20	7.3	36	-	-

Date Sub. September 29, 1997
Date Comp. October 20, 1997

Laboratory Supervisor

Luz Divina K. Eison
LUZ DIVINA K. EISON

Chief, Lab. Services Div.

Nora B. Inciong
NORA B. INCIONG Ph.D.

D S Ky

MIXED ORGANIC-INORGANIC FERTILIZER GROUP 2				
Corn				
Gintong Ani Balanced Fertilization				
Region 1 Pangasinan	Region 5 Catanduanes	Region 7 Bohol		Negros Oriental
Region 2 N. Visaya	Camarines Norte Camarines Sur	Region 9 Zamboanga		ARMM
Region 3 Tarlac (a0) Bataan Zambales	Masbate Sorsogon	Norte/Sur Basilan	Lanao Norte Magulindanao	
Region 4 Batangas Palawan Mindoro Oriental Mindoro Occidental Quezon	Region 6 Aklan Antique Capiz Iloilo Negros Occ. Negros Oriental	Region 12 Lanao del Norte Cotabato North Cotabato Sultan Kudarat		
Recommendations (bags/ha)	Wet Season		Dry Season	
	HYV	OPV	HYV	OPV
Option 1 Basal Application				
1. commercial organic	6	6	5	5
2. 14-14-14	1	1	2	1
3. 16-20-0 or (20-20-0)	2	2	3	2
Top Dress Urea or (Ammosul)	3 (6)	2 (4)	3 (6)	3 (6)
TOTAL FERTILIZER MIX.				
ORGANIC FERTILIZERS	6	6	5	5
INORGANIC FERTILIZERS	6	5	8	6
Option 2 Basal Application				
1. Compost/Manures	30	30	20	20
2. 14-14-14	1	1	2	1
3. 16-20-0 or (20-20-0)	2	2	3	2
Top Dress Urea or (Ammosul)	3 (6)	2 (4)	3 (6)	3 (6)
TOTAL FERTILIZER MIX				
1. ORGANIC FERTILIZERS	30	30	20	20
2. INORGANIC FERTILIZERS	6	5	8	6

MIXED ORGANIC-INORGANIC FERTILIZER GROUP 1				
IRRIGATED RICE				
Gintong Ani Balanced Fertilization				
	Region 1	Region 2	Region 3	Region 5
Note: (a) - add 10-20 kg ZnSO ₄ /ha	Ilocos Norte (a)	Isabela	Tarlac (a)	Albay
	Ilocos Sur		Pampanga	
	La Union			
	Pangasinan (a)			
Required Number Bags/ Hectare				
Recommendations (bags/ha)	Wet Season		Dry Season	
	Heavy/Medium	Light	Heavy/Medium	Light
Option 1				
<i>Basal Application</i>				
Commercial Organic	5	5	6	6
14-14-14	3	3	2	2
16-20-0 or (20-20-0)	0	0	1 or (1)	1 or (1)
<i>Top Dress</i>				
Urea or (Ammosul)	2 or (4)	3 or (6)	3 or (6)	4 or (8)
TOTAL				
ORGANIC FERTILIZERS	5	5	6	6
INORGANIC FERTILIZERS	5 (7)	6 (9)	6 (9)	7 (11)
Option 2				
<i>Basal Application</i>				
Compost/Manures	20	20	30	30
14-14-14	3	3	2	2
16-20-0 or (20-20-0)	0	0	1 or (1)	1 or (1)
<i>Top Dress</i>				
Urea or (Ammosul)	2 or (4)	3 or (6)	3 or (6)	4 or (8)
TOTAL				
ORGANIC FERTILIZERS	20	20	30	30
INORGANIC FERTILIZERS	5 (7)	6 (9)	6 (9)	7 (11)

Implementation (Operation & Maintenance)
 Plan for Dam and Irrigation Facilities
 (prepared by PGP/NIA)

'98-1-30
 received

Dam & Irrigation
 O&M Plan

IMPLEMENTATION PLAN
 FOR THE
 CONSTRUCTION AND OPERATION AND MAINTENANCE OF
 INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL
 IMPROVEMENT PROJECT-IRRIGATION COMPONENT
 (Revised)

INTRODUCTION

The Infanta Impounding Irrigation and Environmental Improvement project will have three (3) major components; Irrigation Component, Environmental Improvement, and Resettlement for Mt. Pinatubo victims. Management of these components during the construction and operation and maintenance requires participation of different national government agencies and various sectors of the local government units.

The National Irrigation Administration^(NIA) being the agency mandated to implement irrigation development program in the Philippines is designated to head the Dam and Reservoir and Service Area Management Group. The main task of the group in coordination with the consultants will be to monitor the implementation of the construction to ensure adherence to plan, quality and specifications. The NIA will also assist the provincial Government of Pangasinan (PGP) in the planning and implementation of the secondary and tertiary canals and other appurtenant structures as their local counterpart to the project. The NIA will prepare the plans of the secondary and tertiary canals and other appurtenant structures. The fund for the construction of these canals and structures will be allocated by the Provincial Government of Pangasinan.

Likewise, the operation and maintenance of the irrigation component of the project after the completion shall be jointly undertaken by the Provincial Government of Pangasinan, the benefited irrigators associations and the National Irrigation Administration. Details on the duties and responsibilities of the different sectors are to be discussed on the operation and maintenance phase of this report.

CONSTRUCTION PHASE:

MOBILIZATION OF MANPOWER AND EQUIPMENTS

The consultants, after the review of the contractor's list, shall furnish the NIA a copy of the list of equipment and manpower necessary for the prosecution of the work for the dam and other appurtenant structures, canals and canal structures. The list of equipment and manpower shall include that of the sub-contractor/s'. Schedule of deployment for both the equipment and manpower shall also be submitted.

TEMPORARY SITE FOR THE FIELD OFFICE

Temporary site for the field office shall be constructed by the contractor at a place strategically located near the construction site for closer supervision during actual construction. The site should be enough to accommodate the warehouse for construction materials, batching plant, laboratory for quality control and testing of materials, field office for the consultants, Project Management Group Office, contractor's office and quarters for the manpower.

Construction of the temporary site should be constructed and completed before the start of the actual construction of the dam and other facilities. The PGP shall assist the contractor in negotiating the site.

RIGHT OF WAY NEGOTIATION

The location of the dam, reservoir, canals and canal structures shall be laid out by the PGP with the assistance from the consultant and the NIA. The right-of-way should be determined by the PGP. Acquisition of right-of-way in whatever mode shall be the responsibility of the PGP.

Right-of-way problems should be all cleared before the start of the project.

PRE-QUALIFICATION OF SUB-CONTRACTORS

Whenever necessary, the main contractor for the construction of dam, appurtenant structures, canals and canal structures shall submit to the consultants, the NIA and PGP for proper evaluation the pre-qualification papers of all prospective subcontractors.

MATERIAL TESTING AND QUALITY CONTROL

All materials that will be used for the construction of the dam, appurtenant structures and other canal structures shall be tested in accordance with the standard acceptable to the Japanese Government, the NIA and the PGP. The results of the tests shall be submitted to the NIA for reference in monitoring the quality of the construction to ensure adherence to specification and design.

REVISION OF PLANS AND SPECIFICATIONS

Revision of plans and specifications during construction for the dam, appurtenant structures, canals and canal structures to suit actual field conditions shall be initially discussed by the consultant to the NIA and PGP before implementation of such revision is to be done.

CONSTRUCTION SCHEDULE

The dry season in the project site usually starts in the month of November. Construction of the diversion conduit could be started during this month. Upon completion of the diversion conduit the water at the river will be diverted and the dam foundation can immediately be started during the month of January of the following year. Construction at the riverbed particularly at dam and appurtenant structures is generally workable during the period from November to June.

Construction schedule for new canals can be started during the month of November. For the rehabilitation of existing canals and canal structures, it can start after

the harvest of the second crop, usually in the month of March. The main cropping season can start in the month of July. Therefore, the construction period for the rehabilitation works is basically from March to June.

Schedule of construction and the planting calendar of the farmers should be well coordinated to ensure smooth implementation of the project while avoiding adverse effect of the construction to the farming activities of the farmers. In this regard, close coordination between the NIA, IA and contractor should be observed.

The construction of main canals (Bamban main canal, San Felipe main canal and left main canal) shall be undertaken by the contractor in accordance with the specifications required by the consultants. Secondary and tertiary canals will be constructed by the PGP following the specification of the main canal as required by the consultants.

The total length of main canal for the three networks, The Bamban, San Felipe and left main canal is 21.60 km. which is included in the grant. The secondary and tertiary canal having a total of 20.00 km. is a counterpart of PGP. As per plan prepared by the consultant, the length of secondary and tertiary canals are just enough and within the allowable standard of NIA which ^{is} 10 hectares for tertiary canal and 50 hectares for secondary canal. Areas that are classified as terraces due to steep slope (more than 10%) will use the paddy to paddy method of delivering water to the lower portion, therefore, no ^{need} (used) for tertiary canal.

SAFETY MEASURES

To avoid accidents that may lead to the lost of lives and properties, safety seminars and workshops shall be conducted by qualified organization such as NIA, Red Cross, Safety Organization of the Philippines Inc. and the Consultants (and) to be attended by all the people involved in the construction.

MONITORING AND EVALUATION

To effectively monitor the progress of the construction, a weekly report and plan, should be submitted by the consultant to the NIA and PGP. Monthly coordination meetings of all the involved agencies, the consultant and the contractor should be conducted to discuss the progress of the project and other pertinent issues.

PROJECT COMPLETION

Immediately upon completion of the construction, a test run should be conducted to determine the functionality of the constructed facilities. Inventory of completed facilities and listing down of deficiencies shall be undertaken. Deficiencies shall be immediately repaired before the final acceptance of the project by the PGP.

PARTIAL AND FULL ACCEPTANCE OF THE PROJECT

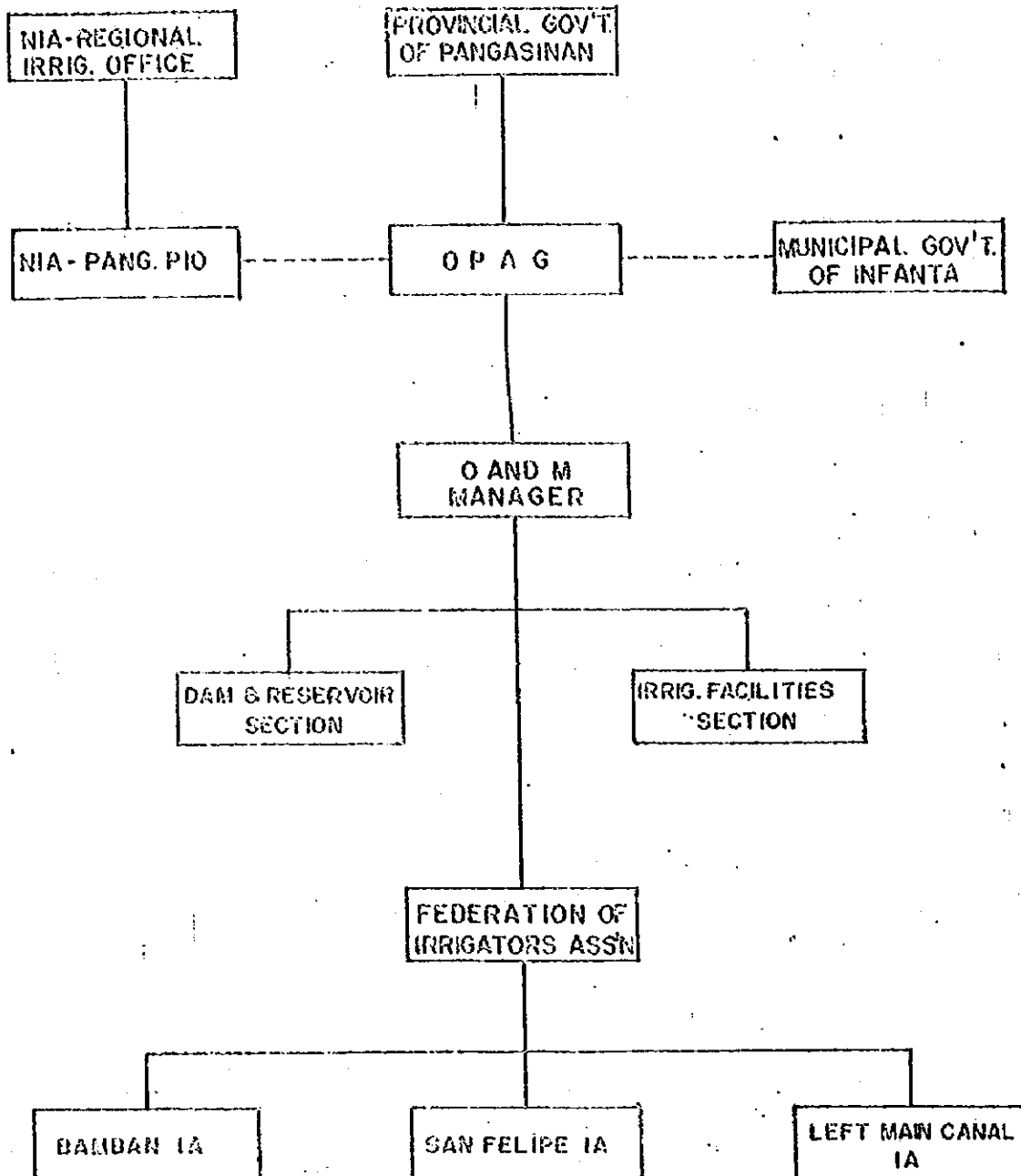
Partial and full acceptance of the project by the PGP in accordance with the interim payments to the contractor shall be upon the recommendations of the NIA.

OPERATION AND MAINTENANCE PHASE:

ORGANIZATIONAL STRUCTURES FOR OPERATION AND MAINTENANCE

The operation and maintenance of the irrigation component including dam and reservoir, weirs, canals, and the other appurtenant structures of the project shall be the responsibility of the NIA (head), PGP, and the I.A.. Since the configuration of the service area will be divided into three communal irrigation systems, their corresponding Irrigators' Association will be responsible on the operation and maintenance of their respective system. The system will include the existing weirs, main canals/primary canals, secondary and tertiary canals. The Provincial Government of Pangasinan will establish a field office for the O & M.

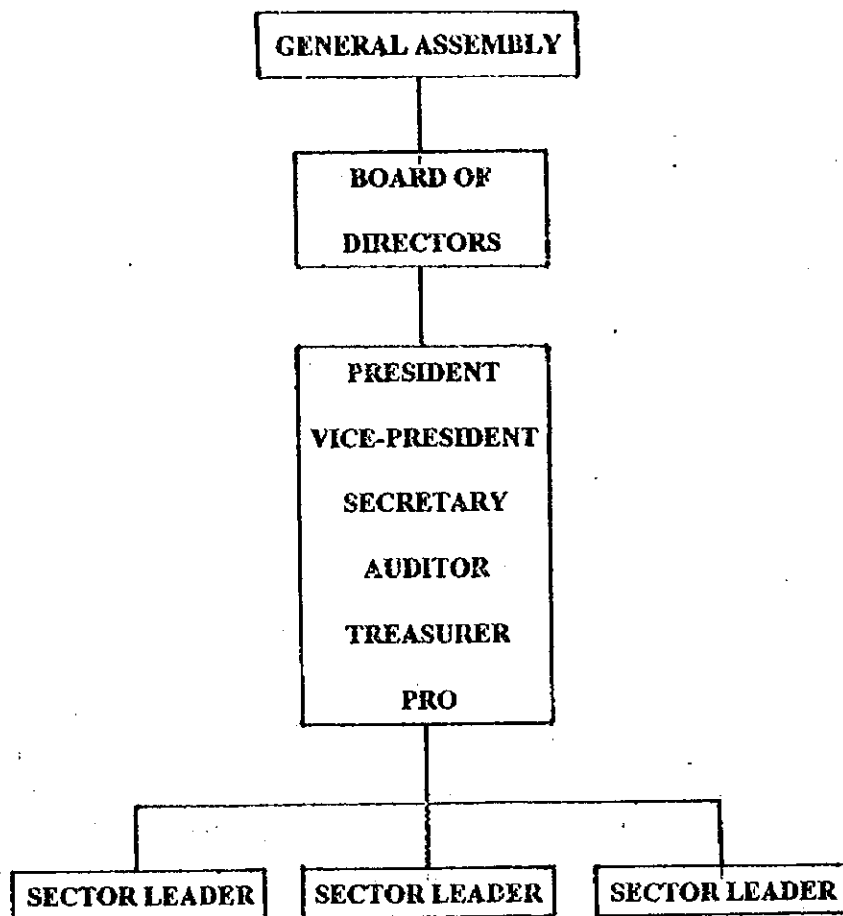
ORGANIZATIONAL CHART
OPERATION AND MAINTENANCE
OF
INFANTA IMPOUNDING IRRIGATION PROJECT



The three (3) Irrigators' Associations namely, MANA I.A. for San Felipe CIS, BAMBAN I.A. for Bamban CIS and the I.A. for the proposed left main canal shall be federated to establish a group responsible for the water distribution to the three systems.

The National Irrigation Administration will be the head to assist the Irrigators' Associations in the operation and maintenance of their communal irrigation systems. The Provincial Government of Pangasinan will be the head to assist in the maintenance and operation of the dam, reservoir and the valve gates.

Below is the proposed Organizational Structure at the I.A. level for the operation and maintenance of each of the systems:



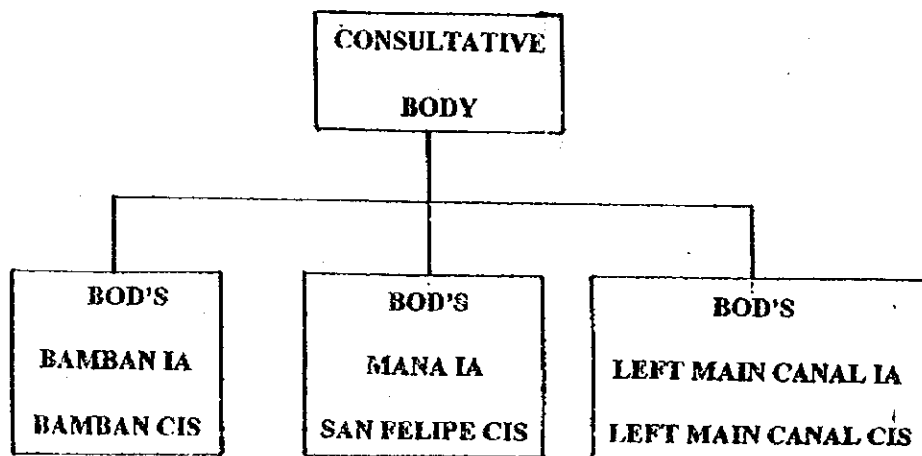
The general assembly of IA is composed of the general members who are directly benefited by the system. All policies to be passed by the Board of Directors should be approved by the General Assembly.

The board of directors are the representatives of the members to the policy-making body. The members of the board of directors are chosen by the farmers of each sector. The sector is based on the command area of each of the canal or water based.

The Irrigators' Associations' President, Vice President, Secretary, Auditor, Treasurer and the PRO is to be elected by the general assembly except for the secretary whom to be selected by the I.A. President. This set of officers shall be responsible for the implementation of the policies passed and approved by the board.

The sector leaders are elected by the sector members. They will implement I.A. policies at the sectoral level.

Below is the proposed Organizational Structure for the federated Irrigators' Association of the three communal irrigation systems which composes of Bamban CIS, San Felipe CIS and the left main canal CIS;



The consultative body will be composed of the chairmen of the three IA's. The consultative body will prepare and implement the policy for the water distribution to the three CISs. The policy that emanates from the consultative body should be approved by the board of directors to the three IA's combined.

IMPLEMENTATION OF OPERATION AND MAINTENANCE

To implement the operation and maintenance of the project after completion, the NIA will conduct a systems management training/workshop (SMT) to be attended by the three Irrigators' Associations and the concerned personnel of the Provincial Government of Pangasinan. The Training/Workshop will be conducted just after the completion of the project and before the first cropping season.

The objective of the training workshop is to prepare or to establish the maintenance plan, water distribution plan, monitoring plan, duties and responsibilities of each of the officers and members of the associations including the PGP personnel that will be assigned in the operation and maintenance of the project.

The plans that have to be prepared during the training will be implemented during the first cropping season and will be reviewed/evaluated in the succeeding operation and maintenance (O & M) conferences between the IA's, PGP and NIA that are usually scheduled on the pre-season, mid season and end season of each of the cropping seasons to re-adjust/improve the plans if necessary.

To monitor the O & M activities, the PGP personnel and the IAs will be required to submit (an) end-season reports to the NIA. These reports will be used in the assessment of the O & M plans. Please see ANNEX B.

DUTIES AND RESPONSIBILITIES FOR THE O & M

PARTICULARS	I. A.	PGP	NIA
1. General/Common	1. Submit monthly report to PGP	1. Submit monthly report to NIA	1. Review the report and give the guidance/advice.
2. Dam and Reservoir	1. Prepare and submit water distribution plan and cropping calendar	1. Safeguards the dam and reservoir against intruders.	1. Evaluate the report of the PGP and give observation and recommendations if necessary.
	2. Maintain and operate the valve gates.	2. Maintain and operate the valve gates.	2. Assist the IA in the preparation of water distribution plan in consideration with proposed reservoir operation.
	3. Observe and record the settlements of the dam.	3. Observe and record the settlements of the dam.	
	4. Measure and record the seepage at the toe of the dam.	4. Measure and record the seepage at the toe of the dam.	
	5. Record daily rainfall and water surface level of the reservoir.	5. Record daily rainfall and water surface level of the reservoir.	
	6. Regulate volume of water releases	6. Regulate volume of water releases.	
	7. Implement minor repair.	7. Implement major repair.	
3. Existing Weirs (Bamban and San Felipe CIS)	1. The IA for San Felipe and Bamban CIS shall operate and maintain the intake gates.	1. Monitor the operation and maintenance of the weir.	1. Monitor the operation and maintenance of the weir
	2. Implement minor repair		2. Implement major repair if needed.
	3. Keep the vicinity clean.		
4. Main canal and Structures	1. The IA will regularly clean the canal of their respective system	1. Monitor the O & M activities and give necessary assistance especially equipment when needed.	1. Monitor the O & M activities and give necessary assistance such as equipment
	2. Implement minor repair	2. Implement major repair at the area of left main canal	2. Implement major repairs, if any, at the area of San Felipe and Bamban CIS.
5. Secondary, Tertiary including Structures	1. At sectoral level the IA will conduct regular maintenance of secondary and tertiary canals including its structures.	1. Monitor the O & M activities	1. Monitor the O & M activities
	2. Implement repair	2. Give technical assistance to the IA.	2. Give technical assistance to the IA.

Note : The Consultant will assist in the activities of these parties, when required.

OPERATION AND MAINTENANCE COST

The Provincial Government of Pangasinan will incur an estimated annual expenses of P882,478.00 for operation and maintenance of the dam, reservoir and the control of gates. The total amount is composed of the cost for the following;

1. Personnel Services - - - - -	P 748,078.00
2. Other Operating Expenses :	
2.a. Fuel and Oil - - - - -	48,000.00
2.b. Powers and Electricity - - - - -	14,400.00
2.c. Office Supplies - - - - -	12,000.00
2.d. Equipment Repairs/Maintenance - - - -	60,000.00

TOTAL - - - - -	P 882,478.00

(See Breakdown in ANNEX "A")

There will be no expenses for the operation and maintenance of the irrigation facilities of the three (3) communal irrigation systems because it will be the responsibility of the irrigators' associations.

The maintenance of the road network shall be the responsibility of the Local Government Units. The roads will be turned-over to Barangay Government when completed. These roads will be registered as barangay roads so that cost for maintenance will be included in the annual budget of the barangay.

Equipment provided by Japanese Government as equipment component of the project;

1. Bulldozer
2. Back hoe
3. Motor grader
4. Dump truck

These equipment shall be used for the operation and maintenance of the dam, reservoir, canals, roads and other facilities.

SOURCE OF INCOME

The source of income for the Irrigation Component of the project will be Irrigation Service Fee of the expansion areas outside the presently irrigated areas of Bamban and San Felipe Communal Irrigation Systems. The expansion area that will be paying the Irrigation Service Fee equivalent to P2,000.00 per hectare is 460 hectares. The amount would be payable twice a year, P800.00 (2 cavans) during the first crop and P1,200.00 (3 cavans) during the second crop per hectare. An existing area of about 370 hectares that will be irrigated during the dry season shall pay P1,200.00 (3 cavans). The total amount of P1,364,000.00 will be enough to cover-up the cost of operation and maintenance.

OTHER TECHNICAL ASSISTANCE

The NIA shall assist the PGP in the organization of the farmers. It will also strengthen the existing Irrigators' Associations of San Felipe and Bamban CISs. The NIA shall conduct necessary training.

The NIA shall give priority to the system whenever there are available funds for the rehabilitation and improvement of the communal irrigation systems.

For the successful operation and maintenance of the system, necessary assistance from the consultants in the form of follow-up services are needed. The consultant will prepare the O & M manual as a guide for the people who will be involved in operation and maintenance after the completion of the project. The O & M manual will be the basis of the practical training and guidance to be conducted in two phases by the consultant.

The first phase will be conducted just after the completion of the project and it will be done in at least six months. The first phase of the practical training will include the following subjects:

1. Impounding tests observations
2. Gate operation
3. Observation and measurement on water leakage, dam deflection, settlement, etc.
4. Inspection and maintenance/repair of the facilities/structures.
5. Recording and report preparation.
6. Information/Communication systems and
7. Safety control

The second phase of the practical training and guidance will ~~be~~ also ^{be} conducted by the consultant within three years after the first phase, possibly one-month period for every half year.

During the implementation of the second phase, the consultant will inspect the dam and other facilities/structures, review all the O & M record and recommend solutions and try to improve the O & M.

ESTIMATED OPERATION & MAINTENANCE COST
Infanta Impounding Irrigation & Environmental Improvement Project

I. Personnel Services

NO.	PERSONNEL REQUIREMENT	MONTHLY BASIC RATE (P)	MONTHLY ALLOW. PERA & ACA (P)	EARNED LEAVES (P)	13TH MONTH PAY (P)	CASH GIFT (P)	ANNUAL TOTAL (P)
1	SR. ENGINEER A	10,204.00	1,000.00	13,915.00	10,204.00	1,000.00	159,587.00
1	GATEKEEPER	6,073.00	1,000.00	8,281.00	6,073.00	1,000.00	100,230.00
1	WATERMASTER	6,073.00	1,000.00	8,281.00	6,073.00	1,000.00	100,230.00
2	DRIVER/OPERATOR	12,450.00	2,000.00	16,977.00	12,450.00	2,000.00	204,827.00
1	SECURITY GUARD	6,546.00	1,000.00	8,926.00	6,546.00	1,000.00	107,024.00
1	UTILITYMAN	4,400.00	1,000.00	6,000.00	4,400.00	1,000.00	76,200.00
	TOTAL	45,746.00	7,000.00	62,389.00	45,746.00	7,000.00	41,892,368.00

II. Other Operating Expenses

1. Personal Services	P 748,078.00
2. Other Operating Expenses:	
2.a. Fuel & Oil	49,000.00
2.b. Powers & Electricity	14,400.00
2.c. Office Supplies	12,000.00
2.d. Equipment Repair/Maintenance	60,000.00
TOTAL	P 882,478.00
	XXXXXXXXXX

Implementation (Operation & Maintenance)
Plan for Forestation
(prepared by PGP/DENR)

198-1-30L
received

INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL FORESTATION PLAN
IMPROVEMENT PROJECT
INFANTA, PANGASINAN
(Revised)

1. INTRODUCTION:

The rehabilitation and development of open and denuded forestlands is the primary objectives toward environmental conservation and improvement of water resources protection of endangered flora and fauna as well as reduction of natural disaster such as soil erosion and flood. It also provides economic values by increasing the income level of residents derived from fruit trees as well as timber and finally, creating awareness on the importance of environmental conservation and improvement of water resource for domestic and household use.

1.1 Situation Analysis

The proposed project is situated at least 11 kilometers East of Poblacion, Infanta, Pangasinan. It is within the territorial jurisdiction of Barangay Bamban, Infanta, Pangasinan. The area is a sub-watershed of San Felipe River and now on its early stage of degradation needing immediate rehabilitation.

San Felipe River irrigates about 300 hectares of agricultural lands of Barangay Fatima and Bamban respectively. About 70 percent of the land area downstream is planted to rice.

The present state of the area needs immediate rehabilitation to ensure sustainability of water resource of San Felipe River and its tributaries.

This project is complimentary with the existing DENR Projects such as: the Administratively Managed Reforestation Project and the Agro-Forestry Reforestation Component.

2. PROJECT DESCRIPTION

2.1 Location and Area

The Infanta Impounding Irrigation and Environmental Project has a gross area of 2,290 hectares located at Bamban, Infanta, Pangasinan out of which 1,800 hectares was earmarked for reforestation component for the impounding project. It lies between latitude 15 54' to 15 60' and longitude 119 58' to 120 00'. It is bounded on the North, South, East and West by Timberland.

2.2 Accessibility

The project site is accessible to any type of vehicles up to Barangay Bamban which is 6 kilometers from the National Road at about 4 kilometers from the Barangay to the project site.

2.3 Climate

The area falls within the first climatic type, which is dry from November to May and wet for the rest of the year. Recorded average annual rainfall is 2,900 mm. The prevailing very dry hot summer period is very crucial in the overall management of the project as it dictates the magnitude of future replanting and damages caused by fire.

2.4 Topography and Damage

The project site is moderately rolling to moderately steep slopes especially over the forested areas. Elevation ranges from 20 to 200 meters ASL. The entire area is drained by two (2) intermittent creeks which run parallels to each other toward San Felipe River.

2.5 Soil

The site is generally underlain by limestone structure which gives rise to non-acidic soil. It has a soil PH that ranges from 6 to 7. The soil is further characterized as shallow, firm and with poor tillage properties. The color is red to reddish brown. It has a clay loam subsoil that extends to about 40-50 cm. deep.

2.6 Vegetative Cover/Land-Use

The site is composed of grassland, brush land and Forestland and currently under the pressures of annual burning and illegal logging. Talahib and samon-samon are the dominant grass species which are associated with tree species like duhat, akling parang, molave, agoho and bignai pugo. A stand of second growth dipterocarp forest is likewise found at the eastern portion of the project site where tanguile, white lauan, apitong and yakal are the dominant species.

The estimated distribution of the existing land-use and vegetation is shown below :

Gross Area Delineated	2290	100 %
Model Refo. Project	243	10.0 %
Agro-Forestry Project	170	7.5 %
Cultivated/ISF/etc.	40	1.8 %
Rocky	37	1.7 %
Open-Grassland	1,800	79.0 %

The model reforestation project is a Regional funded project with an area of 243 hectares consisting of sub-component such as : Timber Stand Improvement, Assisted Natural Regeneration and Bamboo and Rattan establishment among others. It is a four year project with the purpose of establishing a model reforestation site in every region all through out the country showcasing reforestation, timber stand improvement, assisted natural regeneration and bamboo/rattan establishment. The total project cost is P 3,629, 000.00. The project started in the year 1995 and to be turned over in the year 1998.

The Pangasinan Agro-Forestry Project is a regular funded project by the DENR geared toward establishing a protection forests and rehabilitation of watersheds of San Felipe river and tributaries upstream. It has a total project area of 170 hectares to be developed within three years from 1997 to 1999 with a total project cost of P 2, 550,000.

2.7 Socio-Economic Characteristics

2.7.1 Population

Census conducted recently by the Barangay Council revealed that Bamban has a total population of 2,257 composed of 395 households. The average household size is 5.4. Out of the total population, 1,241 are males and 1,016 are females. There were 781; 1406; and 70 people belong to the group of 1 to 14; 15 to 64; and above 65 years old, respectively. The Barangay is predominantly composed of people from ages 15 to 64 making up for 57% of the total population. The community is made up of 90% Ilocanos. The remaining 10% is composed of Pangasinenses, Tagalog and Zambalenos. Despite the differences in ethnic composition, there is no apparent animosity among them. The majority of the people are Catholics and few members of other religion.

2.7.2 Income Profile

Bamban is basically an agricultural Community. Through the San Felipe River, rice is produced twice and sometime thrice a year. Aside from farming, some of the residents derive their income from non-farm activities like managing sari-sari stores, transport business, employment to government and private sector, wage labor in the construction, carpentry and other activities.

Informal interview conducted revealed that the average income of P 43,000 per annum are realized by some farming households while the average annual income of non-farming households varies greatly due to differences in the types/kinds of employment.

3. PROJECT OBJECTIVES

3.1 General

The project shall establish a stable watershed and ecologically sound environment. The bio-economic impact of the two major ecosystems (grassland vegetation and the residual forest communities) shall be enhanced.

3.2 Specific

- Reforest a total of 1,800 hectares of denuded forest land of Bumban, Infanta, Pangasinan.
- Improve and sustain the quality of water for agricultural and household use downstream.
- Increase the income level of inhabitants from the fruit trees as well as timbers to be derived from the project.
- Provide employment and livelihood opportunities for the upland communities nearby.

4. IMPLEMENTATION AND STRATEGIES

4.1 Detailed Survey

A survey was made delineating the area to be developed by year. This is necessary to determine the respective species assignments by year. (Please see attached Project Map)

4.2 Infrastructure

Nine (9) bunkhouses with respective toolroom with a floor area of 54 square meters each shall be constructed within the nursery site. Likewise, eighteen (18) lookout tower with a floor area of 9 square meters respectively shall be constructed in strategic places within the plantation for protection and patrol purposes. Access trail at least 1 meter in wide shall be established connecting the nursery, lookout towers and nearest barangay road. Firebreaks 10 meter wide shall be established in fire prone areas surrounding the project site.

4.3 Choice of Species

The following forest trees and horticultural crops are finally selected from the project based on economic values and social acceptability.

Timber/Climax tree species

Group A

- Mahogany (Swietenia macrophylla)
- Teak (Tectona Grandis)

Group B

- Acacia (Sonanea Saman)
- Eucalyptus (Eucalyptus SPP)
- Gmelina (Gmelina Arborea)

FRUIT TREES

Group C

- Mango (Mangifera indica)

4.4 Nursery Establishment and Development

The nursery shall be established near a perennial creek within the project area where water supply and micro-climate are highly favorable for seedling development and maintenance.

At least 5 major nurseries shall be established to accommodate 3,600,00 seedlings.

SPECIES	AREA (HAS.)	SPACING (M)	POT SIZE (CMS.)	TOTAL NO. OF SEEDLINGS
Mahogany	500	2 x 3	4 x 6	1,039,840
Teak	320	2 x 3	4 x 6	680,020
Acacia	320	2 x 3	4 x 6	680,020
Eucalyptus	240	2 x 3	4 x 6	510,100
Gmelina	320	2 x 3	4 x 6	680,020
Mango	100	10 x 10	6 x 8	10,000
Total	1,800			3,600,000

Seeds shall be collected locally from phenotypically superior mother trees.

Seeds of slow growing species shall be sown within the months of September to December to give enough time for the seedlings to mature and hardened.

Soil potting media shall have a mixture of at least 80 % top soil and 20 % river sand.

The spacing of 2m x 3m is recommended as an ideal spacing for watershed rehabilitation to prevent movement of surface soil and erosion of parent materials. Furthermore, this prevents the loss of water through the action of evapotranspiration.

The construction of Warehouse, Administrative office, germination house, workshop, Sunshade facilities shall be the responsibility of the DENR including the sprayer, incubator, tractor, grass cutter, truck, pump, soil sampling tester and incinerator. However, the Potbeds passage, water pool, irrigation facility and road ditches shall be the responsibility of the JICA counterpart.

4.5 Plantation Establishment

The activities related to the actual site establishment will vary from one slope category to another.

4.5.1 Sources of Planting Material

The use of wildling shall be absolutely discharged. nursery raised seedlings shall be used and must have to pass the acceptable quality (height and vigor). JICA experts will provide technologies and techniques in the selection of seedling/samplings to be planted.

4.5.2 Field Lay-outs and Planting Design

Contour planting following the clinosequence will be adopted. The species shall be planted in designated year category while mangoes shall be planted along the periphery of cultivated areas and along trails and will serve as buffer zone to the forest plantation.

As a general framework, the slope category of designated species are more or less related to their economic importance and availability of moisture for their early and successful establishment.

The number of seedlings required for the completion of the plantation establishment shall be about 3,600,000 including allowances for mortality and replacements using the prescribed planting methods and techniques to be provided for by JICA experts.

4.5.3 Timing of Plantation Establishment

The establishment of nurseries and the turn-over of seedlings must take into consideration the actual rainfall periods. Planting must start when the soil have maintained sufficient moisture capacity in three days or when moisture saturation is 15 - 20 cm. The soil that have retained field capacity or moisture saturation do not exhibit surface cracks when rainfall is absent.

4.5.4 Site Preparation

As much as possible, clearing of areas shall not resort to unnecessary soil disturbances and exposure. Planting holes shall be dug 15 - 20 cms. deep and 15 cms. radius and all grasses, roots and rhizomes shall be removed. One half (1/2) meter radius around the planting holes be clear brushed and the cut grasses shall serve as mulching materials.

4.5.5 Out planting

Seedlings shall be transported through the use of back packs and baskets to avoid unnecessary damages. The seedlings hauled shall be planted immediately and the damage one shall be discarded. Planting shall be confined only at the peak of rainy season to allow full recovery of planted seedlings before the onset of dry season.

4.5.6 Replanting

After the outplanting activities in the first year, qualitative validation shall be done immediately to determine failures (missing hills/dead spots, non vigorous seedlings) and if still feasible, replanting shall be carried - out immediately. In the second year failures shall be replaced using seedlings which are larger than those originally planted to ensure a more or less even - aged plantation. This would require the maintenance of left - over seedlings.

4.6 Plantation Maintenance and Protection

4.6.1 On Maintenance

Weeding and cultivation shall be done twice a year, before and after the rainy season. In cultivation the seedlings, care should be strictly observed and practiced in order not to damage their root system. Cut grasses will be used as mulch.

Fertilizer application shall be done during the first and second year of establishment. Right after planting in the first year, 25 grams of NPK granular fertilizer shall be applied per hill. Application shall again be done during the second year on the first month of rainy season with the same dosage.

Maintenance of planted forestry seedlings/saplings shall be supported by practical assistance and guidance provided by the JICA consultants and experts. Routinay inspection and monitoring of planted tree shall conducted by PGP/DENR with the special practical assistance and guidance by the JICA. Including recording of dead spots as well charting of survived seedlings/saplings.

4.6.2 On Protection

The Community through community interaction shall be tapped to help in the protection of the plantation against astray animals and other deteriorating agents. Deployment of foot patrol guards and construction of firebreaks shall be instituted to protect the plantation from forest fire. In addition, a fire control system must be employed and kept on alert during the year.

Proper and timely monitoring of incidence of any pests and diseases shall be observed with prior importance.

4.6.3 Employment & Participation of Local People

This project shall generate employment with the local populace as partners in the development and rehabilitation of the environment. The priority groups are the residents of adjoining barangays in the vicinity of Bambang, Infanta, Pangasinan with technical capability on forest renewal and forestation.

5. ADMINISTRATION AND SUPERVISION

Project Management Staff shall be headed by a Project Manager assisted by two (2) technical staff who will be directly involved in the nursery and plantation operations.

The Forest Management Service (FMS) functionalities such as : Provincial Environment and Natural Resources Office (PENRO) as well as the Community Environment and Natural Resources Office (CENRO), Japan International Cooperation Agency (JICA) and Provincial Government of Pangasinan (PGP) shall monitor the progress of activities and provide additional technical guidance to the Project Management Staff.

6. MONITORING AND EVALUATION

The following shall be adopted to provide an effective monitoring and control system for the development and Operation of the Project.

- The Project Manager shall submit to the Provincial Environment and Natural Resources Officer thru the CENRO, monthly report on the progress of project development.
- Monitoring and Evaluation (M & E) for plantation shall be conducted after the first weeding of the first year and at least once for the second and last year after the last weeding.
- Periodic monitoring of JICA specialist in coordination with the PGP/DENR to determine the growth of the planted trees every 1 or 2 years after the forestation work.

7. BUDGETARY REQUIREMENTS

The project entails a total amount of P 63,630,000 for a period of five (5) years. This amount shall be disbursed in a schedule represented in the Work and Financial Plan.

Appendices :

Table 1 - Annual Cost and Manpower Requirements

Table 2 - Work and Financial Plan

Operational Map 1 : 50,000

TABLE I
CONTINUED

ANNUAL COST AND MANPOWER REQUIREMENTS

ACTIVITIES	UNIT COST PER/HA	TARGET I			CY 2000		CY 2001		CY 2002		CY 2003		CY 2004		CY 2005	
		Target	Cost	Mandays	Cost	Mandays	Cost	Mandays	Cost	Mandays	Cost	Mandays	Cost	Mandays	Cost	Mandays
Survey/ Mapping	500	1,800	900,000	6,000	900,000	6,000										
Nursery Operations	18,340	3,301,200	33,012,000	220,030	11,004,000	73,360	11,004,000	3,360	11,004,000	73,360						
Plantation Establishment	6,950	3,060,800	12,510,000	83,400	4,170,000	27,000	4,170,000	7,000	4,170,000	27,000	4,170,000	27,000				
Plantation Protection/ Maintenance	6,060	1,800	10,908,000	72,720	1,794,800	8,632	2,114,701	4,098	3,556,500	33,710	2,317,500	15,450	663,750	4,425	663,750	4,425
Infrastructure	-	-	1,440,000	9,600	480,000	3,200	480,000	3,200	480,000	3,200						
Project Management	-	-	4,860,000	32,400	972,000	6,480	1,458,000	9,720	1,458,000	9,720	4,860,000	3,240	243,000	1,620	243,000	1,620
GRAND TOTAL			63,630,000	424,200	18,828,800	125,472	19,523,700	3,025	20,668,500	137,790	2,803,500	18,690	906,750	6,048	906,750	6,048

assumption :

P 150.00/day











INFANTA IMPOUNDING IRRIGATION AND ENVIRONMENTAL PROJECT.

Located at:

Brgy. : Bambar
Municipality : Infanta
Province : Pangasinan

AREA : 1800 HAs.
Scale : 1:50,000

LEGEND

-  River/Creek
-  Project Boundary
-  Road/Trail
- Tree Species:**
 -  A
Mahogany, Teak
 -  B
Acacia, Eucalyptus
 -  C
Fruit Trees
-  Model Refo.
-  Refo. Component (Agro)



1:50,000

WORK AND FINANCIAL PLAN

FOR THE YEAR 1974

FOR THE PROJECT AREA

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

GENERAL PROJECT

FOR THE YEAR 1974

FOR THE PROJECT AREA

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

GENERAL PROJECT

FOR THE YEAR 1974

FOR THE PROJECT AREA

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73

BY: [Signature]

PROJECT AREA: [Location]

SCALE: 1:500

DATE: 10/1/73