No.

Japan International Cooperation Agency (JICA)

Ministry of Settlement and Regional Infrastructure (MOSRI)
The Republic of Indonesia

THE STUDY
ON
COMPREHENSIVE RECOVERY PROGRAM
OF
IRRIGATION AGRICULTURE

VOLUME-6

ANNEX-III (1/3)

Development Plan
(North Sumatra Province)

February 2004

Nippon Koei Co., Ltd.

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Study Area: North Sumatra Province

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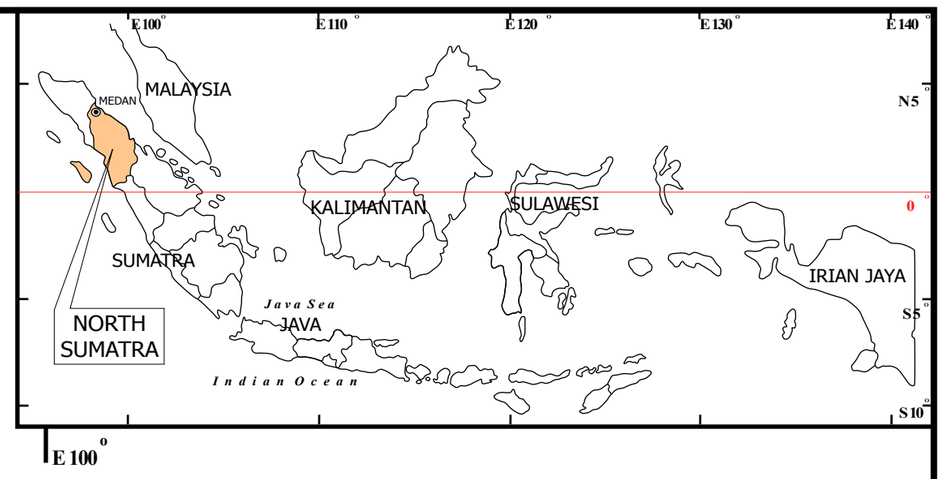
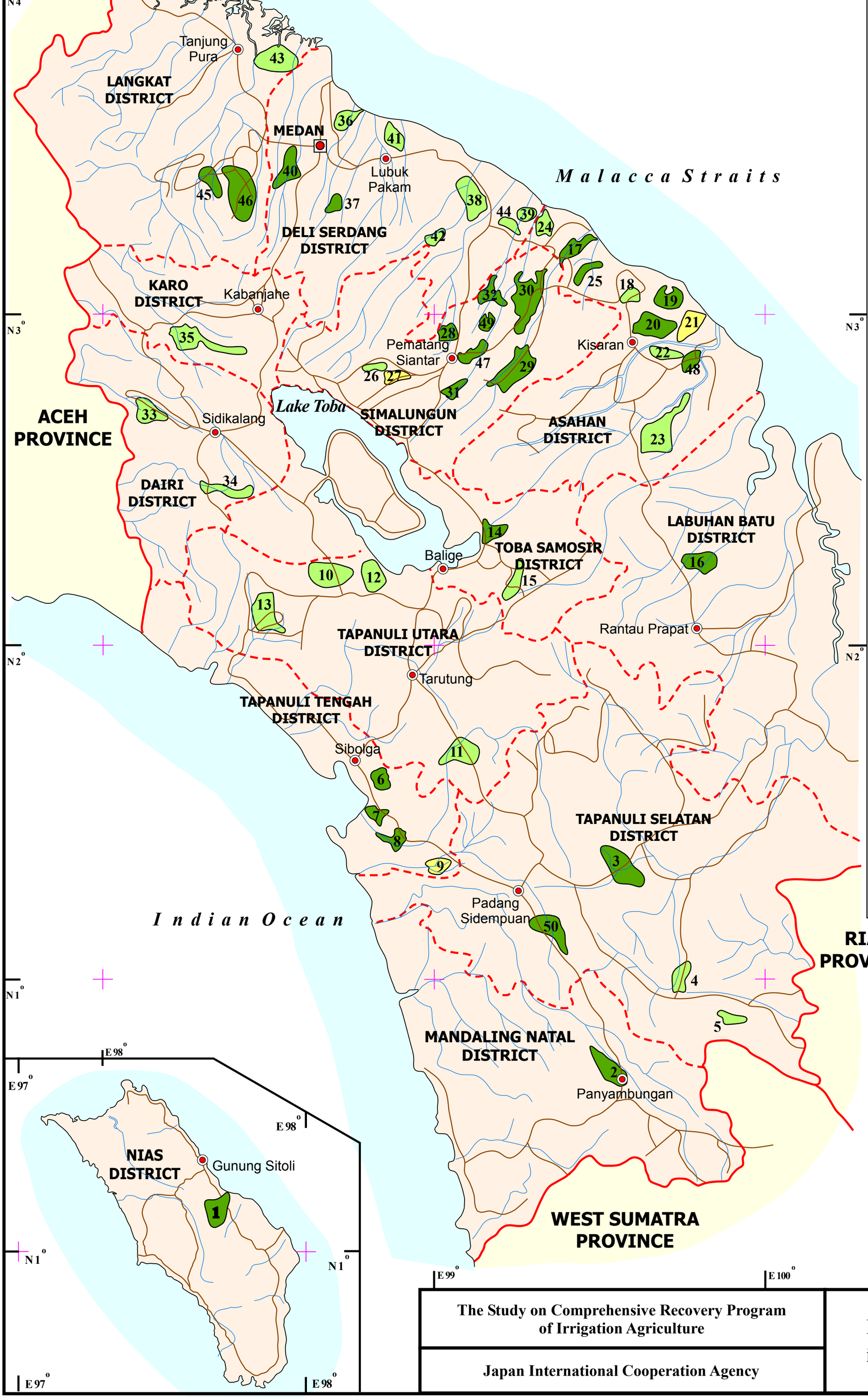
SCALE



Irrigation Scheme

Name of Scheme	Resgitered Area (Ha)		Subject Area (Ha)
1. Gido Sebua	1,258	T	883
2. Batang Gadis	6,628	T	5,575
3. Batang Ilung	4,194	T	3,546
4. Blk Sitongkon/Napa Suron	1,012	ST	500
5. Siborna	1,000	ST	950
6. Siaili Tukka	1,057	T	600
7. Badiri Lopian	1,283	T	899
8. Pandurungan	1,769	T	1,334
9. Sihiong	2,000	NT	779
10. Aek Silang	1,500	ST	1,500
11. Sarulla	2,692	ST	1,692
12. Parmiahan Hutapaung	1,000	ST	1,000
13. Sinamo	1,000	ST	930
14. Aek Mandosi I	1,060	ST	1,059
15. Simangatasi II	1,515	T	1,514
16. Bulung Ihit	5,000	T	1,355
17. Perkotaan	3,457	T	3,446
18. Sungai Balai	1,185	ST	1,130
19. Panca Arga	2,500	T	2,500
20. Serbangan	2,333	T	2,044
21. Silau Bonto	3,231	NT	967
22. Sungai Silau	1,315	ST	452
23. Padang Mahondang	3,231	ST	2,905
24. Simujur	2,560	ST	2,010
25. Purwodadi	1,635	T	1,635
26. Pentera	1,034	ST	298
27. Simanten Pane Dame	1,000	NT	1,000
28. Penambean/Panet Tongah BK	1,723	T	1,722
29. Raja Hombang/T. Mangaraja	2,045	T	2,023
30. Kerasaan	5,000	T	4,144
31. Javacolonisasi Prubolonggo	1,030	T	1,015
32. Naga Sompah	1,360	T	1,015
33. Risma Duma	1,522	ST	1,522
34. Lae Ordi	1,200	ST	1,200
35. Parit Lompaten	1,242	ST	1,242
36. Bandar Sidoras	3,017	ST	3,457
37. Namu Rambe	1,036	T	1,036
38. Sei Belutu	5,082	ST	5,076
39. Langau	2,000	ST	1,900
40. Medan Krio	3,016	T	3,000
41. Rantau Panjang	2,309	ST	2,309
42. Pekan Kamis	1,100	ST	1,100
43. Secanggang	1,400	ST	1,400
44. Paya Lobang	1,558	ST	1,558
45. Namu Sira-Sira Kiri	1,350	T	1,350
46. Namu Sira-Sira Kanan	3,953	T	3,953
47. Bah Korah II	1,995	T	1,723
48. Sijambi	1,013	T	1,008
49. Rambung Mera	1,104	T	944
50. Paya Sordang	4,350	T	4,350

T : Technical Irrigation
ST: Semi-Technical Irrigation
NT: Non-Technical Irrigation



LEGEND

- Capital City of Province
- Capital Town of District
- Provincial Boundary
- District Boundary
- Provincial Road
- River
- Irrigation Scheme
- Technical Irrigation
- Semi-Technical Irrigation
- Non-Technical Irrigation

The Study on Comprehensive Recovery Program of Irrigation Agriculture

Japan International Cooperation Agency

Location Map of Irrigation Schemes in North Sumatra Province

THE STUDY
ON
COMPREHENSIVE RECOVERY PROGRAM
OF
IRRIGATION AGRICULTURE
IN
THE REPUBLIC OF INDONESIA

Volume-6

ANNEX-III (1/3)
DEVELOPMENT PLAN
(North Sumatra Province)

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Drawings

PART I

PRE-FEASIBILITY STUDY FOR PRIORITIZATION OF IRRIGATION SCHEMES

CHAPTER 1 STUDY AREA

1.1 General

North Sumatra Province with a land area of 71,680 km^2 is administratively composed of 14 districts, 6 municipalities, 269 sub-districts and 5,333 villages. The number of districts covered by the target irrigation schemes (the project districts) is 13. Some administrative, demographic and socio-economic features of the province and project districts are presented in Table A-1.1.1 and as follows;

Administrative, Demographic and Socio-economic Features in 2001

Division	Land Area (km^2)	No. of Districts	No. of Sub-districts	Population (1,000)	Household (1,000)
Province	71,680	13	269	11,722	2,756
Project Districts	71,155	13	226	8,977	2,122

Source: Statistic data of BPS, North Sumatra

The main economic activity of the province and the project districts is an agriculture sector accounting respectively for 31 % and 45 % of the total GRDP. In the agriculture sector, the food crops agriculture is a leading sub-sector accounting for 39 % of the sector GRDP followed by the estate crops sub-sector in the province. The provincial per capita GRDP in 2000 is estimated at Rp. 5.9 million.

1.2 Conditions of Paddy Fields and Irrigation Systems

The table below shows the area and percentage of irrigated and rainfed paddy fields to the total paddy fields of North Sumatra Province in comparison with those of the whole country:

Classification of Paddy Fields

Condition of Paddy Field	North Sumatra Province		Whole Country	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Irrigated Paddy Field	285,700	57.4	4,868,800	62.5
Rainfed Paddy Field	212,300	42.6	2,918,600	37.5
Total	498,000	100	7,787,400	100

Source:Laporan Tahunan 2001, Dinas Pertanian Tanaman Pangan Sumatera Utara.
In the case of the whole country, the areas of each type of paddy field exclude those of Maluku and Irian Jaya.

It is seen from the above table that the percentage of irrigated paddy fields in North Sumatra Province is 57.4, while that of the whole country is 62.5. That fact indicates that the percentage of irrigated paddy fields in North Sumatra Province is much lower than that of the whole country.

The table below shows the area and percentage of the respective categories in North Sumatra Province in comparison with those of the whole country based on the above classification:

Classification of Categories of Irrigation Systems depending on Technical Level

Technical Level	North Sumatra Province		Whole Country	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Technical Systems	71,600	25.0	2,214,300	45.5
Semi-technical Systems	72,300	25.3	979,200	20.1
Simple Systems	141,800	49.7	1,675,300	34.4
Total	285,700	100	4,868,800	100

Source: Laporan Tahunan 2001, Dinas Pertanian Tanaman Pangan Sumatera Utara.
In the case of the whole country, the areas of Maluku and Irian Jaya are excluded from those of the respective systems.

It is seen from the above table that the percentage of technical systems in North Sumatra Province is 25.0, while that of the whole country is 45.5. On the other hand, the percentage of simple systems in North Sumatra is 49.7, while that of the whole country is 34.4. Those facts indicate that the technical level of irrigation systems in North Sumatra is much lower than that of the whole country.

1.3 Technical Level of Irrigation System

In North Sumatra, there are 770 government-developed irrigation schemes having potential areas of 299,521 ha. These schemes comprise 172 technical irrigation schemes with potential irrigation areas of 130,135 ha, 398 semi-technical irrigation schemes with potential areas of 121,421 ha and 200 simple irrigation schemes with potential of 47,965 ha as shown in Table A-1.3.1. Regarding the size of irrigation schemes, 635 schemes are less than 500 ha covering 40% of the total potential irrigation areas, while 76 schemes range from 500 ha to 1,000 ha and 59 schemes are more than 1,000 ha as shown in Table A-1.3.2.

In addition, another 276 village irrigation schemes have been developed by communities with the total potential area of 27,151 ha and average size of 98 ha.

1.4 Agricultural and Agro-economic Situations

The agricultural and agro-economic situations in the province and project districts relating to agro-demography, land holding & tenure, land use, food crops agriculture, agricultural institutions and support services is presented in Table A-1.4.1 and summarized in the followings:

1.4.1 Agro-demography and Land Holding & Tenure

The agro-demographic features of the province and project districts are estimated based on the Agriculture Census 1993 by BPS (*Badan Pusat Statistik*, Central Statistic Agency) as presented in Table A-1.4.1 and shown in the following table:

Agro-demographic Features of Province in 1993

Range among

Agro-demographic Indicators	Range among Project Districts (%)	Province (%)
Proportion of Farm Households to Total Households	50-92	52
Proportion of Farm Households Having Activity in:		
- Food Crops Farming	66-97	81
- Horticulture Crops Farming	8-50	21
- Estate Crops Production	16-75	37
- Livestock	8-50	22

On the basis of the census results, the number of farm households of the province in 2001 is estimated at some 1,433,000 or accounting for 52% of the total households of about 2,756,000. The primary farming activity of the farm households in the province is food crops production followed by estate crops production. Food crops farmers are about 81% of the total farmers.

The current land holding status in the province and project districts has been roughly estimated based on the number of farm households and the present agricultural land use as shown in Table A-1.4.1 and summarized below:

Roughly Estimated Land Holding Status in Province

Indicators	Range among Project Districts	Province
Average Farm Land Holding Size/Farm Household	0.62～1.68 ha	1.00 ha
Average Holding Size of Paddy Field/Farm Household	0.17～0.60 ha	0.35 ha
Distribution of Farm Household by Holding Size		
- < 0.5 ha	15～54 %	41 %
- ≧0.5 ha	46～85 %	59 %

Source: Agricultural Census, 1993, BPS

1.4.2 Agricultural Land Use

The present agricultural land use of the province and project districts has been studied based on the statistic data reported by the BPS province as shown in Table A-1.4.2. The largest farm land category in the province and the project districts is estate crops land occupying about 56 or 57% of the total farm land, followed by paddy field accounting for 15% as summarized below:

Present Agricultural Land Use in the Province in 2001

Land Use Category	Province		Project Districts	
	Area (ha) *1	Ratio (%)	Area (ha) *1	Ratio (%)
Paddy Field	498,000	15	487,700	15
Home Garden	280,900	9	262,400	8
Dry Land/Garden	430,500	13	423,800	13
Upland Field	231,400	7	228,300	7
Estate Crops Land *2	1,802,200	56	1,799,700	57
Total Farm Land	3,243,000	100	3,201,900	100

Note: *1. Rounded figures, *2. Estate operated by public or private firms
Source: Laporan Tahunan 2001, Dinas Pertanian Tanaman Pangan Sumatera Utara

1.4.3 Food Crops Agriculture

Paddy production is by far the most important farming activity in the food crops agriculture sub-sector both in the province and the project districts, representing 71% of the total harvested area with food crops (not including vegetables) in 2001 as shown in Table A-1.4.3 and summarized below:

Harvested Area of Food Crops by Proportion in 2001 in Province & Project Districts

Province	Paddy (%)	Maize (%)	Beans *1 (%)	Tubers *2 (%)	Total (%)
Province	71	20	4	5	100
Project Districts	71	20	4	5	100

Note: *1 Include soybeans, mungbeans & groundnut, *2 Include cassava & sweat potatoes
Source: Laporan Tahunan 2001, Dinas Pertanian Tanaman Pangan Sumatera Utara

The second most important food crop in terms of harvested area in the province and project districts is maize accounting for 20% of the total harvested area, followed by tuber crops.

The production of food crops in 2001 in the province and project districts is shown in Table A-1.4.3 and summarized below:

Production of Food Crops in 2001 in Province & Project Districts (unit: 1,000ton)

Province	Paddy	Maize	Beans *1	Tubers *2
Province	3,111	634	42	626
Project Districts	3,046	630	41	610

Note: *1. Includes soybeans, mungbeans & groundnut, *2. Includes cassava & sweat potatoes
Source: Laporan Tahunan 2001, Dinas Pertanian Tanaman Pangan Sumatera Utara

1.4.4 Agricultural Institutions and Extension

The current status of agricultural institutions and extension in the province is discussed in the following section.

(1) Agricultural Institutions

The government agricultural support institutions of in the province include the Agriculture Services Office, Estate Crops Services Office, Livestock Services Office and Food Security Agency. The Agriculture Services Office is composed of five sub-services and Technical Implementation Units (*Unit Pelaksana Teknis Daerah*/UPTD) as shown in Figure A-1.4.1. The agricultural institutions in the province and project districts are shown in Table A-1.4.4.

The government agricultural support institutional set-up at district level is not consistent with the provincial set-up and there are differences among the districts concerned. The district institutions are placed under the jurisdiction of the district governor, although the technical guidance and support linkages with the central and provincial agencies are still maintained. Differences in organization

set-up between central/province agencies and district agencies present constraints for maintaining coordination and technical support or guidance linkages between province and district and for coordination activities among districts. The formation of a certain task force team among province and districts will be essential to perform well-coordinated agriculture development activities.

A number of farmers' organizations involved in agricultural activities have been formed in the province. Among these, a major one is the Farmers' Group (*Kelompok Tani*/KT). A number of KTs formed in the province and their development status assessed by district agricultural agencies is shown by district in Table A-1.4.4. In the province, 39% of KTs are classified as primary level (pemula), 35% as secondary level (lanjut), 21% as middle level (madya) and 5% as advance level (maju).

There are 563 Village Unit Cooperatives (*Koperasi Unit Desa*/KUD) in the province with varying activities from dormant status to actively operated status. General problems encountered by KUD are reported to be: (i) cooperative funds still limited, (ii) management capability still poor and (iii) awareness of members on cooperative activities, member's right & responsibility, and implementation of the cooperative principle still limited.

(2) Agricultural Extension

One of the main features of the decentralization policy in the agriculture sector is the devolution of agricultural extension activities to the district government. Therefore, the functions of the provincial extension agencies have faded away and their current main functions are to provide technical guidance and support to district agencies. The arrangements for institutions for the agricultural extension services are not uniform in the project districts.

The extension services to farmers in Indonesia are basically provided by Field Extension Workers (*Penyuluhan Pertanian Lapangan*/PPL) of district agricultural agencies, who are to guide and serve to farmers through farmers' groups in their working area. PPLs are deployed by sub-district basis to Rural Extension Centers (*Balai Penyuluhan Pertanian*/BPP).

The number of BPPs and food crops extension staffs (PPLs) deployed in the province and the project districts in 2002 are shown in Table A-1.4.4. The number of BPPs and PPLs in the province is 172 and 1,363, respectively.

The weaknesses or problems involved in the current extension services are:

- Limitation of funds for implementation of extension activities, insufficient number of extension staffs and; capabilities of extension

staffs especially on post-harvest and marketing issues, which are still limited, and

- Coordination & collaboration of extension agencies under different jurisdictions yet to be established to introduce holistic approaches for extension.

1.4.5 Farm Machinery and Post-harvest Facilities

The numbers of farm machinery including tractor, water pump, thresher, paddy dryer etc. and rice mills possessed in the project districts are shown in Table A-1.4.5. The availability of hand tractors are quite in shortage when land preparation works of all the paddy fields in the districts are to be carried out by machinery. The results of the Inventory Survey indicate sufficiency of rice mills in most of the target schemes.

1.4.6 Non-food Crops Agriculture

The primary non-food crops agriculture in the province is an estate crops sub-sector operated both by public & private estates and smallholders. Major estate crops include rubber, oil palm and coffee. Statistics figures for non-food crops agriculture are shown in Table A-1.4.6.

1.5 Institution

Based on Regional Regulation No.3/2001, the North Sumatra Provincial Water Resources Service Office (PWRS, *Dinas PU Propinsi Pengairan)* was reorganized. Under the Head of PWRS, four Sub-divisions are set up to handle technical matters and a further seven Technical Implementation Units (UPTs) / Bureau for Water Resources Management (*Balai* PSDA, *Balai Pengelolaan Sumber Daya Air*) are directly controlled as illustrated in Figure A-1.5.1. The functions of UPT/PSDA are to implement: (i) operational services to the community, (ii) water resources conservation activities, and (iii) technical/administrative aspects related to such services and activities.

In North Sumatra, each DWRS organization establishes its branch offices in order to provide supporting services to the existing Water Users' Association (WUA) and encourage water users to establish new WUA and/or to activate previously established WUA. The current fulfillment rate of staff allocated to the whole DWRS is 50% as shown in Table A-1.5.1.

With respect to irrigation water users, there are 1,359 WUA already established throughout the existing irrigation schemes. Compared with 2,251 WUA as the target for establishment in North Sumatra, about 60 % have been realized as

shown in Table A-1.5.2. In the case of technical irrigation scheme areas, the rate of establishment has reached 74%.

Because of time-consuming procedures, only 163 WUA or 12% have legitimate status through registration in local courts of justice. Either registered or yet to be registered, 100 WUA are recognized as well developed with good performance on physical, administrative and financial aspects related to operation and maintenance works. However, 689 units are under development in terms of setting-up internal administration and physical aspects of irrigation water management as well as facility operation and maintenance at on-farm level, legal registration, and so on. The remaining 570 WUA have not been developed yet. Table A-1.5.3 shows the present condition of WUA performance and status by District in North Sumatra as of April 1999.

1.6 Financial Condition of District/Municipal Governments

In Table A-1.6.1, financial condition of the respective District and Municipal Governments in North Sumatra is summarized by using such indicators as per capita income and revenue for 2001 as well as actual receipts and expenditures for 2000. As for the latter indicator, some of financial reports for 2001 are still under internal auditing by officials concerned so that data for 2000 are referred to. In the course of transition period for synchronizing fiscal year with calendar year by the Government, the actual receipts and expenditures for 2000 were born during the 9-month period from April 1 to December 31, 2000.

The consolidated per capita provincial revenue for 2001 comprised Rp.64,442 for own fiscal capacity consisting of own source revenue, non-tax from natural resources and share taxes and Rp.298,978 for general allocation fund (DAU) plus contingency. Among 13 Districts and 6 Municipalities, the own fiscal capacity on per capita basis of 5 Municipalities is over the consolidated provincial level, while the per capita general allocation fund of 8 Districts and 5 Municipalities exceeds over the consolidated provincial level.

CHAPTER 2 SELECTION OF IRRIGATION SCHEMES

2.1 Database of Irrigation Schemes prepared by MOSRI

2.1.1 Verification of MOSRI's Database (WRDC)

The Ministry of Settlement and Regional Infrastructure prepared a database for water resources and irrigation systems called "WRDC", which consists of the following components:

(a) Database for irrigation schemes, crop yield and water users' associations,
(b) Location map of irrigation schemes, and
(c) Irrigation diagrams for irrigation schemes.

The WRDC was established in the year 2001. However, the autonomy, accountability and responsibility for operation and maintenance are still unclear according to information from the Directorate of Technical Guidance, MOSRI.

The status of the WRDC is as follows:

(a) System operation commenced in 2001.
(b) The number of columns (information to be filled out) is 306 in total.
(c) The WRDC is composed of administrative division such as Province, District and Sub-district.
(d) The WRDC is still under preparation and the only information available is the area registered (potential area and non-potential area). Other information such as i) kind of water resources structure/intake, ii) length of canal, and iii) kind and number of related structures have not been input yet.

As a result, it is necessary to collect most of the data from each province and from field investigations, which have been executed on a sub-contract basis.

2.1.2 Contents of the List of Irrigation Schemes

The following basic information is shown in the list, which is provided by the central office of MOSRI and provincial offices:

(a) Registration Code Number
(b) Name of irrigation scheme
(c) Location of irrigation scheme (province, district, sub-district)
(d) Technical level of irrigation scheme
(e) Area (potential and non-potential area)

2.2 Criteria for Selection of Irrigation Schemes

The Inception Meetings were held between the Water Resources Management Services Office (Dinas PSDA) of North Sumatra province and the Study Team in the initial stage of field investigation. In the meeting, the irrigation schemes to be studied were examined and determined based on the following criteria:

(a) The Study area shall be determined based on the original list presented in the Scope of Work (S/W),

(b) The irrigation schemes with the conditions stated below shall be excluded from the original list:
- The schemes which have been recently completed and are functioning appropriately,
- The schemes for which implementation has been pledged by the Government and/or international donors,
- The schemes for which potential is too low (less than 1,000 ha), even though they are included in the original list.

(c) The irrigation schemes that need urgent rehabilitation, have been added to the list in addition to the original schemes presented in the Scope of Work (S/W).

2.3 Definitions

2.3.1 Definition of Land Use and Irrigation Area

The Irrigation Area for the Study is determined by the following formula:

Irrigation Area = (potential area for irrigation + non-potential area for irrigation) - (other land use in potential area + other land use in non-potential area)

2.3.2 Definition of Technical Level of Irrigation System

According to the Indonesian standards for irrigation system design, the irrigation area is classified into three categories, depending on their technical levels, namely technical systems, semi-technical systems, and non-technical systems, as explained below:

Standard of Irrigation System

Items	Irrigation system		
	Technical system (T)	Semi-technical system (ST)	Non-technical system (NT)
Main intake	Permanent structure	Permanent structure and semi-permanent structure	Temporary structure
Diversion structure with measuring devices	Good	Fair	Poor
Canal system	Complete independent canal systems for irrigation and drainage	Not complete independent canal systems for irrigation and drainage	Dual function of irrigation and drainage
Tertiary canal system	Well developed	Developed to some extent	Not developed yet
Irrigation efficiency	50 - 60%	40 - 50%	Less than 40%
Size of irrigation area	No limitation	Up to 2,000 ha	Less than 500 ha

2.3.3 Definition of Rehabilitation

The term of rehabilitation is classified into two, "so-called rehabilitation" and "upgrading" according to the definition stated in the table below. Such classification will be applied for all the irrigation schemes to be studied, and for the selection of irrigation schemes for preliminary investigation.

Definition of Rehabilitation

Classification of rehabilitation	Definition of Rehabilitation
1. Rehabilitation	1) Rehabilitation is not accompanied by an increase of irrigation area. 2) Rehabilitation aims at recovering the system designed irrigation capacity (recovering as designed) from the reservoir/intake facilities to the terminal system. 3) Rehabilitation will increase cropping intensity of dry season crops by 0.2 for Java and 0.3 for outer Java. 4) Rehabilitation aims at repairing reservoir/intake facilities, canals and related structures, which are damaged, defective and deteriorated. 5) The grade to be applied to the irrigation system should be technical level.
2. Upgrading	1) It is possible to expand the irrigation area by upgrading existing irrigation facilities. 2) Extension of the irrigation area by means of upgrading can be made within rainfed paddy fields. More than one cropping can be increased. 3) Rehabilitation of the existing facilities is considered to be the same as 2.1) above. However, as rehabilitation aims at upgrading the quality of structures, deterioration can be decreased (life span can be approx. 50 years). 4) Effectiveness of implementation of upgrading works is expected to be high if the extension area is large. 5) The grade to be applied to the irrigation system should be technical level.

Classification of rehabilitation has been carried out based on the collected information from province and determined as indicated in Tables A-2.3.1, and summarized as shown in the following table:

Type and Number of Rehabilitation Works

No. of Schemes	Classification of Irrigation Scheme	
	Rehabilitation	Upgrading
50	21	29

2.4 Selected Irrigation Schemes

The original list of irrigation schemes attached to the Inception Report indicates that 57 schemes with a total area of 119,472 ha were to be studied in North Sumatra Province.

Rehabilitation of the capacity and function of 6 irrigation schemes with areas of 17,699 ha will be carried out under JBIC Loan No. IP-476, 'Rehabilitation and O&M Capacity Improvement Project'. Improvement of another 4 irrigation schemes with areas of 5,125 ha is being conducted under ADB Loan, 'Northern Sumatra Irrigated Agriculture Sector Program (NSIASP)'. In this context, 10 irrigation schemes with areas of 22,824 ha are excluded from the original list.

There were 4 irrigation schemes with areas of 8,261 ha on the original list. However, as these schemes have not actually been constructed, no rehabilitation can be anticipated. Therefore, these schemes have been dropped from the list.

On the other hand, the inventory survey conducted in 2002 by the Dinas PSDA of North Sumatra indicates that there are 7 irrigation schemes newly registered in the list in addition to the original one. As these schemes require rehabilitation works according to the Dinas PSDA, they are to be included for the study.

Accordingly, it was decided to study 50 irrigation schemes with a total area of 108,511 ha in North Sumatra Province as shown in Table A-2.3.1 and a Location Map attached at the top of this report.

As a result of discussion, number and area of irrigation schemes finally selected for the Study are summarized in comparison with those of the Inception Stage as shown below:

Irrigation Schemes selected for the Study

Inception Stage		Selected Scheme	
Number of Schemes	Scheme Area (ha)	Number of Schemes	Scheme Area (ha)
57	125,706	50	108,511

CHAPTER 3 PRELIMINARY INVESTIGATION

3.1 General Description

3.1.1 Purposes

The purposes of the preliminary investigation for quantification of rehabilitation are as follows:

(a) Confirmation of the related agencies for the investigation and availability of information and holders (agencies),
(b) Analysis of the cause of malfunctioning of the irrigation system,
(c) Collection of basic data necessary for the preparation of evaluation indicators for prioritization of rehabilitation,
(d) Finalization of technical specification for inventory survey work, and
(e) Collection and examination of evaluation standards consisting of standard rehabilitation methods, standard unit prices and information on cost estimates.

The purposes of the preliminary investigation for the irrigation systems are (i) finalization of the specifications for the implementation of the quantification of rehabilitation to be entrusted by analyzing the cause of malfunctioning of the irrigation systems, and (ii) confirmation of the related agencies for the investigation and availability of information and holders (agencies).

In preparation of evaluation indicators for prioritization of rehabilitation in an irrigation network, the past study report, "Technical Guideline, Rehabilitation and Upgrading of Irrigation Network (JICA, 1999, original is written in Indonesian) were reviewed in order to summarize the problems with irrigation facilities.

Evaluation indicators for prioritization of rehabilitation in an irrigation network were prepared respectively for (i) headworks, (ii) free intakes, (iii) canals and related structures, (iv) terminal facilities and on-farm, and (v) inspection roads.

Standard rehabilitation methods were prepared on the basis of, in principle, the "Irrigation Design Standards" prepared by the Directorate General of Water Resources Development, Ministry of Public Works in 1986. In addition, whenever necessary, recent design standards prepared by the Ministry of Agriculture, Fisheries and Forestry in Japan, and United States Development of the Interior, Bureau of Reclamation (USBR). The standard unit prices were determined referring to the recent similar rehabilitation works and bid prices.

3.1.2 Selection of Irrigation Schemes for preliminary investigation

The criteria for the selection of schemes for preliminary investigation were as follows:

(a) Schemes to be selected to represent the types of rehabilitation, i.e., (i) rehabilitation, (ii) upgrading.
(b) The beneficiary areas to be the average of all schemes, i.e., 2,000 to 3,000 ha.
(c) WUAs in the schemes must have been established and be functioning.

Sample areas for the preliminary investigation were further discussed and selected as shown in the table below. The Study Team made the investigations at the beginning of March 2003 in collaboration with engineers of Dinas PSDA.

Irrigation Schemes selected for Preliminary Investigation

Item	Schemes	
Irrigation Scheme	Bandara Sidoras	Medan Krio
District	Deli Serdang	Deli Serdang
Sub-district	Percut	Sunggal
Registered area (ha)	3,017	3,016
Technical level	Semi Technical	Technical
Completion year of system	1985	1978
Water resources river	Percut	Lau Tuntungan
Type of water resources facility	Headworks	Headworks
Settling basin	Not provided	Not provided
Max. intake discharge (m^3/s)	6.8	2.8
Length of main canal (km)	1.4	2.8
Length of secondary canal (km)	37.5	23.3
Number of WUAs (Target/Established)	24/5	29/7
Number of farmers	Not available	Not available

3.2 Main Issues Identified and Study Agenda

3.2.1 Analysis of Causes of Incompleteness and Defectiveness of Facilities

By means of preliminary investigation and reference to past documents, analysis of the causes of problems with each irrigation scheme was carried out in terms of incompleteness, structural and functional defectiveness and necessity for rehabilitation. The causes thus analyzed were classified into five (5) classes according to the kind of structures. In all cases, the study was carried out for the following:

(a) Appropriateness of planning and design (including availability of necessary data and information),
(b) Construction technique and accuracy (including possibility of corner-cutting in the construction works), and
(c) Operational condition of structures.

A table was prepared listing the structural items, problems with the structures and their causes as shown below:

Problems and their Causes on Irrigation Facilities found through Preliminary Investigation

Structure	Problems	Causes
Headworks	1) The design discharge cannot be taken because of sediment in front of intake. 2) The river water level cannot be maintained as designed. 3) Intake of river water cannot be appropriately made. 4) Operation of gates is difficult due to damage of gates. 5) Intake discharge cannot be measured accurately.	1) Sediment exists in front of intake and/or scouring sluice and settling basin is not provided or it is malfunctioning. 2) Civil works (intake weir, etc.) are damaged or defective. 3) Steel gates or other metal structures are damaged or deteriorated. 4) No proper maintenance and repair is being executed. 5) No measuring devices (even gauging) are provided.
Free Intake	1) The design discharge cannot be taken because of i) lowering of river water level and ii) sedimentation in front of intake.	1) No fundamental measures, such as provision of weir, are undertaken against lowering of riverbed. 2) No removal of sedimentation located at or in front of intake is undertaken.
Canal and related structures	1) Irrigation water cannot be conveyed to the tail of the canal. 2) Contour canal located in the upstream section of a system is choked with sediment. 3) Structures with a service life of more than 30 years are malfunctioning in some irrigation systems. 4) Irrigation water is not equitably distributed due to insufficient water supply. 5) Less activity on O&M works.	1) This is due to seepage loss, obstruction of flow by sediment, collapse of canal, etc. 2) Sediment is flowing into canal from headworks/intake due to improper operation of scouring sluice gate/settling basin or no provision of settling basin. 3) Structures are older than service life and no rehabilitation/ replacement has been done. 4) Due to inadequacy of diversion structure, no proper water management could be done. 5) Low density of inspection roads, crossing facility such as bridge, culvert not in working condition.
Terminal facility and on-farm	1) Irrigation water is not used efficiently due to shortage of provision of canals. 2) Drainage is not appropriately practiced due to shortage of provision of tertiary and quaternary drains. 3) Transportation of farming input and output is poor.	1) This is due to insufficient density of tertiary and quaternary (feeder) canals. 2) This is due to insufficient density of tertiary and quaternary drains. 3) Provision of appropriate length of farm road is necessary.

Inspection road	1) O&M are difficult due to poor condition of inspection road along main and secondary canals. 2) Transportation of farming input and output is poor due to lack of farm road connecting village with inspection road.	1) Inadequate proper maintenance has been done and related facilities are in a damaged state. 2) Low density or no provision of roads.

3.2.2 Evaluation Indicators for Rehabilitation Priority

Rehabilitation for the irrigation facilities was to be evaluated by verifying their condition with respect to (i) type, size and condition of headworks/intake, (ii) functional status of canals and their related structures, (iii) condition of terminal facility and on-farm, and (iv) condition of inspection roads.

Evaluation indicators for the rehabilitation that are to be applied for the investigation for all schemes were prepared based on the findings through the preliminary investigation. Evaluation indicators were further examined and finalized mainly referring to the "Technical Guideline, Rehabilitation and Upgrading of Irrigation Network (JICA 1999)".

The following are the principal evaluation indicators for the preparation of prioritization for the rehabilitation.

Evaluation Indicators

Facility	Indicators
1. Headworks (Concrete Weir)	1) Crack/damage on crest 2) Erosion and seepage in stilling basin 3) Leakage from foundation 4) Gate/Leakage from gate 5) Sedimentation/mud in front of gate 6) Flushing of sedimentation/mud 7) Settling basin 8) Measuring device
2. Free Intake	1) Lowering of river water level or degradation of riverbed 2) Intake gate/scouring gate 3) Leakage from gate 4) Sedimentation/mud in front of gate 5) Flushing of sedimentation/mud 6) Settling basin

3. Canals and Related Structures	
3.1 Canals	1) Lined or unlined canal 2) Lining of canal, broken or cracked 3) Sedimentation 4) Seepage loss 5) Collapse of canal bank
3.2 Regulating, Conveyance, Crossing, Protection Structure	1) Gate 2) Leakage on gate 3) Crack on concrete/stone masonry 4) Scouring on structures 5) Settlement 6) Measuring devices
4. Terminal Facilities and On-Farm	1) Leakage on canal 2) Sedimentation/mud on canal 3) Density of canal, road
5. Inspection Roads	1) Condition 2) Density

The method of evaluation of the existing facilities against respective indicators is discussed in Chapter 6.

3.2.3 Technical Specifications for Inventory Survey Work

Draft technical specifications for inventory survey work were prepared in initiation stage and finalized based on the findings of preliminary investigation. The composition and contents of the technical specifications are as follows:

Part-I: Inventory of Irrigation Schemes

1.1 General
1.2 Structure of Water Source
1.3 Irrigation Canals
1.4 Terminal Facility and On-farm
1.5 Socio-economy and Agriculture
1.6 Present Condition of WUAs
1.7 Rehabilitation Plan

Part-II: Survey for Estimate of Rehabilitation Works

2.1 General Layout
2.2 Irrigation Diagram
2.3 Schematic Layout of Related Structures
2.4 Survey Sheets
2.5 Quantity Estimate
2.6 Photographs

3.2.4 Standards for Design and Construction

For the Evaluation of existing condition and preparation of measures for rehabilitation, the following criteria for the design and construction of rehabilitation is provisionally shown in the below table:

Standards for Design and Construction

Facilities	Condition of structures	Measures for recovery of function
Dam	Leakage from foundation	1) Cement grouting
	Sliding of embankment/ insufficient stability of slope	1) Re-construction 2) Extra embankment
	Damaged/defective spillway/ structure	1) Repair by concrete works
	Insufficient capacity of spillway for flood discharge	1) Extend crest length of spillway
	Damages/inadequate function of gate, valve, metal works	1) Repair/replace
Headworks	Damages due to settlement, broken, washed away, deterioration	1) Reconstruction/renovation
	Insufficient intake capacity	1) Widening of gate 2) Heightening of weir crest
	Influx sediment load	1) Provision of settling basin 2) Increase of basin barrel 3) Proper operation of scouring sluice gates
	Damages/inadequate function of gate and metal works	1) Repair/replace
Irrigation canal	Retarded design capacity	1) Dredging, removal of foreign materials 2) Provision of concrete lining
	Collapsed embankment/lining	1) Re-embankment 2) Provision of concrete lining
	Earth canal	1) Provision of concrete lining with n = 0.017
Related structure	Decrepit more than 50 years after construction	1) Replace/reconstruct
	Deflection, settlement and no function for gate operation	1) Replace/reconstruct
	Broken/damaged	1) Repair/replace
	Insufficient load capacity for traffic (bridge, culvert)	1) Replace with required design load (T = 10, 14, 20)
	Clogging	1) Remove foreign materials 2) Provision of screen 3) Widening of barrel section

3.2.5 Estimation of Work Quantities and Costs

The work quantities for rehabilitation are estimated by means of site survey works and summarized in each work item. The unit prices of each work item are collected through the actual expenditures and/or average of tender and contracted prices of similar works.

CHAPTER 4 FIELD INVESTIGATION

4.1 Execution of Field Investigation

4.1.1 Works by Indonesian Consultant

The inventory survey work was carried out by an Indonesian Consultant on a sub-contract basis (PPA Consultants), who was selected through competitive bidding. The work was commenced on April 11, 2003 and completed in the middle of June 2003.

4.1.2 Procedures

Major assignments entrusted to the sub-contractor were as follows:

(1) Preparatory work
   (a) Coordination meeting with Dinas and Balai PSDA for the orientation of the investigation methods, and
   (b) Collection of data and information, which were required for field investigation, from said offices.

(2) Field work
   (a) Collection of basic information regarding water resource facilities to the on-farm level of each irrigation and drainage system, agriculture and agro-economy, and status of WUAs,
   (b) Field investigation of the existing condition of irrigation facilities, evaluation of their functions and analysis of the cause of problems, and
   (c) Preparation of the latest irrigation diagram and the schematic structure diagram of each scheme.

(3) Outcomes
   (a) Preparation of investigation report, and
   (b) Estimation of work quantities for rehabilitation work on major irrigation works.

4.2 Results and Findings

4.2.1 Irrigation Systems

As discussed in Chapter 3, field investigations were carried out for the collection of information regarding the condition of the following facilities in order to evaluate the functional status of each irrigation system;

   (a) Particular information (constructed and rehabilitated year, name of the river and catchment area at the location of the water resource

facilities),

(b) Water resource facility (dam, headworks, free intake, pumping station),

(c) Irrigation canals with related structures (main and secondary canals),

(d) Drainage canals and related structures, and

(e) Terminal facilities and on-farm

On the basis of the results of the investigation, the irrigation facilities were classified, by the scale of required rehabilitation, into the following four (4) groups:

A: Facilities are functioning well, and no rehabilitation is needed,

B: Facilities are partially damaged/deteriorated, and minor rehabilitation is needed,

C: Facilities are not functioning well, i.e., operation of the system is difficult, and large-scale rehabilitation is needed, and

D: Facilities are seriously damaged operationally, and replacement or reconstruction is needed.

In order to identify the particular causes of problems and constraints of the existing facilities, detailed evaluation of the facilities was made based on the investigation results as summarized hereinafter.

(1) Water Resource Facilities of Each Scheme

1) Existing conditions

Type of water resource facilities and their existing conditions are detailed in Table A-4.2.1, and summarized as shown below:

Condition of Water Resource Facilities

Type of Water Resource Facility	Number	Condition of Facilities			
		A	B	C	D
Headworks	37*	0	14	14	9
Free Intake	13	0	0	1	12
Total	50	0	14	15	21

Note: * Number of settling basins provided is 16.

Out of the 50 intake facilities listed above, 3 were out of service due to washed away of weir portion (Rantau Panjang scheme) and serious sedimentation problems with the free intake systems (Silau Bonto and Secanggang schemes) for a long time (more than 5 years).

2) Analysis of causes of problems and constraints

The causes of problems and constraints were analyzed for all the irrigation schemes as detailed in Table A-4.2.2, and summarized as shown below:

(a) Physical operation problem due to damage and deterioration of

structure,

(b) Lowering of intake water level due to damage and deterioration of weir or degradation of river bed in case free intake,

(c) Inflow of bed loads into canal due to sedimentation upstream of weir resulting in inadequate function of scouring sluice,

(d) No provision of settling basin or inadequate function due to sedimentation, and

(e) Operation and management problems with intake gate and introduction of bed loads and soils into canals.

Secanggang Free Intake **Bandar Sidoras Headworks**

Sediments in front of Intake

No Function of Scouring Sluice Gate

(2) Irrigation Canals and Related Structures

1) Existing Conditions

The features of irrigation canals and related structures are detailed in Table A-4.2.3 to A-4.2.6 and summarized as shown below:

Canal Types, Lengths and Conditions

Canals	Length (km)			Condition (Scheme)			
	Lined Canal*	Unlined (Earth)	Total	A	B	C	D
Main Canal	115 (35.7%)	206 (64.3%)	321	0	9	17	24
Secondary Canal	223 (31.7%)	482 (68.3%)	705	0	3	12	35
Total	338 (33.0%)	688 (67.0%)	1,026	-	-	-	-

Note: * Masonry and concrete lining

Condition of Related Structures

Canals	Total Number of Structures	Condition of Canals (%)			
		A	B	C	D
Main Canal	1,372	0	66	31	3
Secondary Canal	2,790	0	60	34	6

2) Analysis of causes of problems and constraints

Analysis of causes of problems and constraints for all the schemes is detailed as shown in Table A-4.2.7, and summarized as shown below:

(a) Sedimentation in canals and obstruction of water flow,
(b) Damage and deterioration of canal lining and structures,
(c) Leakage from unlined canals and defective lined canals,
(d) Difficulty in maintenance of canals due to no provision and/or non-trafficable condition of inspection roads,
(e) Difficulty in O&M due to poor/malfunctioning structures
(f) Physical operation problem with regulating structures in water distribution due to deteriorated and/or damaged steel gates, and
(g) Entering of eroded soil in the excavated canal portion due to no provision of drainage canal and facilities along the canal.

Sei Belutu Scheme **Bulung Ihit Scheme**

No Canal Dike and Broken Structure **Broken Structure on Main Canal**

(3) Inspection Road along Canal

1) Existing Conditions

The existing conditions of inspection roads are detailed as shown in Table A-4.2.3 and A-4.2.6, and summarized as follows:

Ratio of Inspection Road to Canal

Inspection Road	Total length of canals (km)	Inspection roads (km)	Ratio (%)
Along Main Canal	320	203	63
Along Secondary Canal	705	356	50
Total	1,025	559	55

Condition of Inspection Roads

Inspection Roads	Number of Schemes provided with Inspection Roads	Condition of Roads (scheme)			
		A	B	C	D
Along Main Canal	21	0	9	9	3
Along Secondary Canal	23	0	0	23	0

2) Analysis of causes of problems and constraints

As seen in the table above, the ratio between the length of irrigation canals with inspection roads and the total length of canals is approximately 50% for both main and secondary canals. In addition, more than 80% of the inspection roads are non-paved and/or damaged, and as a result, most of them are out of service, not only in the wet season but also in the dry season. Low density of inspection roads and their poor conditions give rise to serious problems in operation and maintenance of canals and related structures. They also affect farming practices, especially in conveying farming materials and agricultural products. (Problems and constraints are shown in Table A-4.2.7)

(4) Terminal Facilities and On-farm

The existing condition of terminal facilities and on-farm are detailed as shown in Table A-4.2.7, and summarized as follows:

Existing Condition of Terminal Facilities and On-farm

Terminal Facilities and On-farm	Condition of terminal facilities and on-farm (%)			
Average of 50 Schemes	A	B	C	D
	0	2	36	62

The existing conditions of terminal facilities and on-farm were found very poor due to low density of canals, farm roads and provision of their related facilities.

Bandar Sidoras Scheme

Less On-Farm Facility

4.2.2 Agriculture and Agro-economy

The agriculture and agro-economic investigations were primarily carried out through the Inventory Survey. However, some basic data and information such as crop yields, crop budget and farm economy were separately collected from statistic data and secondary data from agriculture services offices. The present agricultural conditions of the target irrigation schemes thus identified are presented in Table A- 4.2.8 and summarized as follows:

(1) Present Land Use

The scheme-wise present land uses of the target areas for development are shown in Table A-4.2.8. The overall provincial features are summarized in the followings:

Overall Present Land Uses of Target Schemes

Land Use Category		Area (ha)	Ratio (%)
1. Potential Area for Irrigation	Irrigated Paddy Fields	72,620	74
	Rainfed Paddy Fields	10,536	11
	Non-paddy Fields	11,838	12
	- Upland Fields	2,297	-
	- Tree Crops Land *1	6,371	-
	- Uncultivated Land	3,170	-
2. Non-potential Area for Irrigation	Rainfed Paddy Fields	810	1
	Non-paddy Fields	2,338	2
	- Upland Fields	593	-
	- Tree Crops Land	1,221	-
	- Uncultivated Land	524	-
3. Target Area for Development (Potential Area + Non-potential Area)		98,142	100
4. Non-subject Area for Development *2		9,041	-
5. Registered Area (3 + 4)		107,183	-

Note: *1. Including fish ponds of 643ha, *2. Including other land use (alih fungsi)

As shown in the table, the potential area accounts for 97% of the target area for the development study and the non-potential area for 3%. The irrigated paddy fields, rainfed paddy fields and non-paddy fields represent 74%, 12% and 14% of the target area, respectively. Tree crop land is the largest land use category in the non-paddy fields representing 8% of the target area. The target area for development under the Study accounts for 92% of the registered area.

(2) Cropping Seasons and Pattern

The principal cropping seasons in the target schemes and in the province are composed of two (2) seasons; wet season and dry season. Although there are some area specific variations due to irrigation water supply schedule or availability, rainfall distribution, drainage/flooding etc., the principal cropping calendars are identified as follows:

Wet season: November/December - February/March
Dry season: April/June - July/September

In only one irrigation scheme, the 3rd cropping season for upland crop is reported as being from July to October.

The current cropping patterns introduced in the irrigated paddy fields in the target irrigation schemes are shown in Table A-4.2.8. As shown in the table, the prevailing cropping patterns in the irrigated fields are double cropping of paddy (paddy - paddy/fallow). Cultivation of palawija in irrigated fields is rather limited and a cropping pattern of paddy – paddy/palawija is practiced only in about 30% of schemes, mostly to a limited extent. The most common palawija in the target schemes and province is maize. The prevailing patterns in the target schemes are as summarized below.

Most common: Wet season - dry season: paddy – paddy or paddy/fallow
Second common: Wet season - dry season: paddy - paddy/palawija/fallow

In the province the prevailing pattern in the rainfed paddy fields is paddy – fallow, while double cropping paddy is also practiced in areas with abundant rainfall distribution to a limited extent.

(3) Cropped Area and Cropping Intensity

The irrigation performances in the target schemes expressed by cropped area and cropping intensity to the irrigated area were examined based on the monitoring data of provincial and district irrigation agencies obtained through the Inventory Survey.

The results are shown in Table A-4.2.8. The overall cropped areas and cropping intensities of paddy and palawija in the wet and dry season in irrigated paddy fields are:

Overall Cropped Area & Cropping Intensity in Irrigated Fields in Target Schemes

Season	Paddy		Palawija		Overall	
	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)
Wet Season	62,565	86	100	0.1	62,665	86
Dry Season	42,987	59	3,905	5	46,892	65
Annual	105,552	145	4,005	6	109,557	151

As shown in the table, the overall cropped area and annual intensity is estimated respectively at some 109,600 ha and 151% of the total irrigated paddy fields of 72,620 ha.

Naturally, the annual cropping intensities vary largely depending on irrigation schemes due mainly to availability of irrigation water in the dry season. The

target irrigation schemes (50 schemes) are classified based on annual cropping intensities of irrigated paddy in irrigated paddy fields as follows:

Irrigation Schemes by Annual Cropping Intensity of Paddy

Cropping Intensity of Paddy *1	No. of Schemes	Proportion (%)
≧ 180 %	9	18
≧ 150 ～ < 180 %	17	34
≧ 120 ～ < 150 %	7	14
≧ 100 ～ < 120 %	7	14
< 100 %	10	20

Note: *1. Cropping intensity in irrigated paddy fields

Further, there appear to be some differences in the intensities according to the technical level of irrigation schemes. The annual cropping intensities of irrigated paddy by the technical levels of the target irrigation schemes are:

Technical irrigation schemes (25 nos): 53% - 199%; average 153%
Semi-technical irrigation schemes (22 nos): 0% - 200%; average 127%
Non-technical irrigation schemes (3 nos): total irrigated area only 20ha

In rainfed paddy fields, single cropping of paddy in the wet season is prevailing in the target irrigation schemes. Accordingly, under the present Study, the current cropping intensity in the rainfed paddy fields is assumed to be 100% of paddy in the wet season on the basis of the findings of the Inventory Survey and information provided by the Provincial Agriculture Services Office.

The overall cropped area and cropping intensity in the target area for development are shown in Table A-4.2.8.

(4) Crop Yields and Crop Production

The current paddy yield levels of the individual target schemes are estimated by analyzing yield data obtained through the Inventory Survey, BPS crop cutting survey results by sub-district, BPS statistic information by sub-district reported in *Kabupaten dalam Angka*, and statistic information on paddy yield by district reported by the Provincial Agriculture Services Office. The estimated paddy yields adopted in the present Study are shown in Table A-4.2.9. together with yield data used for the estimates. The estimated paddy yields are summarized as follows:

Estimated Current Irrigated Paddy Yields

Cropping Season	Yield Range (t/ha)	Average (t/ha)	Cropping Season	Yield Range (t/ha)	Average (t/ha)	Annual (t/ha)
Wet Season	3.0 – 5.0	3.8	Dry Season	3.0 – 4.5	4.1	3.9

The yield level of rainfed paddy and palawija is assumed based on the findings of the Inventory Survey and statistical information as follows:

Rainfed paddy: 2.5 t/ha

Palawija (maize): 2.5 t/ha (grain, composite maize assumed)

The current crop productions in the individual target schemes are estimated from the estimated cropped areas and crop yields as shown in Table A-4.2.8. The overall features are presented in the following table:

Overall Crop Productions

Commodity	Wet Season (ton)	Dry Season (ton)	Annual (ton)
Paddy	309,000	176,000	485,000
Palawija (maize)	10,013	6,725	16,738

(5) Crop Budget

Crop budgets for major commodities produced in the target irrigation schemes were studied based on the data collected through the Inventory Survey and crop budgets analyses made by the provincial and district food crops agriculture services agencies. Crop budgets for different yield levels of irrigated paddy, rainfed paddy and main palawija (represented by maize composite) thus estimated are shown in Table A-4.2.10 and summarized below:

Financial Net Return per ha Assumed

Commodity	Yield (t/ha)	Net Return/ha (Rp.000)	Commodity	Yield (t/ha)	Net Return/ha (Rp.000)
Irrigated Paddy	3.5	2,570	Paddy (rainfed)	3.0	2,140
	4.0	3,030	Rainfed Paddy	2.5	1,750
	4.5	3,450	Palawija (maize)	2.5	1,840
	5.0	3,930	-		

(6) Farm Economy

The primary objective of the farm economic analysis under the present Study is to examine capacity-to-pays or possible contribution of O&M costs by beneficiary farmers after the project. Further, the limited accessibility to reliable data on land holding and tenure conditions and farm household incomes and expenditures prevent setting typical farms in individual schemes and examining farm economic conditions. Accordingly, the present farm economic analysis has been made on 1ha of irrigated paddy field or rainfed paddy field or upland field depending on the present land use of individual schemes by estimating net farm income from the field. The results of the farm economic analysis thus made is presented in Table A-4.2.11 and summarized below:

Estimated Net Farm Income from 1ha of Field

Land Use Category	Net Farm Income from Paddy Field (Rp.000)	
	Range	Average
Irrigated Paddy Fields	1,750 - 6,815	4,558
Rainfed Paddy Fields	only 3 schemes	1,811
Upland Fields	only 2 schemes	1,656

(7) Agricultural Support Services and Marketing

The present status of agricultural institutions, support services and food crops marketing in the individual schemes identified through the Inventory Survey are presented in Table A-4.2.12. The major or prevailing issues on the subjects in the province and the target schemes are as follows:

(a) Almost all the target schemes are served by field extension workers (PPL) posted in or around the scheme. The number of PPLs assigned basically depends on the size of the schemes.
(b) Accessibility to farm credits depends on irrigation schemes and varies from "no difficulty to receive" to "almost no access to credits".
(c) No difficulties for procurement of farm inputs and quality seeds are reported in most of the target schemes.
(d) The most prevailing marketing practice for paddy is "sold after harvest at field" followed by "sold paddy after drying".
(e) The most prevailing marketing channel for paddy is "paddy to collector or middlemen" followed by "paddy to rice mill".
(f) Palawija production in and around the target schemes is extremely limited. The reported most prevailing marketing channel is "sold at local market".
(g) In most schemes, sufficient availability of rice mills is reported under the current marketing practices for paddy.

(8) Development Constraints

The primary constraint for irrigation agriculture in most of the target schemes is insufficient water availability at on-farm level, specifically in the dry season, due to malfunctioning or destruction of irrigation facilities, decrease of water resources, degradation of river bed and poor O&M of irrigation facilities and systems.

The agricultural development constraints in the individual schemes identified through the Inventory Survey are presented in Table A-4.2.12. The major or prevailing issues in the target schemes are enumerated as follows:

Engineering Issues

"Water shortage in dry season" and "poor O&M at main & 2ndry canals" is the main constraints reported.

Agronomic Issues

"Farmers not following recommended farming practices" and "rat attack" are the agronomic constraints prevailing in the target schemes.

Paddy Marketing Issues

"Low marketing prices" is the most prevailing constraint in paddy marketing followed by "limited bargaining power of farmers".

Farmer Organization (KT) Issues

"Most members are not active", "economic activities are limited" and "managerial capability of KTs are limited" are the main constraints reported.

Extension Services Issues

Constraints reported differ among the target schemes. The prevailing ones are "implementation of extension programs is limited" and "extension activities of PPLs are limited".

4.2.3 Water Users' Associations (WUAs)

The WUA establish target set up by PWRS North Sumatra is 574 in 50 irrigation schemes. The average working area of one WUA is 188 ha with a wide range from 47 ha at the minimum to 1,616 ha at the maximum.

Up to now, 337 WUA have been established in 48 irrigation schemes, while no WUA has been organized yet in the remaining 2 irrigation schemes. At present, the WUA establishment target ratio is 100% in 18 irrigation schemes, 50% to less than 100% in irrigation schemes and less than 50% in 19 irrigation schemes.

Regarding performance of WUA, regular monitoring and evaluation (M&E) is uniformly made in each Provincial Government taking into account organization, water allocation and distribution, irrigation maintenance, financing, physical condition of irrigation and related facilities, and Government program on WUA promotion and development. According to the evaluation result of PWRS North Sumatra, 11 WUA are classified into "Developed", while 201 are "Under developing" and 125 are "Not yet developed". Due to slow progress of legal arrangement, however, only 57 WUA have been legitimized in the local court of justice.

The present condition of WUA as mentioned above is shown in Table A-4.2.13 and summarized as shown below.

Present Condition of WUA in North Sumatra

WUA Establishment Target Realization Ratio	No. of Scheme	No. of Existing WUA	Performance and Legal Status of Existing WUA					
			Developed		Under Developing		Not Yet Developed	
			L	N	L	N	L	N
75% and more	24	250	8	0	20	115	5	102
50% to 74%	7	44	0	1	5	31	2	5
25% to 49%	6	9	1	0	1	5	0	2
Less than 25%	13	34	1	0	14	10	0	9
Total	50	337	10	1	40	161	7	118

Note : L ; Legitimated in local court
N ; Not yet legitimated in local court

4.3 Database for Existing Condition of Irrigation Scheme

Existing conditions of irrigation schemes of North Sumatra Province are prepared and presented in ANNEX-II (1/3). (Title: Priority List of Irrigation Schemes for Rehabilitation)

CHAPTER 5 REHABILITATION PLAN

5.1 Basic Concepts

5.1.1 Rehabilitation Plan

For the proper management of irrigation schemes, it is necessary to carry out improvement of irrigation infrastructures, to operate and maintain the systems appropriately, and to upgrade the organization of management of water resources and water supply, farming technology, etc. as well as to recognize the significance of irrigated agriculture. For this, important items to be considered are (i) preparation of a rehabilitation plan in due consideration of both aspects of agriculture and organization, (ii) improvement of crop productivity which can be capable of paying the irrigation management fee, and (iii) strengthening of water users' associations.

The basic concepts for the formulation of rehabilitation of facilities to recover the irrigation system are itemized as follows:

(a) Provision of appropriate irrigation infrastructures with sufficient sustainability, which does not require heavy rehabilitation works during the service life of the systems as far as routine O&M are practiced,
(b) Securing of design discharge throughout the irrigation system and equitable distribution of canals in order to remove constraints of O&M,
(c) Provision of user-friendly and easy-operation and maintenance canal structures with sufficient water level at each outlet to irrigate farmlands,
(d) Proper arrangement of measuring devices and outlets (diversion structure/turnout), considering water distribution methods and easy O&M,
(e) Provision of inspection roads along main and secondary canals for O&M and farm machinery,
(f) Provision of farm roads in on-farm level connecting with inspection roads and villages, and
(g) Provision or renewal of irrigation offices and gate-keeper houses at water resource facilities and canals with transportation equipment.

5.1.2 Agriculture Plan

The basic concepts applied for the formulation of the agriculture plans for the present Study are as enumerated below.

(a) The formulation of agriculture plans placing emphasis on paddy production envisaging contribution to food security in Indonesia and setting a double cropping of paddy as a basic cropping pattern,
(b) The irrigation agriculture performances and experiences in the advanced schemes among the target schemes of the Study in each province have been to be fully taken into consideration in the formulation of agriculture plans,
(c) The plans envisage improvement of crop productivity and realization of an increase of cropping intensity through the efficient use of irrigation water,
(d) The current agricultural status including crop selection, cropping schedule, cropping pattern and cropping intensity in the target schemes should dully be assessed and taken into planning so that the formulated plans will be sustainable in accordance with beneficiaries intentions and capabilities,
(e) The rational utilization of irrigation water resources is to be emphasized. In this regard, the increase of cropping intensity with the available water in the 3rd cropping season (cropping season following or between the double crops of paddy) to a possible extent is envisaged. The consensus of beneficiaries should be sought at the project detail design stage for this, and
(f) It is assumed that there will be no constraints on farm labor availability as almost all the target areas for development are existing paddy fields.

5.1.3 Institutional Aspects

(1) New Irrigation Management Policy

In line with the irrigation substance of the draft Law of Water Resources, all irrigation management activities of main and secondary systems of irrigation schemes are under the full responsibility of the Government and/or Regional Governments. Based on the participatory irrigation management policy that is a new concept in the draft Law of Water Resources, farmers can participate in any activities related to the above systems as long as they have established WUA and their willingness, capacity and capability are sufficient to do.

Operation and maintenance works of tertiary irrigation systems including fund arrangement are the full responsibility of WUA. Although the Government, in its Bill of Law on Water Resources, proposed the House of Representatives (DPR) that tertiary irrigation system development cost shall be shouldered by WUA,

DPR has made several counter proposals to share fully or partly the said cost by the Government. This issue is under deliberation in DPR at moment.

(2) Regional Government Capacity Building on Irrigation Management

In North Sumatra, Balai PSDA as branch offices of PWRS is responsible for water resources management and technical assistance to district/municipal government which is principally responsible for irrigation water usage management. At present, the respective district/municipal governments allocate 1,676 staff as a whole to manage 770 public irrigation schemes throughout the province, but actual number of staff is only 317. In other words, 80.5% of positions are vacant. Considering the necessary manpower requirements for covering a series of irrigation management activities, therefore, the concept of district/municipal government capacity building in this study is to improve the existing staff capability and also to fill up the vacancies of key positions.

(3) WUA Establishment Acceleration

In the participatory irrigation management policy, WUA is considered the fundamental body of irrigation water users. In connection with this, the target of WUA establishment set up by PWRS North Sumatra should be fully realized in parallel with recovery of function of irrigation system. At moment, 237 WUA in 32 irrigation schemes have not been established yet. In institutional planning to accelerate WUA establishment, therefore, primary attention is to be paid to these irrigation schemes.

(4) WUA Strengthening

Out of 337 WUA already established in 48 irrigation schemes, the current performance of 140 WUA is evaluated as "Under developing" and 87 as "Not yet developed". This monitoring and evaluation record clearly reveals that most WUA needs to improve their capacity to manage organization, capability to collect and expense member's fee, and activities to conduct operation and maintenance of tertiary irrigation system.

The focal point in formulating institutional plan, therefore, is to be technical assistance to "Under developing" and "Not yet developed" WUA to overcome its weakness.

(5) Setting-up of WUA Federation

Since the Government Regulation No. 77/2001 on Irrigation was enacted, it was promoted to organize higher-level institutional bodies of irrigation water users, i.e. federation of WUA (FWUA) on secondary canal basis and main federation of WUA (MWUA) on apex scheme-level basis. Although the core of these

higher-level bodies should be WUA and irrigation water users themselves should act as the main player in organizing such bodies, actual promotion activities for FWUA/MWUA establishment in North Sumatra seem to depend on top-down procedures through the channel from the Ministry of Home Affairs to district/municipal governments following the above regulation and the previous Irrigation Management Policy Reform (PKPI) backed up by the World Bank. Such top-down activities result in that there has been less opportunity of consulting with WUA representatives about FWUA/MWUA establishment.

In institutional planning under this study, therefore, the basic concept is to be set up in such way that the role of reasonable FWUA/MWUA is to coordinate member WUA concerning common rule of water allocation to each WUA as well as to collect ideas and data from WUA as input materials to district/municipal governments.

(6) WUA Activity in Operation and Maintenance Stage

After completion of rehabilitation work, WUA is responsible for operation and maintenance of tertiary system of irrigation scheme. In this regard, WUA's members should master necessary skills required for optimum operation and maintenance of related irrigation facilities to practice irrigation water distribution plan.

In formulating WUA activity plan to meet such requirements, attention is paid to provide WUA's members with on-the-job training on operation and maintenance of tertiary irrigation system once irrigation water can be distributed to the concerned tertiary block. Further activity is considered to be guidance on collection and expenses of WUA member's fee as well as preparation of annual financial report.

5.2 Irrigation Facility

5.2.1 Criteria for Rehabilitation

(1) Classification of rehabilitation in estimating cost

Classification of rehabilitation is based on the degree of defectiveness and deterioration as follows:

(a) Class A: Facilities are functioning well: In this case, no rehabilitation cost is incurred.

(b) Class B: Facilities are partially damaged/deteriorated, and minor rehabilitation is needed. In this case, rehabilitation cost is

estimated to be 30% of the new construction cost.

(c) Class C: Facilities are not functioning well, i.e., operation of the system is difficult and large-scale rehabilitation is needed. In this case, the rehabilitation cost is estimated to be 50% of the new construction cost.

(d) Class D: Facilities are seriously damaged with respect to operation. In this case, the rehabilitation cost is estimated to be equivalent to the replacement and new reconstruction cost.

(2) Headworks

1) Design criteria for rehabilitation of civil works

(a) More than 50 years: Class D is applied,

(b) From 30 to 50 years: Class C is applied,

(c) From 20 to 30 years: Classes B to D are applied depending on the condition, and

(d) Less than 20 years: Classes B to D are applied depending on the condition.

2) Design criteria for rehabilitation of steel gates and other metal works

(a) More than 20 years: Class D is applied, and

(b) Less than 20 years: Class C to D are applied depending on the condition.

3) Other design criteria

(a) Provision of a settling basin with a sand flush function

(b) Provision of a device for measuring discharge,

(c) Provision of an operation bridge, and

(d) Provision of a water level gauging staff.

(3) Canals and related structures

1) Proposed ratio of canals and structures

The proposed ratio of the canal length and number of related structures to the original design is determined as shown in the following table:

Proposed Ratio of Canals and Structures

Canal works	Classification of canal	Technical	Semi-technical	Non-technical
Canal length	Main canal	1.0	1.1	1.2
	Secondary canal	1.0	1.2	1.5
No. of structures	Main canal	1.1	1.2	1.3
	Secondary canal	1.2	1.35	1.5

2) Standardization of canals based on discharge in m^3/sec (refer to the Irrigation Design Standard prepared by DGWRD in 1986)

Construction costs for lining canals have been estimated based on the following classified standards:

Standardization of Canals by Discharge (Unit: m^3/sec)

0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2 - 4	4 - 6	6 - 8
8 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	more than 35

Notes: Canal; lined with concrete, side slope; 1:1.25, longitudinal slope; 1/5,000, n = 0.017

3) Design criteria for inspection roads

It is proposed to provide inspection roads with gravel metaling along the main and secondary canals. The total width of the inspection road is 5.0 m and the effective width is 3.0 m both main and secondary canals. The thickness of gravel metalling is 0.20 m.

4) Standard canal section

For the standard canal section including inspection road, refer to the Irrigation Design Standard prepared by DGWRD in 1986. Typical canal sections for cost estimation are as follows:

(a) Type A: New construction,
(b) Type B: Main canal without existing inspection road,
(c) Type C: Main canal with existing inspection road,
(d) Type D: Main and secondary canals along existing provincial road,
(e) Type E: Secondary canal without inspection road, and
(f) Type F: Secondary canal with existing inspection road.

5) Design criteria for rehabilitation of canals

Cost estimation for rehabilitation of canals is based on the typical canal section and the degree of defectiveness and deterioration as follows:

(a) Based on the above type of canal section, cost is estimated at the assumption of concrete lining reinforced with PVC fiber mesh,
(b) More than 20 years: Class D is applied,
(c) From 10 to 20 years: Class C is applied, and
(d) Less than 10 years: Classes B to D are applied depending on the condition.

6) Related canal structures

Cost estimates for rehabilitation of related structures have been based on the same standards as headworks, both for civil and metal works.

7) Other design criteria

(a) Provision of a watercourse section to prevent inflow from outside of the canal during rainfall,
(b) Provision of discharge measuring devices for appropriate water management,
(c) Replacement or renewal of bridges or crossing structures with required design loads (T-10 to T-20 class),
(d) Provision of hectometer, kilometer posts and name plates for structures for operation and maintenance, and
(f) Provision of safety facilities for traffic and humans (safety rope, handrail, etc.).

(4) Terminal facilities and on-farm

A design criterion for terminal facility and on-farm is as follows:

(a) Provision of tertiary and quaternary (feeder) canals and related structures with appropriate density,
(b) Provision of farm roads with appropriate density, and
(c) Provision of field drains with appropriate density.

(5) Project facilities

It is proposed that gate-keeper houses at major diversion structures with an area of 50 m^2 be provided.

(a) From 1,000 ha to 2,000 ha: 2 gate-keeper houses,
(b) From 2,000 ha to 5,000 ha: 4 gate-keeper houses,
(c) From 5,000 ha to 10,000 ha: 8 gate-keeper houses, and
(d) More than 10,000 ha: 10 gate-keeper houses.

(6) Office equipment

It is proposed that field cars (4WD, 3,000cc class), motor cycles (125cc class), and computers, copy machines and consumables as office equipment be provided.

For field cars,

(a) From 1,000 ha to 5,000ha: 2 field cars,
(b) From 5,000 ha to 10,000 ha: 5 field cars, and
(c) More than 10,000 ha: 7 field cars.

For motor cycles

(a) From 1,000 ha to 2,000 ha: 10 motor cycles,
(b) From 2,000 ha to 5,000 ha: 20 motor cycles,
(c) From 5,000 ha to 10,000 ha: 30 motor cycles, and

(d) More than 10,000 ha: 40 motor cycles.

For computer, copy machine and consumables

(a) From 1,000 ha to 2,000 ha: Rp. 100 million,
(b) From 2,000 ha to 5,000 ha: Rp. 150 million,
(c) From 5,000 ha to 10,000 ha: Rp. 250 million, and
(d) More than 10,000 ha: Rp. 400 million.

5.2.2 Availability of Water Resources

It is understood that the cropping intensity of some irrigation schemes in North Sumatra Province is not necessarily 200%. In other words, cropping intensity in the rainy season is more or less 100% in any schemes, whereas cropping intensity in the dry season is sometimes less than 100% due mainly to the shortage of river runoff.

It is a common practice in the planning stage to determine the irrigation area in the wet and dry season by means of a water balance study between the water demand of the proposed cropping pattern and the availability of water resources. As such information is not available, it is not possible to review the cropping intensity through previous study reports.

The Ministry of Settlement and Regional Infrastructure has been preparing the database for water resources and irrigation systems called "WRDC". The WRDC was established in the year 2001. However, the autonomy, accountability and responsibility are still unclear. It is also understood that discharge measurement of river runoff is not being done systematically in this country. As a result the database on water resources has not been prepared by WRDC, and consequently it was not possible to collect information necessary for carrying out a water balance study.

Consequently, information on water resources and irrigable area of the schemes furnished by the Dinas PSDA/project offices have been adopted for the determination of the possibility for water supply for the schemes in Pre-F/S stage.

5.2.3 Development Plan

(1) Countermeasures for recovery of function

The existing condition of irrigation systems from the water resource facilities to the terminal facilities and on-farm has been examined and analyzed for the establishment of a rehabilitation plan. Problems and constraints are detailed in Section 4.2.1 and its countermeasures for the recovery of function of the facilities are proposed as summarized below:

Countermeasures for Recovery of Function

Causes of Problems and Constraints	Countermeasures for Recovery
Water resource facility	
1. Weir, flood way, scouring sluices: civil works	
- Crack or damage on weir crest	Repair by chemical/cement grouting or filling concrete
- Leakage from foundation, settlement of weir	Grouting or adding concrete on weir crest
- Inclination, settlement and deflection of pier	Reconstruction
- Settlement and washed away apron and/or stilling basin	Reconstruction
- Fallen down, inclined, or washed away retaining wall	Reconstruction
- Washed away riprap, concrete block	Provision of additional protection works
- Physical O&M problems due to deterioration	Replacement and reconstruction
2. Weir, flood way, scouring sluices: gate and metal works	
- Leakage from guide frame	Repair or replacement of guide frames seal rubber and other members
- Lower strength against design requirement	Replace or strengthen with additional steel members
- Physical operation problem due to deflection, breakage, deterioration	Replacement of parts, replacement of all, paint, oil to hoist gear
3. Intake, free intake: civil works	
- Insufficient diversion water due to sedimentation at and around intake	Removal of sediments through proper maintenance and operation of scouring sluices and intake gates during flood
- Physical operation problems due to breakage of structure	Repair or replace with new construction
- Inflow of bed loads into canal	Proper operation of scouring sluice, provision of settling basin
4. Intake: gate and metal works	
- Leakage from gates and guide frames	Repair or replace guide frames and other members
- Physical operation problems due to breakage or deterioration	Replace or strengthen with additional steel members
5. Others	
- Difficulty in water distribution/water management	Provision of measuring devices, water level gauging staff, and proper operation of intake gate
- Difficulty in O&M	Provision of access road, operation house, inspection bridge and necessary facilities/equipment for O&M
Irrigation Canal and Related Structure	
1. General	
- Sedimentation and/or obstruction of flow	Removal of sediment/water plants by periodical maintenance
- Leakage	Replacement of embankment material by impervious material

(to be continued)

- Collapse	Provision of drainage ditch along canal, provision of cross drain, redesign of canal slope
- General O&M problems	Provision of inspection roads, kilometer and hectometer posts, name plate of respective structures
2. Canal Works	
- Leakage, cracks, collapse	Replace with concrete canal lining with provision of under and side drains
- Physical O&M problems due to deterioration, unlined	Provision of concrete lining, inspection roads
3. Related Structures	
- Poor function of discharge control facilities (diversion structure, off-take) due to deterioration of structure both civil and gate works	Repair or reconstruct structure with water management facilities such as measuring devices, staff, gauge
- Poor function of water conveyance facilities (siphon, aqueduct, drop) due to deterioration, breakage, leakage	Repair, replace, provide protection facilities, maintenance facilities (blow-off for siphon)
- Poor function of canal crossing structures (bridge, culvert, cross drain) due to deterioration, clogging by foreign materials, narrow width for traffic	Reconstruct bridge based on actual traffic load, remove clogged materials/sediments, reconstruct cross drain based on actual site condition
4. O&M Matters	
- Difficulty in O&M due to no or less density of inspection roads	Provision of inspection roads with all weather type design, execution of periodical maintenance of canal and roads
- Difficulty in water distribution and management	Review of irrigation area, irrigation diagram and field water requirement and redesign of canal, if required
- Physical operation problems due to breakage of structure	Repair or replace with new construction
Drainage Canal	
Natural River/Drainage Canal	
- Inundation of paddy fields during rainy season due to drainage problem	Provision of drainage canals and sluices
- Physical drainage problem due to sediments, water plants and obstructive materials inside drainage canal	Periodical maintenance
- Physical operation problems due to insufficient number of related structures	Provision of sluices, bridges, culverts, protection works, etc.
Terminal Facilities and On-farm	
Facilities/Water Management	
- Physical operation problems due to low density of irrigation and drainage canals in a tertiary block	Provision of sufficient irrigation and drainage canals with related structures
- Physical operation problems during planting and harvesting	Provision of farm roads for operation of farm machinery, conveyance of harvested paddy
- Physical operation problems of water management due to poor land leveling	Execution of land leveling and re-layout of irrigation and drainage canals

(2) Rehabilitation plan

1) Basic Concept for Rehabilitation Plan

Rehabilitation plans are to be designed for all the schemes in accordance with the rehabilitation criteria discussed in Section 5.2.1. For the rehabilitation plans the following measures were considered and applied.

Water Resource Facilities

(a) Type of water resource facilities

The existing intake method of free intake is replaced by the headworks type to prevent inflow of sediment loads into the canal and to provide a measure for the bed river degradation in the future. (12 schemes)

(b) Provision of settling basin to all the headworks

As analyzed in the previous section, the major problems of operation and maintenance of irrigation canals is caused by sediments that flow into the canal from the river not only during the flood time but also under the normal flow condition of the river. To prevent sediment loads flowing into the irrigation canal, it is proposed to provide settling basin structures for all the headworks except where the intake method is direct from the dam reservoir. (34 schemes)

(c) Provision of integrated headworks

In order to supply irrigation water throughout the year from adequate and stable water resources, the following existing intake structures (free intake system) in the Asahan District are to be combined and designed as an integrated headworks. The source of irrigation water is R. Silau with a catchment area of 150 km^2 at the proposed headworks sites.

Silau Irrigation System: Sungai Silau, Sijambi
Bunut Irrigation System: Panca Agra, Serbangan, Silau Bonto

(d) Replacement of steel gates for scouring sluice and intake

One of the major causes of sedimentation in front of the intake and of inflow into the irrigation canal is judged to be the physical operation problems of both steel gates due to damage and deterioration. To remove this major cause, replacement and/or large scale repair of gates is to be executed.

(e) Provision of inspection bridge and measuring devices

The following facilities are to be provided with appropriate operation and maintenance as well as discharge control structures:

- Inspection bridge having effective width not less than 3.5 m.
- Measuring devices such as gauging staff, measuring devices with instruments.

Canals and Related Structures

(a) Provision of concrete lining

In order to make provision for proper water management and to decrease O&M costs, including repairing works, it is proposed to provide concrete lining for both the main and secondary canals for rehabilitation of non-lined canals.

(b) Provision of inspection road

In order to carry out proper O&M and to contribute to the agricultural activities and distribution of products, the inspection roads along the canals are to be rehabilitated or newly provided. The road design should be all-weather type with pavement (effective width: 3.5 m in minimum).

(c) Rehabilitation and provision of related structures

In order to execute proper water management and O&M, the related structures are to be rehabilitated and/or newly provided. Steel gates associated with the control structures (diversion and off-take structures) are to be replaced by new ones in cases where they have deteriorated (over the age of their service design) and/or physically damaged/not functioning.

Terminal Facility and On-Farm

In order to support proper water management and post harvest activities, the terminal facilities including canals, farm roads and related structures are to be rehabilitated or provided new.

2) Features of rehabilitation plan

Based on the basic rehabilitation plan mentioned above in 1), rehabilitation designs at the pre-feasibility study level were made for the irrigation systems from the water resource facilities to terminal facilities including on farm development. The features of the rehabilitation plan for each scheme are shown in Tables A-5.2.1 and Figure A-5.2.1, respectively.

5.2.4 Cost Estimates

Cost estimates for the rehabilitation works have been made for the following five items:

(1) Direct construction cost for rehabilitation

(a) Water resource facilities
(b) Irrigation canals and related facilities
(c) Drainage canals and related facilities
(d) Terminal facilities and on-farm
(e) Project facilities (Field office and office equipment)

(2) Work quantities

Work quantities for the rehabilitation including reconstruction and/or new construction have been estimated based on the field investigation and the rehabilitation design described in Section 5.2.1.

(3) Unit prices

Material costs, labor wages, and unit prices of respective construction items have been collected through the field investigation. In addition to the survey results, the actual engineer's cost estimates were collected from similar projects under MOSRI. After examination of the costs, all the costs were found to be the same or similar. Therefore, the same unit prices have been applied for the cost estimates.

(4) Cost estimates

Costs for the rehabilitation works for 50 schemes have been estimated and the results are shown in Tables A-5.2.2. Figures shown in the table below indicate the rehabilitation cost per hectare at a maximum of 5,428 US$/ha (or 43.4 million Rp.) and a minimum of 1,164 US$/ha (or 9.64 million Rp.).

Rehabilitation Cost per Hectare

Number of Schemes	Unit	Minimum	Maximum	Average
50	US$/ha	1,164	5,428	2,644
	million Rp./ha	9.64	43.4	21.9

Note: Conversion rate US$ 1.00 = Rp. 8,279 as of May 2003.

5.3 Agriculture Plans

5.3.1 Agriculture Land Use Plans

The approaches employed in the planning of future land uses under the Study are as follows:

(a) The subject areas for the present agriculture land use plans are the irrigation development areas determined through the irrigation development study,
(b) Basic principles applied for the land use planning of the subject areas are:

Basic Principles for Land Use Planning

Present Land Use	Land Use Plan
Irrigated Paddy Fields	Irrigated Paddy Fields
Rainfed Paddy Fields	Irrigated Paddy Fields (converted)
Non-paddy Fields - Upland Fields - Uncultivated Land	Irrigated Paddy Fields (converted) (net area: 70% x gross area)
- Tree Crops Land	Not converted

(c) As shown in the table, tree crops lands have been excluded from the subject area for the rehabilitation plans because of farmers general reluctance towards the conversion of tree crops lands to paddy fields identified through the Inventory Survey.

(d) No changes in areas have been assumed in the existing paddy fields.

The agricultural land use plans of the subject areas in the individual target schemes are shown in Table A-5.3.1. The overall features by province are as follows:

Overall Land Use Plans of Subject Areas

Land Use Category	Present/Before Project		Future Plan	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Irrigated Paddy Fields	72,620	80	88,576	98
Rainfed Paddy Fields	11,346	13	0	-
Upland Fields	2,890	3	0	-
Uncultivated Land	3,694	4	0	-
Non-irrigable Land *1	-	-	1,974	2
Total	90,550	100	90,550	100

Note: *1 Non-paddy fields (gross) - Converted paddy fields (net)

As shown in the table, the increase of irrigated paddy fields of some 16,000 ha (increase of 22% from the present level) is planned as a whole under the Study.

5.3.2 Planned Cropping Pattern and Schedule

Under the present Study, the selection of crops to be introduced in the planned cropping patterns in the target irrigation schemes has been made basically observing the current cropping patterns prevailing in the target schemes, which represent farmers intention and capabilities to a certain extent. In addition, the availability of irrigation water and the rational use of irrigation water among beneficiaries and area specific needs for selection of crops, if any, have been taken into consideration. The crop selection has been made as follows:

(a) The introduction of double cropping of paddy is envisaged in all the target schemes based on the farmers' preferences for crops and the volume of market demands, and

(b) Maize is selected as a representative palawija to be introduced in the planned cropping pattern since it is the most common palawiaja currently cropped in and around the target schemes. Further, from the demand/supply conditions and profitability of crops, hybrid maize appears to be the most promising crop among palawija. Similarly, maize is the most promising palawija in terms of the national economy.

The two basic cropping patterns (Pattern A & B) have been formulated on the basis of: (i) study of the current irrigation performances in the target areas and (ii) inapplicability of a cropping pattern of continuous triple cropping of paddy (paddy-paddy-paddy) because of the danger for serious infestation of pests & diseases and because of the time required for periodical O&M of irrigation facilities; as explained in the following table:

Basic Cropping Patterns

Pattern	Planned Cropping Pattern *1*2			Subject Irrigation Schemes
	Wet Season	Dry Season I	Dry Season II	
Pattern A	Paddy (100%)	Palawija	Paddy (100%)	Sufficient water in dry II
Pattern B	Paddy (100%)	Fallow	Paddy/palawija	Insufficient water in dry II

Note: *1 Wet season: Oct/Nov-Jan/Feb; Dry I: Feb/Mar-Apr/May; Dry II: May/June-Aug/Sep.
*2 (%): cropping intensity in the season

A cropping pattern of paddy (intensity 100%) - fallow - paddy (intensity <100%) in irrigation schemes with insufficient water supply in the dry season II has not been planned. The plans aim at efficient use of irrigation water as stated in the basic concepts (Section 5.1.2). The planned cropping patterns for the individual target schemes are presented in Table A-5.3.2.

5.3.3 Planned Cropped Area and Cropping Intensity

In accordance with the planned cropping pattern and the selected crops discussed earlier, the target cropped areas and cropping intensities in the target schemes under the present Study have been planned in accordance with the following manners.

(a) Target cropped areas and cropping intensities have been determined on the basis of current and past cropped areas and cropping intensities in individual schemes and by setting a minimum target for the intensity of paddy and an envisaged target for the overall intensity,
(b) The minimum target intensity of paddy is set to 150% and an increase of more than 20% of the overall intensity from the current level is targeted,
(c) In addition, the introduction of palawija (represented by maize) to the minimum extent of 5 to 10% in all schemes is envisaged, and

(d) In accordance with the above points, the target cropping intensities for individual schemes have been determined as presented in Table A-5.3.3.

In accordance with the planned cropping pattern and the selected crops discussed earlier and the target cropping intensities, the cropped areas in the target schemes have been planned as presented in Table A-5.3.2 and summarized in the following table:

Overall Features of Cropped Area & Cropping Intensity

Crop	Cropped Area (ha)				Cropping Intensity (%)	
	Wet	Dry I	Dry II	Annual	Range	Overall
Paddy	88,576	0	69,061	157,637	150 - 200	178
Palawija	0	3,396	6,123	9,519	5 - 30	11
Total	88,576	3,194	74,598	166,368	155 - 200	189

The overall increase of annual cropped area of some 32,900 ha of paddy and 2,500 ha of palawija from the present level is planned under the Study. Further, an overall increase of paddy cropping intensity of 33% and of palawija intensity of 5% in irrigated fields is envisaged.

5.3.4 Target Crop Yields and Crop Production Plans

Target crop yields have been estimated by assuming that all the target irrigation schemes will be developed or upgraded to the level of the existing advanced irrigation schemes and that intensification of the farming practices will be carried out by beneficiary farmers. Target yields of paddy have been assumed for individual schemes based on the current yield levels in the schemes and the yield levels in advanced irrigation schemes as shown in Table A-5.3.2 and are summarized below:

Target Yields under the Study

Cropping Season/Crops	Target Yield	
	Range	Overall Average
Wet Season Paddy (GKG)	4.5 - 5.5 ton/ha	5.1 ton/ha
Dry Season Paddy (GKG)	4.5 - 5.5 ton/ha	5.1 ton/ha
Maize (hybrid; grain)	-	5.0 ton/ha

The overall average target yield level of 5.1 t/ha is an increase of 1.2 t/ha from the present overall average yield of 3.9 t/ha (including rainfed paddy).

On the basis of the target crops yields and the planned cropping pattern, the with-project crop production plans have been formulated for individual target schemes as shown in Table A-5.3.2. As shown in the table, the production increase of 312,000 tons of paddy as a whole is estimated under the with-project condition.

5.3.5 Crop Budgets

The planned crop budgets estimated based on the planned farming practices of paddy and palawija are detailed in Table 4.2.10 and summarized in the following table:

Planned Crop Budget per ha

Crops	Return (Rp.000)		Crops	Return (Rp.000)	
	Gross	Net		Gross	Net
Paddy			Maize (hybrid)		
- Yield 5.5 t/ha	7,150	4,420	- Yield 5.0 t/ha	5,500	3,490
- Yield 5.0 t/ha	6,500	3,930			
- Yield 4.5 t/ha	5,850	3,450			

5.3.6 Farm Economy

The farm economic analyses under the present Study have been made to examine capacity-to-pays or possible contribution of O&M costs by beneficiary farmers after the project. The analysis was made on 1 ha of irrigated paddy fields or rainfed paddy fields depending on the present land use of individual schemes by estimating net farm income from the fields as discussed earlier in Section 4.2.2.

The results of the farm economic analysis made on the individual schemes are presented in Table A-5.3.4 and summarized below:

Estimated Net Farm Income from 1ha of Field

Land Use Category	Net Farm Income (Rp.000)			Incremental Net Income (Rp.000)
	With-Project		Present	
	Range	Average	Average	Average
Irrigated Paddy Fields	5,484 - 9,767	7,341	4,558	2,783
Rainfed Paddy Fields	only 3 schemes	5,599	1,811	3,789
Overall		7,170	4,278	2,892

5.4 Institutional Capacity Building

(1) District/Municipal Government Capacity Building Plan

The focal point of capacity building of district/municipal district government staff in charge of irrigation management is to make staff understand fully the new participatory irrigation management policy and also the difference from the previous irrigation management policy reform based on hand-over of authority to water users. For this purpose, technical guidance seminar will be held in each capital town/city by facilitators consisting of PWRS task force team, consultant and if necessary staff of central line ministries. Materials to be distributed to all attendants are outline papers of new Law on Water resources, Amendment of Government Regulation on Irrigation (Regulation No.77/2001 to be modified) and

relevant ministerial decrees of Ministry of Settlement and Regional Infrastructure, Ministry of Home Affairs and Ministry of Finance.

Following this technical guidance seminar, workshop is to be held to review and modify decrees of Regent/Mayor related to water resources and irrigation as well as job descriptions of officials concerned of district/municipal government about irrigation management in line with the spirit of new Law on Water Resources. In this workshop, discussion should be made among facilitators and attendants regarding how to put the priority over fulfillment of vacant posts taking into account salient features of irrigation schemes located in the concerned district/municipality.

Such seminar and workshop for the technical guidance need to be held in all districts and municipalities in the province. To ensure effective and efficient dissemination of the new irrigation management policy, however, the technical guidance should be carried out with more compact scale. Considering the availability of capable facilitators for technical guidance, therefore, the technical guidance is to be started from the following districts and municipalities where the selected 141 irrigation schemes are located:

Mandaling Natal, Tapanuli Selatan, Tapanuli Tengah, Toba Samosir, Labuhan Batu, Asahan, Simalunggun, Langkat Districts and Binjai Municipality.

(2) WUA Strengthening Plan

The main objective of WUA strengthening is to make all member farmers be aware of role of WUA and responsibility of its membership in the concerned irrigation scheme. In this connection, the basic concept of WUA strengthening plan is to identify weak points of WUA activities by members themselves on the participatory basis by recapturing monitoring and evaluation record of WUA performance focusing on administrative, financial and operational aspects.

The main targets of WUA strengthening plan are WUA's board of directors and member farmers. The plan consists of WUA awareness raising workshop and technical assistance to WUA concerning capacity to manage organization, capability to collect and expense member's fee, and activities to conduct operation and maintenance of tertiary irrigation system. As for technical assistance, class room training, on-the-job training and mass guidance will be combined in on package program to meet technical assistant requirements of the respective WUA. Although the target of this plan is 201 "Under developing" WUA and 125 "Not yet developed" WUA, the package program should be implemented for 140 "Under developing" WUA and 87 "Not yet developed" WUA.

(3) WUA Federation Setting-up Plan

In the irrigation scheme where WUA federation has been organized, its role and function are to be confirmed through review of its article from the viewpoint of new participatory irrigation management policy. Also hearing is to be made to representatives of the federation focusing on who took an initiative to establish the federation and whether or not the establishment of federation was backed up by the general will of WUA in the concerned irrigation scheme. If the article is based on Government Regulation No. 77/2001 on Irrigation and relevant ministerial decrees as well as less connection and coordination with member WUA are found, it is confirmed whether the representatives of federation need technical support from Regional (provincial/district) Government for modification of its article and resetting-up of FWUA/MWUA.

For the case of new establishment of FWUA/MWUA, socialization workshop is to be held by the Provincial task force team aiming in order to make WUA and its members understand fully the necessity as well as the role and function of FWUA/MWUA in line with the irrigation substance of new Law on Water Resources. To support WUA for smooth establishment and initial setting-up of FWUA/MWUA, the Provincial task force team is to act as a facilitator.

Although WUA federation setting-up plan needs cover 50 irrigation schemes, the first priority should be given over 18 irrigation schemes.

(4) WUA Establishment Acceleration Plan

The main target of WUA establishment acceleration plan is farmers group in each tertiary block where no WUA has been established although irrigation water can be distributed to the concerned block. For this purpose, Provincial task force team is to invite representatives and members of Farmers Group to socialization meeting and workshop aiming at confirmation of their awareness to establishment of and participation to WUA as well as their needs for general guidance about procedure and practice of WUA establishment.

Although this plan has to cover 137 WUA not yet established in 32 irrigation schemes, its implementation should be commenced from 9 candidate schemes in which there remain 40 WUA not yet established.

(5) On-the-job O&M Training and Management Guidance

As O&M of tertiary irrigation system is the responsibility of WUA, training programs are to be implemented during the implementation period of rehabilitation works in the respective irrigation schemes in order to enable WUA member farmers to carry out physical activities smoothly and non-physical

activities properly. The main menu is on-the-job training program on O&M of irrigation facilities at tertiary level and management guidance program on collection and expense of WUA member's fee.

(6) Strengthening of Extension Services

To strengthen extension services based on the area specific concept in order to accommodate farmer's needs, promote farmer/farmers group participation and to take initiatives in the execution of extension services in the irrigation scheme, the main activities are to include farmer/farmers' group empowerment, staff empowerment, field demonstration, technical development/trial, class room training, field school, study tour, workshop and mass guidance.

(7) Cost Estimate for Institutional Capacity Building

The unit cost of each institutional capacity building plan is estimated at preliminary level as follows:

District/municipal government capacity building plan	Rp.10,000,000/time
WUA strengthening plan	Rp.40,000/ha
WUA Federation Setting-up Plan	Rp.20,000/ha
WUA Establishment Acceleration Plan	Rp.20,000/ha
On-the-job O&M Training	Rp.100,000/ha
WUA Management Guidance	Rp.20,000/ha
Strengthening of Extension Services	1% of rehabilitation cost

Taking into account the above unit cost, target and established numbers of WUA, and subject area of irrigation scheme, institutional capacity building cost has been estimated and the result is as shown in Table A-5.4.1.

5.5 Economic Evaluation

5.5.1 General

The economic evaluation of the present Study has been made to assess the economic viability by comparing the project costs and the incremental project benefits between the present/before project conditions and the with-project conditions as the reliable prediction or estimation of the without-project conditions was not possible and impractical. The approaches or assumptions applied for the economic evaluation are as follows;

(a) Economic evaluation has been made by estimating project benefits between the present/before project and the with-project conditions,
(b) For economic evaluation, economic internal rate of return (EIRR), financial gross return per ha have been examined,

(c) Project benefits are estimated based on crop production benefits and indirect or intangible benefits have not been counted,
(d) The useful life of the Project was taken as 30 years from project implementation,
(e) Exchange rate of Indonesian Rupiah (Rp.) to US. Dollar (US$) was taken to be Rp. 8,279 equivalent to US$ 1.00 (as of May 2003);
(f) Constant prices at 2003 level were used in the economic evaluation, and

5.5.2 Project Costs

The project costs of the individual rehabilitation plans consist of initial investment costs, replacement costs and O&M costs. The economic project costs were calculated from the financial project costs by applying standard conversion factor of 0.90 as shown in Table A-5.5.1.

5.5.3 Project Benefits

(1) Economic Prices of Farm Inputs and Outputs

Economic prices of farm inputs and outputs were estimated in order to evaluate the expected project benefits. Economic prices of trade goods such as rice, maize, soybeans, groundnuts and fertilizers were estimated on the basis of the projected world market prices of these commodities forecast by the World Bank. Non-trade goods were valued at financial prices which were estimated on the basis of current market or farm gate prices. Farm labor was valued at the shadow wage rate of 0.80. The economic prices of farm inputs and outputs applied for the economic evaluation are presented in Table B-6.2.2 and B-6.2.3.

(2) Project Benefits

Only the crop production benefits are assessed as the project benefits as stated earlier. The net project benefits are defined as the difference in net return from crop production between the with-project and the present/before project conditions. The economic crop budgets applied for the estimation of the net return under the Study are as presented in Table A-5.5.2. The project benefits expressed as the incremental net return form crop production in the individual schemes are estimated as shown in Table A-5.5.3.

5.5.4 Results of Economic Evaluation

The results of the economic evaluation (EIRR, B/C, B - C & incremental gross return per ha) are presented in Table A-5.5.4 and as summarized below.

Economic Internal Rate of Return (EIRR)

EIRR	No. of Schemes	Ratio (%)
≧ 20%	3	6
15 - 19%	7	14
10 - 14%	25	50
< 10%	15	30

EIRRs of the target schemes are in the range of 3.1% to 26.2% and the rates of 35 schemes (70%) out of 50 schemes are calculated at higher than 10%.

B/C at Discount Rate of 10%

B/C	No. of Schemes	Ratio (%)
≧ 1.0	35	70
< 1.0	15	30

The incremental gross returns per ha of the subject area under the with-project conditions are shown in Table A-5.5.4 and summarized in the following table.

Incremental Gross Return per ha (Financial Value)

Incremental Return (million Rp./ha)	No. of Schemes	Ratio (%)
≧ 6.0	9	18
3.0 - < 6.0	41	82
< 3.0	0	-

Overall average gross returns per ha and incremental gross returns per ha are estimated as shown in the following table.

Average Incremental Gross Return per ha of Subject Area

Gross Return per ha (Rp.000)		
Before Project	With-project	Increment
7,169	12,026	4,857

The overall average incremental gross returns per ha of the subject area under the with-project conditions is estimated at Rp. 4,857,000 respectively as shown above.

5.6 Database for Rehabilitation Plan

The databases for the rehabilitation plan of 50 irrigation schemes are shown in Volume 5, ANNEX-II (1/3).

CHAPTER 6 PRIORITIZATION FOR IMPLEMENTATION OF REHABILITATION

6.1 Flow of Criteria for Prioritization

6.1.1 Flow of Prioritization

The general flow for prioritization of Rehabilitation Projects is shown in Figure A-6.1.1.

The procedure for the prioritization is described as below:

First Screening

Step-1

1.1 Collection of data on existing irrigation schemes with a registered area of more than 1,000 ha.

1.2 If the area of both the registered area and the estimated area were more than 1,000 ha proceeded to Step-2. If an estimated area was less than 1,000 ha, such scheme has been categorized into Group-VI.

Step-2

2.1 Evaluation of capacities of WUA of each irrigation schemes and related district governments.

2.2 If more than 50% against target number of WUAs has been already established as well as the post of head of water resources and irrigation service office has been fulfilled by the third or higher rank officer, proceeded to Step-3 (1). On the other hand, if more than 50% against target number of WUAs has not been established or the said post has been vacant or fulfilled by the fourth rank officer, the scheme has been categorized into Group-V.

Step-3

3.1 Information on water resources and irrigable area of the scheme furnished by the Dinas PSDA/project office has been adopted for the determination of the possibility for water supply for the scheme.

3.2 If the water resources was considered to be sufficient for the scheme according to such information, an inventory survey and pre-F/S have been carried out.

3.3 If the water resources were considered to be insufficient for the scheme according to the information, proceeded to Step-3 (2).

3.4 In case that there was a possibility of reformulation of water resources development plan, the scheme has been categorized into Group-IV. On the

other hand, if there was no possibility of reformulation of water resources development plan, the scheme has been categorized into Group-VI.

Second Screening

Step-4

4.1 If there are such problems as low technical sustainability (high construction cost and low economic feasibility) and less contribution to the society, such scheme shall be categorized into Group-VI.

Step-5

5.1 Evaluation indicators for prioritization consist of issues of: (a) irrigation, (b) agricultural productivity, (c) society, and (d) economic and financial impacts.

5.2 Based on the comprehensive examination of the above evaluation indicators in pre-F/S, priority of the schemes to be rehabilitated shall be determined and listed.

Priority

Based on the priority list thus prepared, recommendation of implementation procedure is made as follows:

Group-I:	Recommended as the first priority
Group-II:	Recommended as the second priority
Group-III:	Recommended as the third priority
Group-IV:	Recommended to reformulate water resources development plan
Group-V:	Recommended to accelerate WUA establishment and to empower district government officials concerned
Group-VI:	Recommended to formulate development method by other categories

6.1.2 Criteria for Prioritization

Prioritization of rehabilitation works has been based on following four major evaluation indicators:

(a) Rehabilitation of irrigation system impact
(b) Agriculture productivity impact
(c) Social impact
(d) Economic and financial impacts

It should be noted that the status of water users' association has not been included in the evaluation indicators due to the reasons stated in the box in the next stage.

(1) Rehabilitation of irrigation system impact

Rehabilitation of irrigation system impact consists of following three items:

(a) Utilization of resources potential
(b) Urgency of rehabilitation
(c) Sustainability

"Utilization of resources potential" means that actual intake of water vs. designed capacity of intake structure. It is necessary to evaluate increment of intake of water by improving or repairing intake structure, and as a result how much irrigation area can be increased.

"Urgency of rehabilitation" means recovery of function of irrigation scheme, which was not functioning due to disorders of the facilities, by means of rehabilitation. For instance, intake structure or main canal is heavily damaged by some reasons, all the system may not function at all. In such case, evaluation should be made in such a manner that how much function of the system recovers with limited investments.

"Sustainability" does not necessarily depend on structure stability, but it is one of the most important indicators of the effect of rehabilitation. Evaluation of sustainability should be based on the extension of project life.

(2) Agriculture productivity impact

Agriculture productivity impact consists of following three items:

(a) Increase of irrigation area
(b) Cropping intensity
(c) Crop yield

Evaluation of agriculture productivity impact shall be made in terms of increments of irrigation area, crop yield and cropping area.

(3) Social impact

Social impact consists of following two items:

(a) Increase of beneficiaries
(b) Improvement of rural infrastructures

Evaluation of social impact shall be made both aspects of alleviation of poverty and improvement and newly provision of rural infrastructures.

(4) Economic and financial impacts

Evaluation of economic feasibility shall be carried out based on Economic Internal Rate of Return (EIRR) and evaluation of financial viability shall be based on analysis of agriculture return.

6.2 Weights of Evaluation Indicators

Distribution of weighted score for four respective indicators is determined as below and details are shown in Table A-6.2.1.

Evaluation Indicators for Prioritization of Rehabilitation Work

Evaluation Indicator		Weighted Score
1.	**Issue of Irrigation Indicator**	**50**
1.1	Utilization of irrigation potential	(10)
1.2	Urgency of rehabilitation	(25)
1.3	Sustainability	(15)
2.	**Issue of Agriculture Productivity**	**20**
2.1	Current cropping intensity	(10)
2.2	Current unit yield of paddy	(10)
3.	**Issue of Society**	**15**
3.1	Number of beneficiaries	(7.5)
3.2	Provision of social infrastructure	(7.5)
4.	**Issue of Economic and Financial Impact**	**15**
4.1	Feasibility (EIRR)	(7.5)
4.2	Agriculture return per hectare	(7.5)

6.3 Evaluation Results

The evaluation was made for 50 schemes and the evaluation results are finally classified into Group I, II, III, IV, V and VI as shown in Table A-6.2.2 and summarized below, and high priority is given in the schemes classified into from Groups I to III.

Summary of Prioritization

Priority Group						
I	II	III	IV	V	VI	Total
7	7	5	3	13	15	50

The database for the prioritization in each scheme is presented in Volume 5, ANNEX-II (1/3).

6.4 Selection of Model Scheme for the Feasibility Study

Selection of model scheme to be taken up for the feasibility study has been comprehensively made considering not only the evaluation results of prioritization but also the following factors:

(a) The scheme of which irrigation area is more or less the same as the average area of the 50 schemes,

(b) The scheme of which condition of topography, situation of agriculture

and agro-economy, type of irrigation system/facilities, etc. represents the subject schemes,

(c) The scheme of which rehabilitation brings about immediate effects on the recovery of the system (such as damages on the primary canal)

(d) The scheme of which rehabilitation gives rise to a great impact on a regional community/economy (schemes located suburbs of a city or at large market)

A few proposed irrigation schemes were selected by the Team in due consideration of the above factors. This proposal was further examined in the meetings with the counterpart personnel and the representatives of Dinas PSDA. Finally, Padang Mahondang Scheme was selected and determined to be taken up fro the model schemes. The general features of Padang Mahondang Scheme are as follows:

Features of Selected Areas

Irrigation Scheme	Padang Mahondang
District	Asahan
Sub-district	Pulo Rakyat
Existing Condition	
Registered area (ha)	3,231
Technical level	Semi Technical
Completion year of system	1981
Water resources river	S. Asahan
Type of water resources facility	Free Intake
Settling basin	Not provided
Max. intake discharge (m^3/s)	0.6
Length of main canal (km)	3.6
Length of secondary canal (km)	9.2
Number of WUAs (Target/Established)	2/1
Number of farmers	Not available
Development Plan	
Subject area (ha)	2,905
Water resources facility	Free Intake (New construction)
Settling basin	Newly provide
Length of main canal (km)	3.5
Length of secondary canal (km)	10.0
Rehabilitation cost: Total (million Rp.)	42,036
Rehabilitation cost: Per hectare (million Rp.)	14.5 (US$1,748/ha)
Economic internal rate of return (%)	19.4

CHAPTER 7 PREPARATION OF ACTION PLAN

7.1 Action Plan

The priority ranking has been made for each irrigation scheme in the preliminary feasibility study. The action plan for rehabilitation work after the prioritization should be prepared with following contents:

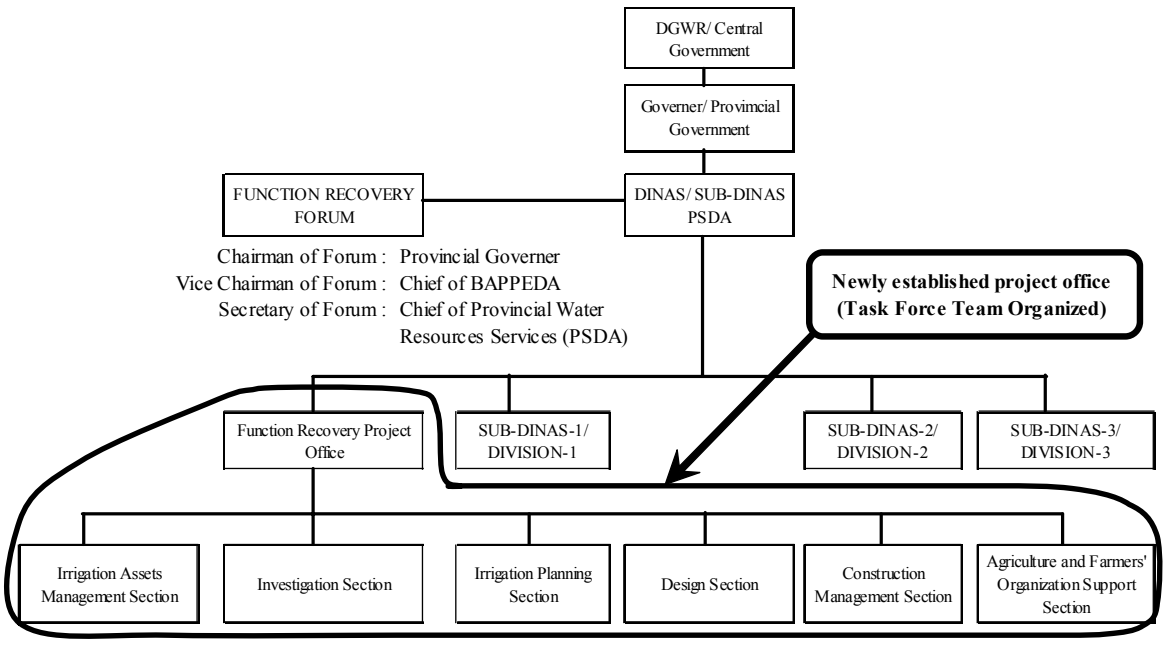
(a) Organization plan,
(b) Action plan for recovering function of irrigation facilities,
(c) Action plan for institutional strengthening,
(d) Action plan for extension services strengthening, and
(e) Action plan for budgeting.

7.2 Organization Plan

(1) Precondition

The organization for the recovery program is proposed as illustrated below:

Proposed Organization for Recovery Program of Irrigation Agriculture



The organization is to be formed of "Forum" as a decision making body and "Project Office" as an implementation body. These bodies are to be newly established at provincial level, which are responsible for implementing the

comprehensive recovery program of irrigation agriculture from the initiation phase to the final phase on the basis of participatory irrigation management concept.

The Project Office is attached to provincial water resources service as one of functional units and under the control of the chief in charge of water resources management and utilization.

(2) Function Recovery Forum

The Forum is to play facilitator's role in collecting ideas and inputs to the function recovery program at the respective Phases from water users and other stakeholders. The Forum is also responsible for getting final approval from the Governor about its decisions on implementation of the program including budgeting and budget implementation plans. The Forum will be composed of the following members:

Chairman of Forum:	Provincial governor
Vice chairman of Forum:	Chief of BAPPEDA
Secretary of Forum:	Chief of Provincial Water Resources Services (PSDA)
Member of Forum:	District Regent, Municipal Mayor, Chief of District BAPPEDA, Chief of District Water Resources Services, Chief of Agriculture Services at provincial and district level, Chief of relevant services at provincial and district level, Representative of Water Users' Association, University and NGO

(3) Function Recovery Project Office

As discussed in the precondition, "Function Recovery Project Office (tentative name)" will be established under PSDA or Public Services (PU) and take full responsibility of implementation and management of all activities in each phase of the recovery program. The Project Office will be composed of about six (6) Sections such as (a) Irrigation Assets Management Section, (b) Investigation Section, (c) Irrigation Planning Section, (d) Design Section, (e) Construction Section, and (f) Agriculture and Farmers' Organization Support Section.

The Project Office has to (i) maintain close relationship with the stakeholders of water user side, (ii) clarify, utilize and manage their ideas and inputs, and (iii) has a right of influence on their demands for the successful completion of the project. The Project Office will organize various task force teams to carry out specific activities under the direction of the Forum.

In implementing and managing the recovery program, the project manager is a leader of the working group, and his leadership has to be displayed in any activity of the program. He is expected to have skills as communicator, negotiator and problem solver.

Major activities of the respective sections stated above are as follows:

Project Manager	1. The person in charge of implementation of the project. 2. Responsible for negotiation with related agencies, and obtaining consensus. 3. Responsible for implementation schedule. 4. Responsible for drawing up and expending budget for the implementation of the project.
Irrigation assets management section	1. Responsible for managing/safekeeping and updating of irrigation facilities account book. 2. Collection and assessment of information of irrigation facilities from the subordinate agencies (Kabupaten).
Investigation section	1. Confirmation of consistency of the account book and the existing status of irrigation facilities. 2. Supervision of observation and collection/classification of meteorological and hydrological (river runoff) data. 3. Periodical investigation on the status of irrigation facilities and preparation of report. 4. Conducting inventory survey of the existing facilities, which are necessary for formulating the rehabilitation program.
Irrigation planning section	1. Analysis of data on meteorology and hydrology (river runoff). 2. Formulation of rehabilitation plan based on the investigation results. 3. Prioritization of irrigation schemes based on the rehabilitation plan and the construction cost. 4. Preparation of manual of water management and O&M, and guidance of the manual 5. Conducting investigation on environmental impact assessment, and obtaining permits for implementation of the project.
Design section	1. Preparation of design report and bill of quantities, and tender documents including drawings. 2. Conducting design modification during the construction of irrigation facilities.
Construction section	1. Selection of contractors (from tendering to contract signing). 2. Supervision of construction works. 3. Inspecting completion of work, and supervising the project works during the guarantee period.
Agriculture and farmers' organization support section	1. Collection and classification of information on the WUA and related organizations. 2. Collection and classification of information on agriculture and agro-economy required for formulating rehabilitation program. 3. Establishment and support of the program on agriculture and agro-economy. 4. Establishment and support of the program on the empowerment of institutional organization.

The activities stated above will change in accordance with the implementation progress of activities in each phase of the program. It will become necessary to

employ specialized and qualified consultants (Indonesian and/or international) as required.

7.3 Action Plan for Recovering Function of Irrigation Facilities

7.3.1 Action Plan based on the Priority Group

Recommendations based on the evaluation results for the six (6) groups from Groups I to VI are as follows

Group I: High priority schemes (Recommended making F/S)
Group II: Second high priority schemes (Recommended making F/S)
Group III: Third high priority schemes (Recommended making F/S)
Group IV: Schemes that require reexamination of availability of water resources before making F/S
Group V: Schemes that require empowerment of WUA or district government before making F/S
Group VI: Schemes that require reexamination of development methodology before making F/S

Of the above classification, action plan for Groups I to III is more or less the same, though timing of initiation of implementation is different, whereas action plan for Groups IV to VI is not the same due to different constraints. Action plan for each group is as follows:

Groups I to III:

- Procurement of consultants for making F/S,
- Execution of F/S,
- Preparation of implementation program for each scheme,
- Appropriation of funds for the rehabilitation,
- Procurement of consultants for detailed design and construction supervision,
- Field investigation and topographic survey, etc., for detailed design, and preparation of detailed design,
- Preparation of tender documents including drawings,
- Selection of contractor(s),
- Supervision of construction, and
- Final inspection for completion delivery and O/M of the system.

Group IV:

- Procurement of consultants for field survey and study on development plan,

- Preparation of alternative development plan,
- Execution of F/S based on the alternative plan, and
- Activities to be followed are the same as Groups I to III stated above.

Group V:

- Promotion of the organization of WUA to the required level,
- Promotion of the organization of district government to the required level,
- Classification of schemes to Groups I to III or Group VI, and
- Activities to be followed are the same as Groups I to III stated above.

Group VI:

- Procurement of consultants for field survey and study on development plan,
- Preparation of alternative development plan (If the registered area is less too small, integration of plural schemes or exclusion from the list are to be considered.),
- Execution of F/S based on the alternative plan, and
- Activities to be followed are the same as Groups I to III stated above.

7.3.2 Evaluation of Each Scheme and Confirmation of Development Plan

Evaluation of each scheme in terms of issues/problems and their countermeasures are summarized as follows:

Priority of Rehabilitation of the Schemes, Issues/ Problems and Countermeasures

Group	Priority of Rehabilitation	Issues and Problems	Countermeasures
I	High priority (Recommend F/S)	- Poor function of basic structures - No problem in water resources facilities	- Recovery of function by R/U of basic structures.
II	Second priority (Recommend F/S)	- Poor function of the system due to deterioration - Malfunction of terminal system - No problem in water resources facilities	- 30-50% of facilities needs R/U. - Replacement or repairing of gates is necessary. - New construction or rehabilitation of inspection road is necessary.
III	Third priority (Recommend F/S)	- Malfunction of the system due to deterioration - No function of terminal system - No problems in water resources facilities	- More than 50% of facilities need R/U. - Rehabilitation of terminal system is urgent.
IV	Re-examination	- Water is not distributed to the terminal system due to shortage of river runoff. - Paddy field is converted to upland field or orchard due to shortage of water.	- Development of new water resources - Integration of schemes - Conversion of crops to be cultivated to meet irrigable area.

V	Re-examination	- Poor functions and activities of WUA or district government (on the condition that there is no problem in water supply).	- Establishment and empowerment of WUA or empowerment of district government is urgent (on the condition that there is no problem in water supply).
VI	Re-examination	- Registered area with less than 1,000 ha (recommended by JICA Study Team) - Absolute shortage of water resources - Low effect on investment - Low motivation of farmers in practicing farming	- Development of new water resources - Conversion of crops to meet irrigation area

7.3.3 Packaging of Field Survey and Construction Works

(1) Field Investigation for F/S

In order to maintain the uniformity of field survey results, number of package of F/S is one (1) regardless of the scale of the schemes. The study period ranges from 6-18 months depending on size of the schemes.

(2) Construction Works

Packaging of the construction works is made on the basis of monetary terms that are the decisive factors. The approximate construction cost is Rp. 50,000 million (approximately ¥ 700 million) per package. The construction period of one scheme is determined to be 2 years in principle, however, that of large area is 3 years.

7.3.4 Implementation Schedule

The irrigation schemes in the province are classified based on the evaluation of rehabilitation priority as shown below:

Number of Schemes classified based on Priority of Rehabilitation

Group	I	II	III	IV	V	VI	Total
Number	6	7	5	3	14	15	50

Based on the priority group and major features of the schemes stated in the above table, the implementation schedule together with the said information are summarized in Table A-7.3.1 and Figure A-7.3.1. It should be noted that the implementation schedules of the F/S and construction works of the schemes classified into Groups IV, V and VI are not presented in the report because various kinds of survey and study are required before commencing F/S.

7.3.5 Status of Basic Information on the Irrigation Schemes

In commencing the Study on the Comprehensive Recovery Program of Irrigated Agriculture, basic information such as irrigation area, irrigation diagram, dimension of canals and related structures, intake water record, meteorological and hydrological data. Needless to say, the Study largely depends on the availability of such basic data and their accuracy.

One of the most important tasks of the Study is to collect the basic information. However, many schemes are equipped with neither basic information nor detailed information. To cope with this situation, it was necessary to visit the branch offices of the Provincial Water Resources Management Services Office (Dinas PSDA), nonetheless plenty of documents have been scattered and lost.

The comprehensive recovery project is expected to be certain that the function of facilities can be easily recovered, as most of the existing schemes.

In order to complete successfully the project, the "processing of basic information and preparation of the updated book" is prerequisite condition. For the implementation of the project, necessary information can be collected through such updated book, and if further information is required, additional field survey would be necessary, which is to be added to the book.

It is recommended that the Dinas PSDA should supervise such activities and be responsible for keeping book. In other words, it is urgently necessary for Dinas PSDA to update the information regarding meteorology, hydrology, conditions of irrigation facilities, irrigated area, crop production, etc., which can be furnished for the formulation of rehabilitation plan.

7.4 Action Plan for Institutional Strengthening

7.4.1 Type of Plan

Action plan for institutional strengthening consists of the following two program groups:

- The one is to be conducted in either initial or midterm phase prior to the implementation of rehabilitation works of irrigation system. Action plan for this group includes institutional capacity building and staff capability improvement program, WUA strengthening program, FWUA and MWUA initial setting-up program, and WUA establishment acceleration program; and
- The other is to be carried out in final stage as one of the project

components in parallel with rehabilitation works of irrigation system. Action plan for this group covers training program on operation and maintenance of tertiary irrigation system, and guidance program for collection and expense of irrigation water service charge.

The overall implementation schedule of action plan for institutional strengthening is included in Figure 4.6.1.

7.4.2 Formulation of Task Force Team for Institutional Strengthening

For conducting the action plan of the first group, a Task Force Team will be established by the Provincial Government. In principle, this Task Force Team is responsible for providing initial ideas/needs and making decision to take necessary arrangement for the program implementation. This Task Force Team is therefore formed of the following members:

- Chief is to be appointed from Provincial Water Resources Service Office;
- Secretary is to be appointed from Provincial Water Resources Service Office; and
- Members are to be appointed from Provincial and District/Municipal Water Resources Service Offices as well as representatives of WUA, FWUA/MWUA if already organized and Farmers Group in non-WUA.

For carrying out the action plan of the second group, a working group will be organized under the control of the rehabilitation project manager and led by a senior project staff in charge. As members of this working group, experts are also invited from NGO and universities in addition to representatives of WUA and FWUA/MWUA if available. This working group is responsible for providing necessary inputs and making decision and necessary arrangement for the program implementation.

7.4.3 Elements of Action Plans for Institutional Strengthening

(1) Institutional Capacity Building and Staff Capability Improvement Program

This program contains two (2) components. One is to enable irrigation officials at regional level to understand and practice the new irrigation management policy. The other is to improve the capacity of organization units of district/municipality government involved in irrigation management and those staff capability in line with the new irrigation management policy.

The first component will be done through undertaking a series of seminar and workshop to be facilitated by the central government after the legal framework of

water resources and irrigation management is completed. Its program formulation and budget arrangement will be also made by the central government.

The second component should reflect to the above nationwide dissemination of the new irrigation policy by the central government. This component will be done by the Task Force Team at provincial level and consultants as follows:

- To evaluate the capacity of district/municipal government authorities and the capability of those staff, both involved in irrigation management activities;
- To identify needs for improving institutional capacity and staff capability to cope with the new irrigation management policy as well as supporting requirements for fulfillment of such needs through technical assistance by central/provincial government; and
- To formulate implementation programs on institutional capacity building and staff capability improvement for the respective district/municipal government authorities involved in irrigation management.

Regarding the budget arrangement for these implementation programs, the main source is district/municipal government budget to cover the cost for institutional capacity building and staff capability improvement, while the supplemental source is provincial government budget to cover the cost for implementation of the supporting menus.

In implementing the institutional capacity building and staff capability improvement program, a group of trainers will be organized by inviting well experienced specialists from consultant, NGO and universities. Monitoring and supervision of the program implementation should be carried out continuously by relevant organization units at provincial level throughout the program implementation stage with periodical reporting on performance and impact of the program implementation.

(2) WUA Strengthening Program

The background of this program is the existence of many irrigation schemes where majority of WUA have yet shown good performance in terms of organization management and financing aspects other than physical aspects like irrigation facility condition and water allocation utilization. From the initial stage of irrigation system rehabilitation, farmers' participation is prerequisite so that the capability of WUA is one of important key factors for successful implementation of the comprehensive recovery program of irrigation agriculture.

The Task Force Team should be responsible for making necessary arrangement to formulate and implement WUA strengthening program by recruiting consultant as technical assistant. The Task Force Team and its consultants shall:

- hold WUA' awareness raising workshop to reconfirm weak points elaborated from recapitulated the latest monitoring and evaluation (M & E) record on WUA's performance;
- confirm establishment of WUA Federation (FWUA) at secondary level and federations group at primary level (MWUA) as well as non-WUA tertiary system within the irrigation scheme;
- carry out interview survey to WUA' representatives of all WUA in the irrigation scheme if the latest M&E record shows the condition of more than three years ago, and update M&E record;
- identify technical assistant requirements for improving WUA's capacity to manage organization, capability to conduct operation and maintenance of tertiary irrigation system, and/or activities to collect and expense WUA members' fee;
- formulate a technical assistant menu list and make a package program of technical assistance menus according to WUA's needs to improve its capacity, capability and/or activities; and
- estimate unit cost of each technical assistant menu and total cost of package program.

Budget for implementing package program for strengthening WUA is to be arranged by Regional Government according to its jurisdiction.

In implementing the WUA strengthening program before starting rehabilitation works, the Task Force Team shall make necessary arrangement to recruit consultant, NGO and/or universities as facilitators and implementers in the irrigation scheme area.

(3) FWUA and MWUA Initial Setting-up Program

The background of this program is the current change in the operation and maintenance responsibility of primary and secondary irrigation system in line with the draft of Law on Water Resources. These two groups will represent those member WUA so that they should build up transparent channel and good cooperation among WUA, FWUA and MWUA in implementing irrigation management activities. In order to secure appropriate role and function of WUA' groups in conformity with the participatory irrigation management policy, therefore, it is necessitated to support initial setting-up of FWUA and MFUA.

The same Task Force Team and its consultant shall:

- collect list of FWUA/MWUA, list of member WUA, legal documents;
- review and confirm role and function of FWUA/MWUA compared with the participatory irrigation management policy;

- socialize the necessity of setting up representative groups to WUA to cope with the participatory irrigation management policy if FWUA/MWUA has not been established;
- formulate a guidance menu list and make a package program of guidance menus to support initial setting-up of FWUA/MWUA according to the current situation in the irrigation scheme; and
- estimate unit cost of each guidance menu and total cost of package program.

Budget for implementing package program for initial setting-up of FWUA and MWUA is to be arranged by Regional Government according to its jurisdiction.

In implementing the initial setting-up of FWUA and MWUA program before starting rehabilitation works, the Task Force Team shall make necessary arrangement to recruit consultant, NGO and/or universities as facilitators and supporters in the irrigation scheme area.

(4) WUA Establishment Acceleration Program

The background of this program is the existence of tertiary blocks where no WUA has yet established within one irrigation system resulting in that the realization of full-scale management of irrigation system is still impossible. In such case, any irrigation scheme with WUA establishment target realization ration of less than 50% is to be dropped from Master List according to the criteria. Further, there are candidate irrigation schemes which have tertiary blocks without WUA. As long as irrigation water is distributed to the concerned tertiary block, WUA should be established as a terminal body of water users. Therefore, it is indispensable for accelerating WUA establishment up to the target level in each irrigation scheme in order to ensure participatory irrigation management in the whole tertiary blocks of one irrigation system in an integrated manner.

The same Task Force Team and its consultant shall:

- hold socialization meeting and workshop to invite representatives and members of farmers groups which are available in non-WUA tertiary blocks provided with irrigation water, for the purpose of accelerating WUA establishment and promoting participatory irrigation management;
- confirm farmers' awareness to establishment of and participation to WUA as well as their needs for guidance about procedure and practice of WUA establishment;
- formulate a guidance menu list and make a package program of guidance menus to accelerate WUA establishment in non-WUA tertiary blocks to which irrigation water is distributed; and
- estimate unit cost of each guidance menu and total cost of package program.

Budget for implementing package program for WUA establishment acceleration is to be arranged by Regional Government according to its jurisdiction.

In implementing the WUA establishment acceleration program before starting rehabilitation works, the Task Force Team shall make necessary arrangement to recruit consultant, NGO and/or universities as facilitators and supporters in the irrigation scheme area.

(5) Training Program on Operation and Maintenance of Tertiary Irrigation System

This training program will be done after completing the rehabilitation works of irrigation system. For this purpose, however, preparation of training manual and program should be done in parallel with the final stage of rehabilitation works. Also the concept of training program should synchronize irrigation water allocation plan to tertiary blocks as well as cropping pattern and planting schedule in the irrigation scheme.

As this training will be done as one of rehabilitation project components, consultant under the project manager is responsible for preparing training manuals, formulating training program estimating training cost and implementing training program. To ensure effective and efficient implementation of training on operation and maintenance of tertiary irrigation system, NGO and other volunteers will be encouraged to involve in training activities at field level in addition to the project staff, Regional Government officials and consultant.

Budget arrangement based on consultant's cost estimate is the responsibility of the project manager.

(6) Guidance Program for Collection and Expense of Irrigation Water Service Charge

The background of this program is the reconfirmation of WUA's obligation to operate and maintain tertiary irrigation system in the draft of new Law on Water Resources. Since 1984, farmers have been responsible for paying irrigation service fee to cover the cost for operation and maintenance of tertiary irrigation system as well as management cost of WUA. Due to uncertain realization of irrigation water allocation plan to each tertiary block of the irrigation system, however, many WUA members put lower priority over their irrigation service fees among annual expenses from their income. As irrigation water supply can be guaranteed as planned after the rehabilitation works completed, therefore, it is needed for reluctant farmers to remind their obligation and to encourage them to fulfill their obligation.

In parallel with preparation of training manual on operation and maintenance of tertiary irrigation system, the project consultant shall:

- identify issues on book keeping system, fee determination method, payment form, fee collection system and payment schedule;
- identify issues fee allocation system to cover administration, operation, maintenance and other miscellaneous cost;
- identify incentives to members;
- formulate a guidance menu list and a package program of guidance menus for collection and expenses of irrigation water service fee; and
- estimate unit cost of each guidance menu and total cost of package program.

Budget arrangement based on consultant's cost estimate is the responsibility of the project manager.

In formulating and implementing the guidance program for collection and expense of irrigation water service charge, the project manager should pay his due attention to recruit a consultant with specific experiences matching with the above terms.

7.5 Action Plan for Extension Services Strengthening

7.5.1 Formulation of Action Plan

The goal of strengthening extension services is to mitigate individual or plural constraints to agricultural development based on farmer-to-farmer approaches. To reach the goal, it is prerequisite to formulate a strategic action plan tailored to area specific needs. Therefore, the action plan has to include a series of program menus aiming at farmer/farmers group and staff empowerment. Formulation of the action plan for strengthening extension services also has to be well synchronized with the implementation schedule of rehabilitation works of the irrigation scheme. Key program menus are field demonstration, technical trial, classroom and field school training, study tour, workshop, mass guidance, and so on.

7.5.2 Formulation of Task Force Team for Extension Services Strengthening

For implementing the action plan, a Regional Task Force Team for strengthening extension services will be established by Regional Government. This Task Force Team is formed of the following members:

Chief	Regional agriculture services agencies
Secretary	Regional agriculture services agencies
Member	Irrigation services agencies

	Water users' associations (farmers)
Technical guidance team	Agriculture & irrigation agencies of higher jurisdiction; BPTP

7.5.3 Formulation of Implementation Program

An implementation program of the action plan for strengthening extension services will be formulated stepwise as below:

Constraints for development will be identified by the following means:

- Investigation on the present agriculture conditions and identification of constraints to be mitigated for the attainment of the targets set in the agriculture plan; and
- Field confirmation of the constraints by the research-extension dialog team.

Approaches and countermeasures or technologies will be introduced by establishment of:

- Approaches for the mitigation of the constraints identified;
- Countermeasures for the mitigation of the constraints identified; and
- Agriculture technologies for the mitigation of the constraints identified.

Based on the extension system employed in a district, the modified system accommodating area specific conditions and needs should better be worked out by emphasizing promotion of farmer/farmers' group's participation and initiatives in the execution of extension services in the irrigation scheme.

Element extension programs will be formulated for the mitigation of individual or plural development constraints by emphasizing farmer-to-farmer approaches. Element extension programs should be area specific ones tailored to area specific needs and will include farmer/farmers' group empowerment program, staffs empowerment program, field demonstration program, technical development or trial program, training program in class and in field (field school), study tour, workshop, mass guidance and so on.

For implementing extension services strengthening program, a certain period from 3 to 5 years will be required as shown in Figure A-7.3.1, based on the time series for implementation schedule of element programs, budget requirement and availability as well as staff availability and capability.

7.5.4 Implementation of Extension Services Strengthening Program

The extension services strengthening program will be implemented as follows:

- Formulation of annual work program for the strengthening of extension services in individual irrigation schemes based on the action plan for

strengthening of extension services and through participatory approach;

- Budget arrangement on the basis of the annual work program formulated above;
- Preparation of detail agreed plan of operation for the implementation of strengthening programs accommodated in the budgets through participatory approaches of stakeholders involved in the implementation of the programs;
- Extension materials or materials required for the implementation of the programs accommodated in APO should be prepared in time for the execution of the programs;
- Based on the establishment or development of agriculture technologies to be introduced, simple extension materials to be distributed to farmer/farmers' group should be prepared;
- Implementation of the programs for the strengthening of extension services should better be carried out by a working Team organized for the implementation of the programs in individual irrigation schemes. The Working Team should be composed of: staffs of district agriculture services office, field agriculture & irrigation staffs, representatives of WUAs and representatives of participants of the programs;
- Monitoring & supervision of the program implementation by the Task Force Team should be carried out continuously throughout the program implementation stage; and
- Monitoring of the program implementation and impacts should be made by the Working Team under the supervision of the Task Force Team. Periodical reporting of the results and findings of such monitoring activities should be institutionalized.

7.6 Action Plan for Budgeting and Budget Implementation

In discussing the preparation of budget proposals and implementing of budget to be allocated to the function recovery program, special attention has to be paid to the following key issues related to the modified irrigation management policy in line with the draft of new Law on Water Resources:

- Arrangement of irrigation management responsibility between irrigation water suppliers and water users;
- Arrangement of irrigation management responsibility among government authorities;
- Funding criteria; and
- Mechanism of budget arrangement and utilization

Among irrigation management activities, the responsibility of planning and design works for development, rehabilitation and upgrading purposes is arranged to governments at central and provincial level to assure quality of outputs from these works. Regarding implementation of physical works, it can be considered that the budget availability, staff capability and contractor capacity are crucial factors at district/municipal level. Therefore, it can be considered rational that irrigation schemes commanding more than 1,000 ha are to be handled by provincial governments in a sense of participatory irrigation management.

Although irrigation schemes covering 500 to 1,000 ha are to be dropped from the function recovery program, rehabilitation and upgrading works of such schemes needs to be implemented by district/municipal government with financial support by the Special Allocation Fund to district/municipal government (*DAK*) and technical assistance from provincial government, if necessary.

Budgeting for activities in the initiation and midterm phase of the function recovery program for the irrigation scheme with the scale of more than 1,000 ha is recommended to be made at central level. For allocating APBN of Ministry of Settlement and Regional Infrastructure, therefore, it is required to make a package of the initiation phase activities on provincial basis. It is also recommended that, after budget is allocated, provincial government is to execute initiation phase package plans through assistant task.

In the midterm phase of the function recovery program, it is recommended that Ministry of Settlement and Regional Infrastructure takes an initiative for budgeting after scrutinizing provincial governments' proposals for undertaking F/S and packaging priority schemes. Similar procedures of budgeting and budget implementation are also recommended.

Budgeting for implementing rehabilitation works of irrigation schemes will be basically made according to the jurisdiction of irrigation management stipulated in the daft of new Law on Water Resources if internal budget source is considered. If external funding sources are targeted, it is recommended to consider the scale of proposed project matching with the financing standard of the donor agencies. In other words, central government is to prepare an implementation program (I/P) by packaging irrigation schemes proposed by Regional Governments.

Tables

Table A-1.1.1 Administrative, Demographic and Socio-economic Features by Project District and Province in 2001: North Sumatra

I. Administrative & Demographic Features

Province/District	Land Area		No. of Administrative Units		Population & Households											
					Population				Density (per km2)	Urban Population		Rural Population		Households		Tranmigrant Household
	(km^2)	(%)	Sub-district	Village	Male	Female	Total	Growth Rate		(No.)	(%)	(No.)	(%)	Households No.	Family Size	
101 Nias	5,318	7	17	657	347,628	351,520	699,148	1.55 %	131	21,708	3	677,440	97	142,033	4.9	75
102 Mandaling Natal	6,620	9	8	273	180,526	187,874	368,400	1.60 %	56	46,495	13	321,905	87	88,634	4.2	-
103 Tapanuli Selatan	12,277	17	20	1,265	369,982	379,021	749,003	1.34 %	61	109,889	15	639,114	85	175,289	4.3	1,870
104 Tapanuli Tengah	2,188	3	8	147	125,320	124,348	249,668	1.37 %	114	29,922	12	219,746	88	61,094	4.1	750
105 Tapanuli Utara	7,165	10	20	340	202,115	205,717	407,832	0.04 %	57	41,643	10	366,187	90	101,274	4.0	75
106 Toba Samosir	3,440	5	13	300	150,958	155,416	306,374	0.51 %	89	41,166	13	265,208	87	73,860	4.1	-
107 Labuhan Batu	9,323	13	22	242	436,305	427,133	863,438	1.47 %	93	169,941	20	693,497	80	205,406	4.2	300
108 Asahan	4,581	6	17	271	474,686	469,136	943,822	0.58 %	206	252,431	27	691,391	73	223,192	4.2	-
109 Simalungun	4,369	6	14	251	432,538	431,141	863,679	0.63 %	198	196,552	23	667,127	77	194,537	4.4	-
110 Dairi	3,146	4	13	158	147,112	148,211	295,323	0.58 %	94	35,686	12	259,637	88	73,882	4.0	250
111 Karo	2,127	3	33	258	143,225	144,628	287,853	0.99 %	135	66,968	23	220,885	77	83,359	3.5	-
112 Deli Serdang	4,339	6	20	637	1,016,332	1,004,689	2,021,021	2.10 %	466	1,118,735	55	902,286	45	481,374	4.2	-
113 Langkat	6,262	9	21	230	466,696	455,216	921,912	1.14 %	147	194,777	21	727,135	79	218,405	4.2	-
114 Others (Municipalities)	525	1	43	304	1,365,786	1,379,138	2,744,924	n.a.	5,228	2,727,079	99	17,847	1	633,267	4.3	-
Province Total	71,680	100	269	5,333	5,859,209	5,863,188	11,722,397	1.20 %	164	5,052,992	43	6,669,405	57	2,755,606	4.3	3,320
Indonesia 2/	1,890,754		4,918	70,460	106,332,251	105,670,749	212,003,000	1.49 %	112	85,380,627	42	115,861,372	58	55,041,000	3.9	

II. Socio-economic Features

Province/District	Working Population & Occupation							GRDP in 2001 5/				Farm Economy					Population under Poverty Line (%)
	Working Population 3/		Working Population per Family	Proportion of Working Population by Sector (%) 4/				Agriculture Sector (Rp. million)	Non-agriculture Sector (Rp. million)	Per District (Rp. million)	Per Capita (Rp.000)	Estimated Annual Family		Annual Per Capita Expenditure in 2002			
	(No.)	(%)		Agriculture	Industry	Others	Total					Income (Rp.000)	Expenditure (Rp.000)	Food (Rp.000)	Non-food (Rp.000)	Total (Rp.000)	
101 Nias	408,643	58.4	2.9	88	3	9	100	1,198,367	1,220,402	2,418,769	3,387	No data available	7,269	1,131	346	1,477	31.4
102 Mandaling Natal	205,449	55.8	2.3	80	1	19	100	833,827	615,099	1,448,926	3,525		7,226	1,379	360	1,739	23.8
103 Tapanuli Selatan	425,441	56.8	2.4	77	3	20	100	1,493,426	2,427,295	3,920,721	4,979		7,499	1,329	426	1,755	21.9
104 Tapanuli Tengah	139,216	55.8	2.3	68	8	24	100	492,070	494,198	986,268	3,979		6,516	1,167	428	1,594	29.9
105 Tapanuli Utara	230,137	56.4	2.3	82	2	16	100	1,056,742	654,074	1,710,816	3,897		7,611	1,383	507	1,890	20.9
106 Toba Samosir	174,416	56.9	2.4	80	4	16	100	797,270	643,570	1,440,840	4,036		8,517	1,546	507	2,053	24.0
107 Labuhan Batu	504,441	58.4	2.5	68	4	28	100	2,566,099	4,810,618	7,376,717	8,047		8,295	1,412	562	1,973	15.1
108 Asahan	577,199	61.2	2.6	56	13	31	100	3,483,420	5,939,439	9,422,859	8,777		8,019	1,352	545	1,896	15.7
109 Simalungun	538,144	62.3	2.8	72	7	21	100	2,588,006	1,581,864	4,169,870	4,160		8,130	1,273	558	1,831	18.9
110 Dairi	166,838	56.5	2.3	90	2	8	100	1,075,856	450,654	1,526,510	4,354		6,809	1,215	488	1,704	24.7
111 Karo	184,181	64.0	2.2	82	2	16	100	1,266,560	644,948	1,911,508	6,194		7,557	1,630	558	2,188	23.2
112 Deli Serdang	1,264,109	62.5	2.6	35	29	36	100	3,178,225	5,176,074	8,354,299	3,648		9,883	1,503	851	2,354	10.0
113 Langkat	581,798	63.1	2.7	65	10	25	100	2,318,294	2,463,857	4,782,151	5,276		8,429	1,462	535	1,997	20.6
114 Others (kota)	1,971,963	71.8	3.1	8	22	70	100	1,375,463	25,891,400	27,266,863	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.
Province Total	7,371,975	62.9	2.7	56	12	32	100	23,723,625	53,013,492	76,737,117	5,876		9,140	1,464	684	2,149	15.8
Indonesia 2/	135,426,402	63.9	2.5	47	8	45	100	246,298,200	1,203,099,900	1,449,398,100	6,837		9,537	1,448	1,028	2,476	18.2

1/:Figures in 2001, if not stated otherwise 2/: Figures in 2001 based on Statistik Indonesia 2002, BPS Indonesia 3/: Estimated based on: population of age group 15 - 64 x 1.0 + age group ≧65 x 0.5

4/: Proportion of working population of aged 10 years and over by working sector during the previous week; Survei Sosial Ekonomi Nasional, 2001

5/: Pendapatan Regional Sumatera Utara Menurut Kabupaten/Kota 1996-2001, BPS Sumatera Utara

Source: Sumatera Utara Dalam Angka (2001), BPS Sumatera Utara & Karakteristik Penduduk Sumatera Utara, Hasil Sensus Penduduk 2000, BPS Sumatera Utara

Table A-1.3.1 Number and Area of Irrigation Schemes in North Sumatra

	District / Municipal	Irrigation Scheme and Potential Area											
		Technical Irrigation Scheme		Semi-technical Irrigation Scheme		Simple Irrigation Scheme		Government Scheme Sub-total		Village Irrigation Scheme		Total	
		No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)
1	Nias	1	1,258	13	2,696	18	2,010	32	5,964	43	3,325	75	9,289
2	Mandaling Natar	2	6,420	17	3,629	8	2,275	27	12,324	12	1,611	39	13,935
3	Tapanuli Selatan	4	6,080	42	8,834	47	7,459	93	22,373	39	4,663	132	27,036
4	Tapanuli Tengah	9	6,861	25	6,612	3	880	37	14,353	7	470	44	14,823
5	Tapanuli Utara	1	602	55	15,532	18	1,495	74	17,629	53	4,473	127	22,102
6	Toba Samosir	7	3,483	53	13,298	17	1,270	77	18,051	30	1,989	107	20,040
7	Labuhan Batu	4	4,541	5	1,344	7	1,535	16	7,420	12	1,386	28	8,806
8	Asahan	9	13,622	12	11,991	1	3,231	22	28,844	2	160	24	29,004
9	Simalungun	107	45,908	30	4,835	40	8,579	177	59,322	15	1,250	192	60,572
10	Dairi	0	0	51	12,198	36	5,311	87	17,509	8	690	95	18,199
11	Karo	0	0	46	11,699	0	0	46	11,699	4	308	50	12,007
12	Deli Serdang	15	23,086	17	21,077	1	4,000	33	48,163	51	6,826	84	54,989
13	Langkat	2	882	25	5,220	0	0	27	6,102	0	0	27	6,102
14	Inter-District (Lintas Kabupaten)	7	16,570	1	443	1	9,200	9	26,213	0	0	9	26,213
15	Kota Padang Sidimpuan	1	360	6	2,013	1	500	8	2,873	0	0	8	2,873
16	Kota Pematang Siantar	3	462	0	0	2	220	5	682	0	0	5	682
17	Kota Tebibg Tinggi	0	0	0	0	0	0	0	0	0	0	0	0
	Total	172	130,135	398	121,421	200	47,965	770	299,521	276	27,151	1,046	326,672

Source: Inventarisasi Luasan, Sarana/Presarane dan Personil O&P Daerah Irrigasi dan Rawa Tahun 2002, Dinas Pengairan Sumatera Utara

Table A-1.3.2 Classification of Government Irrigation Schemes by Size in North Sumatra

	District / Municipal	Class of Size														
		Less than 500 ha					500 - 1,000 ha					More than 1,000 ha				
		T (No.)	ST (No.)	NT (No.)	Total (No.)	Total Area (ha)	T (No.)	ST (No.)	NT (No.)	Total (No.)	Total Area (ha)	T (No.)	ST (No.)	NT (No.)	Total (No.)	Total Area (ha)
1	Nias	0	12	18	30	4,160	0	1	0	1	546	1	0	0	1	1,258
2	Mandaling Natar	1	15	7	23	3,780	0	2	1	3	1,916	1	0	0	1	6,628
3	Tapanuli Selatan	1	40	45	86	14,029	2	1	2	5	3,150	1	1	0	2	5,194
4	Tapanuli Tengah	5	23	3	31	8,329	1	2	0	3	1,998	3	0	0	3	4,026
5	Tapanuli Utara	0	45	18	63	8,350	1	6	0	7	4,565	0	4	0	4	4,714
6	Toba Samosir	4	46	17	67	10,157	2	6	0	8	5,319	1	1	0	2	2,575
7	Labuhan Batu	2	5	6	13	2,920	1	0	1	2	1,200	1	0	0	1	3,300
8	Asahan	2	5	0	7	1,420	1	2	0	3	2,013	6	5	1	12	25,411
9	Simalungun	82	26	39	147	38,087	18	3	0	21	4,835	7	1	1	9	16,400
10	Dairi	0	47	36	83	14,312	0	3	0	3	1,797	0	1	0	1	1,400
11	Karo	0	40	0	40	6,543	0	5	0	5	3,914	0	1	0	1	1,242
12	Deli Serdang	1	7	0	8	2,856	6	5	0	11	8,483	8	5	1	14	36,824
13	Langkat	1	23	0	24	3,225	1	1	0	2	1,477	0	1	0	1	1,400
14	Inter-District (Lintas Kabupaten)	1	1	0	2	643	0	0	0	0	0	6	0	1	7	25,570
15	Kota Padang Sidimpuan	1	5	0	6	1,393	0	1	1	2	1,480	0	0	0	0	0
16	Kota Pematang Siantar	3	0	2	5	682	0	0	0	0	0	0	0	0	0	0
17	Kota Tebibg Tinggi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	104	340	191	635	120,886	33	38	5	76	42,693	35	20	4	59	135,942

Source : Inventarisasi Luasan, Sarana/Presarane dan Personil O&P Daerah Irrigasi dan Rawa Tahun 2002, Dinas Pengairan Sumatera Utara

Remarks : T; Technical irrigation scheme, ST; Semi-technical irrigation scheme, NT; Non-technical irrigation scheme

Table A-1.4.1 Agro-demographic Conditions by Project District and Province: North Sumatra

(Unit: ha & %)

Province/District	Conditions in 1993 (based on 1993 Agriculture Census)															Estimated Current Conditions					
	Total Household	Farm Household		Farm Household Use Land	Farm Household Having Activities in					Farm Household by Land Control Size 1/		Land Tenure Status of Cultivated Land (ha)				Total Household	Estimated Farm Household	Total Farm Land	Total Paddy Field	Per Farm Household	
					Paddy/ Palawija	Horti-culture	Estate Crops	Livestock	Farm Labor			Own Land	Rented-out	Rented-in	Total					Farm Land	Paddy Field
		No.	%							< 0.5 ha	≧ 0.5 ha					(No.)	(No.) 2/	(ha) 3/	(ha) 3/	(ha) 4/	(ha) 4/
101 Nias No.	106,670	98,460	*92*	98,460	90,010	41,670	73,680	49,140	3,890	14,860	83,600	137,982	1,975	4,553	142,535	142,033	131,101	81,387	22,484	0.62	0.17
% to Total F. H. 5/		*100*		*100*	*91*	*42*	*75*	*50*	*4*	*15*	*85*	*97*		*3*	*100*						
102 Mandaling Natal No.	Included in Tapanuli Selatan															88,634	70,021	53,871	19,450	0.77	0.28
% to Total F. H. 5/																					
103 Tapanuli Selatan No.	202,700	160,050	*79*	157,330	138,540	29,510	71,920	13,420	23,280	63,720	93,600	145,532	10,794	19,300	164,832	175,289	138,407	172,599	45,206	1.25	0.33
% to Total F. H. 5/		*100*		*98*	*87*	*18*	*45*	*8*	*15*	*41*	*59*	*88*		*12*	*100*						
104 Tapanuli Tengah No.	42,510	35,000	*82*	32,500	28,620	5,420	14,590	6,630	2,320	9,880	22,610	24,574	2,233	10,436	35,010	61,094	50,301	56,203	17,725	1.12	0.35
% to Total F. H. 5/		*100*		*93*	*82*	*15*	*42*	*19*	*7*	*30*	*70*	*70*		*30*	*100*						
105 Tapanuli Utara No.	141,070	121,620	*86*	121,620	117,700	31,130	43,850	37,410	2,840	65,200	56,420	62,111	4,246	12,281	74,392	101,274	87,311	107,389	27,742	1.23	0.32
% to Total F. H. 5/		*100*		*100*	*97*	*26*	*36*	*31*	*2*	*54*	*46*	*83*		*17*	*100*						
106 Toba Samosir No.	Included in Tapanuli Utara															73,860	63,520	72,539	34,810	1.14	0.55
% to Total F. H. 5/																					
107 Labuhan Batu No.	157,070	86,070	*55*	83,030	53,350	8,700	43,360	9,250	58,910	14,190	68,840	122,765	5,878	14,732	137,497	205,406	112,557	113,133	67,791	1.01	0.60
% to Total F. H. 5/		*100*		*96*	*62*	*10*	*50*	*11*	*68*	*17*	*83*	*89*		*11*	*100*						
108 Asahan No.	175,470	98,510	*56*	93,420	73,570	8,000	32,160	16,770	47,050	40,260	53,160	75,405	4,681	16,850	92,255	223,192	125,301	104,239	44,892	0.83	0.36
% to Total F. H. 5/		*100*		*95*	*75*	*8*	*33*	*17*	*48*	*43*	*57*	*82*		*18*	*100*						
109 Simalungun No.	167,640	104,570	*62*	104,520	89,710	16,110	24,450	24,580	27,790	54,270	50,250	55,532	4,276	16,639	72,171	194,537	121,348	144,530	47,258	1.19	0.39
% to Total F. H. 5/		*100*		*100*	*86*	*15*	*23*	*24*	*27*	*52*	*48*	*77*		*23*	*100*						
110 Dairi No.	54,130	48,840	*90*	48,790	43,400	11,410	32,150	6,310	2,050	15,070	33,730	33,404	2,531	5,921	39,325	73,882	66,662	87,776	12,104	1.32	0.18
% to Total F. H. 5/		*100*		*100*	*89*	*23*	*66*	*13*	*4*	*31*	*69*	*85*		*15*	*100*						
111 Karo No.	66,250	46,220	*70*	46,180	34,540	22,990	9,510	8,070	10,090	11,340	34,840	32,276	3,537	11,688	43,964	83,359	58,156	97,740	12,759	1.68	0.22
% to Total F. H. 5/		*100*		*100*	*75*	*50*	*21*	*17*	*22*	*25*	*75*	*73*		*27*	*100*						
112 Deli Serdang No.	348,340	175,120	*50*	171,950	146,700	36,800	27,290	38,360	63,190	87,750	84,210	94,882	9,736	29,813	124,695	481,374	242,000	213,060	86,138	0.88	0.36
% to Total F. H. 5/		*100*		*98*	*84*	*21*	*16*	*22*	*36*	*51*	*49*	*76*		*24*	*100*						
113 Langkat No.	187,710	115,150	*61*	109,880	75,580	22,740	36,930	30,210	53,080	48,600	61,280	86,410	10,476	24,039	110,449	218,405	133,980	97,679	49,337	0.73	0.37
% to Total F. H. 5/		*100*		*95*	*66*	*20*	*32*	*26*	*46*	*44*	*56*	*78*		*22*	*100*						
114 Others (Municipalities No.	504,450	28,130	*6*	25,100	19,080	4,610	3,530	4,720	9,140	18,040	7,060	8,795	411	3,675	12,470	633,267	35,313	38,576	10,270	1.09	0.29
% to Total F. H. 5/		*100*		*89*	*68*	*16*	*13*	*17*	*32*	*72*	*28*	*71*		*29*	*100*						
Province Total No.	2,154,010	1,117,740	*52*	1,092,780	910,800	239,090	413,420	244,870	303,630	443,180	649,600	879,668	60,774	169,927	1,049,595	2,755,606	1,435,977	1,440,721	497,966	1.00	0.35
% to Total F. H. 5/		*100*		*98*	*81*	*21*	*37*	*22*	*27*	*41*	*59*	*84*		*16*	*100*						
Indonesia No.	42,116,421	21,758,429	*52*	21,183,420	18,104,471	5,054,931	6,371,686	5,684,338	9,055,989	10,936,919	10,246,501	15,053,478	926,014	2,598,312	17,651,790						
% to Total F. H. 5/		*100*		*97*	*83*	*23*	*29*	*26*	*42*	*50*	*47*	*85*		*15*	*100*						

1/: No. of farmer households by size of farmlands under control (luas lahan yang dikuasai)
2/: Estimated --- proportion (%) of farm households to total households in 1993 x total households in 2001
3/: Total farm land or paddy field in province or project districts (source: Table 3.1.5 Agricultural Land Use)
4/: Total farm land /No. of farm households estimated or total paddy field /No. of farm households estimated
5/: Proportion (%) to total farm households
Source: Sensus Pertanian 1993, BPS,Propinsi Sumatera Utara

Table A-1.4.2 Agricultural Land Use by Project District and Province in 2001: North Sumatra

(Unit: ha & %)

Province/District		Paddy Field										Paddy Field	Non-paddy Farm Land			Total Farm Land
		Irrigated Paddy Field					Non-irrigated Paddy Field				Total		Home Garden 1/	Dry Land/ Garden 2/	Upland Field 3/	
		Technical	Semi-technical	Non-technical	Village Irrigation	Sub-total	Rainfed Field	Tidal Irrigation	Others	Sub-total						
101 Nias	ha	883	1,911	1,237	2,191	6,222	16,262	0	0	16,262	22,484	22,484	11,073	36,014	11,816	81,387
	%	*4*	*8*	*6*	*10*	*28*	*72*	*0*	*0*	*72*	*100*	*28*	*14*	*44*	*15*	*100*
102 Mandaling Natal	ha	3,105	1,460	3,148	6,306	14,019	4,676	0	755	5,431	19,450	19,450	14,258	15,530	4,633	53,871
	%	*16*	*8*	*16*	*32*	*72*	*24*	*0*	*4*	*28*	*100*	*36*	*26*	*29*	*9*	*100*
103 Tapanuli Selatan	ha	5,835	9,077	2,901	18,455	36,268	8,649	0	289	8,938	45,206	45,206	67,883	39,824	19,686	172,599
	%	*13*	*20*	*6*	*41*	*80*	*19*	*0*	*1*	*20*	*100*	*26*	*39*	*23*	*11*	*100*
104 Tapanuli Tengah	ha	0	4,133	2,105	3,460	9,698	4,410	0	3,617	8,027	17,725	17,725	10,942	19,019	8,517	56,203
	%	*0*	*23*	*12*	*20*	*55*	*25*	*0*	*20*	*45*	*100*	*32*	*19*	*34*	*15*	*100*
105 Tapanuli Utara	ha	175	2,762	6,150	16,574	25,661	2,081	0	0	2,081	27,742	27,742	18,215	39,895	21,537	107,389
	%	*1*	*10*	*22*	*60*	*92*	*8*	*0*	*0*	*8*	*100*	*26*	*17*	*37*	*20*	*100*
106 Toba Samosir	ha	1,094	4,657	6,696	19,734	32,181	2,629	0	0	2,629	34,810	34,810	7,554	13,291	16,884	72,539
	%	*3*	*13*	*19*	*57*	*92*	*8*	*0*	*0*	*8*	*100*	*48*	*10*	*18*	*23*	*100*
107 Labuhan Batu	ha	2,333	819	883	1,060	5,095	20,417	19,112	23,167	62,696	67,791	67,791	26,552	13,161	5,629	113,133
	%	*3*	*1*	*1*	*2*	*8*	*30*	*28*	*34*	*92*	*100*	*60*	*23*	*12*	*5*	*100*
108 Asahan	ha	8,140	5,661	3,880	1,316	18,997	23,447	0	2,448	25,895	44,892	44,892	29,656	26,786	2,905	104,239
	%	*18*	*13*	*9*	*3*	*42*	*52*	*0*	*5*	*58*	*100*	*43*	*28*	*26*	*3*	*100*
109 Simalungun	ha	37,560	3,201	2,317	4,180	47,258	0	0	0	0	47,258	47,258	14,982	52,360	29,930	144,530
	%	*79*	*7*	*5*	*9*	*100*	*0*	*0*	*0*	*0*	*100*	*33*	*10*	*36*	*21*	*100*
110 Dairi	ha	0	2,527	1,892	7,685	12,104	0	0	0	0	12,104	12,104	10,073	39,400	26,199	87,776
	%	*0*	*21*	*16*	*63*	*100*	*0*	*0*	*0*	*0*	*100*	*14*	*11*	*45*	*30*	*100*
111 Karo	ha	0	5,695	2,774	3,242	11,711	429	0	619	1,048	12,759	12,759	3,920	19,984	61,077	97,740
	%	*0*	*45*	*22*	*25*	*92*	*3*	*0*	*5*	*8*	*100*	*13*	*4*	*20*	*62*	*100*
112 Deli Serdang	ha	6,242	24,775	9,078	12,466	52,561	30,957	2,364	256	33,577	86,138	86,138	33,463	80,096	13,363	213,060
	%	*7*	*29*	*11*	*14*	*61*	*36*	*3*	*0*	*39*	*100*	*40*	*16*	*38*	*6*	*100*
113 Langkat	ha	3,802	4,625	0	1,014	9,441	35,542	3,479	875	39,896	49,337	49,337	13,797	28,436	6,109	97,679
	%	*8*	*9*	*0*	*2*	*19*	*72*	*7*	*2*	*81*	*100*	*51*	*14*	*29*	*6*	*100*
114 Others	ha	2,392	1,001	264	748	4,405	5,523	342	0	5,865	10,270	10,270	18,510	6,679	3,117	38,576
(Municipalities)	%	*23*	*10*	*3*	*7*	*43*	*54*	*3*	*0*	*57*	*100*	*27*	*48*	*17*	*8*	*100*
Province Total	ha	71,561	72,304	43,325	98,431	285,621	155,022	25,297	32,026	212,345	497,966	497,966	280,878	430,475	231,402	1,440,721
	%	*14*	*15*	*9*	*20*	*57*	*31*	*5*	*6*	*43*	*100*	*35*	*19*	*30*	*16*	*100*

1/: Bangunan/pekarangan; 2/: Tegal/kebun; 3/: Ladang/huma;

Source: North Sumatra --- Laporan Tahunan 2001, Dinas Petanian Tanaman Pangan Sumatera Utara

Table A-1.4.3 Harvested Area and Production of Food Crops in 2001 by Project District and Province: North Sumatra

Province/District	Paddy		Maize		Soybeans		Mungbeans		Groundnut		Others [1/]		Total
	Harvested Area (ha)	Production (GKG t)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)	Production (ton)	Harvested Area (ha)
101 Nias	31,448	110,252	303	702	15	14	150	127	175	156	4,623	44,812	36,714
102 Mandaling Natal	35,835	160,124	2,370	5,555	1,570	1,635	507	480	1,143	1,171	552	6,178	41,977
103 Tapanuli Selatan	83,078	375,302	2,876	6,731	1,106	1,164	357	429	885	1,054	872	10,883	89,174
104 Tapanuli Tengah	25,696	100,654	1,679	4,341	351	366	323	303	450	433	1,544	17,534	30,043
105 Tapanuli Utara	34,573	138,576	2,554	6,493	23	24	2	2	1,826	1,866	3,600	38,581	42,578
106 Toba Samosir	29,108	116,468	2,608	6,661	30	33	672	631	922	945	2,417	38,150	35,757
107 Labuhan Batu	67,851	270,170	1,412	3,669	260	271	116	107	148	139	672	7,765	70,459
108 Asahan	67,181	276,002	3,619	10,827	730	770	160	148	77	74	854	10,251	72,621
109 Simalungun	87,983	411,584	56,714	185,229	799	1,024	2,548	2,539	7,887	8,890	13,776	165,855	169,707
110 Dairi	15,932	62,165	36,048	116,943	0	0	3	3	2,200	2,254	430	4,407	54,613
111 Karo	11,557	46,452	52,555	174,260	0	0	40	39	546	525	550	5,049	65,248
112 Deli Serdang	145,156	656,194	23,869	75,723	2,320	2,515	3,130	3,096	3,552	3,827	20,510	251,181	198,537
113 Langkat	78,303	321,871	10,414	32,640	2,222	2,329	890	850	596	603	796	9,089	93,221
114 Others (Municipalities)	15,143	64,801	1,688	4,388	577	574	472	357	723	548	2,501	15,967	21,104
Province Total	728,844	3,110,615	198,709	634,162	10,003	10,719	9,370	9,111	21,130	22,485	53,697	625,702	1,021,753
%	71		20		1		1		2		5		100

1/: Cassava & sweat potato

Source: Laporan Tahunan 2001, Dinas Pertanian Sumatera Utara

Table A-1.4.4 Inventory on Agriculture Support Institutions and Farmers Organizations by Project District and Province in 2002: North Sumatra

Province/District	Food Crops Agriculture Agencies	Food Crops Estension Agencies	Extension				Food Crops Research Institute	Plant Protection		Seed Production & Supply				Seed & Farm Input Supply			Credit	Farmer Organizations						
			BPPs	No. of PPLs				Center	PHP	Seed Farm			BPSB	SHS	PT	PT	BRI Unit Desa	KUD	Kelompok Tani (KT)					UPJA
			(No.)	Mantan	PPLs	Total		BPTPH		BBI	BBU	BBP			Pertani	Pusri	(No.)	(No.)	Primary *Pemula*	Secondary *Lanjut*	Middle *Madya*	Advanced *Utama*	Total	(No.)
101 Nias	District agriculture service Food security office	Dinas	5	3	34	37	-	-	5	-	-	1	-	-	-	○	4	34	310	91	3	0	404	-
102 Mandaling Natal	District agriculture service office Food security office	Dinas	4	2	60	62	-	-	6	-	-	-	-	-	-	○	-	-	262	339	145	26	772	-
103 Tapanuli Selatan	District agriculture service office Food security office	Dinas	16	13	185	198	-	-	16	1 (hort.)	-	4	-	○	-	○	14	44	929	586	139	252	1,906	80
104 Tapanuli Tengah	District agriculture service office Food security office	Dinas	8	4	63	67	-	-	6	-	-	1	-	-	-	○	7	10	395	207	12	2	616	13
105 Tapanuli Utara	District agriculture service office Food security office	Dinas	13	20	78	98	-	-	14	1 (palawija)	-	1	-	-	-	○	18	128	431	374	269	15	1,089	39
106 Toba Samosir	District agriculture service office Food security office	Dinas	6	4	58	62	-	-	9	-	-	-	-	-	-	○	-	-	239	351	241	3	834	40
107 Labuhan Batu	District agriculture service office Food security office	KIPPK	6	8	81	89	-	-	10	-	-	1	-	-	-	○	12	31	1,072	427	66	47	1,612	13
108 Asahan	District agriculture service office Food security office	BIPP	9	13	178	191	-	-	15	-	-	2	-	○	-	○	15	88	406	398	583	219	1,606	10
109 Simalungun	District agriculture service office Food security office	KIPPK	12	19	119	138	-	-	23	-	-	2	-	-	○	○	16	54	397	768	317	3	1,485	4
110 Dairi	District agriculture service office Food security office	Dinas	13	1	57	58	-	-	10	-	-	-	-	-	-	○	5	27	427	145	63	2	637	-
111 Karo	District agriculture service office Food security office	Dinas	12	5	62	67	BPTP branch	-	13	1 (hort.)	-	2	-	-	○	○	13	55	289	310	232	91	922	17
112 Deli Serdang	District agriculture service office Food security office	Dinas	37	33	211	244	-	-	36	2 (paddy/ palawija)	-	2	-	-	-	○	10	36	946	1,184	619	97	2,846	14
113 Langkat	District agriculture service office Food security office	Dinas	17	18	114	132	-	-	18	-	-	1	-	-	-	○	-	40	320	636	812	149	1,917	50
114 Others (Municipalities)	District agriculture service office Food security office	Dinas	14	20	63	83	BPTP Medan	1 Medan	9	-	2 Medan	1 Medan	1 Medan	○	○	○	40	16	267	210	161	19	657	-
Province/Province Total	Prov. Agriculture Services Office Food Security Agency	Dinas	172	163	1,363	1,526	1	1	190	5	2	18	1	3	3	18	154	563	6,690	6,026	3,662	925	17,303	280

Source: Provincial Agriculture Services Office

Table A-1.4.5 Inventory on Farm Machinery by District in 2000: North Sumatra

(Unit: Number)

District	Hand Tractor	4 Wheel Tractor	Transplanter	Water Pump	Sprayer		Thresher		Paddy Dryer	Paddy Cleaner	Paddy Husker	Large Rice Mill	Small Rice Mill	RMU
					Hand	Motor	Pedal	Power						
1. Nias	16	1	-	2	1,617	-	114	1	0	63	34	35	24	70
2. Mandaling Natal	45	28	-	-	2,369	-	121	2	7	0	90	21	85	16
3. Tapanuli Selatan	158	5	-	55	6,154	-	163	586	24	1,062	1	34	141	217
4. Tapanuli Tengah	4	4	-	-	536	4	10	5	0	40	6	2	36	5
5. Tapanuli Utara	153	29	-	45	11,551	1	1	82	3	370	15	38	257	305
6. Toba Samosir	697	9	-	59	4,314	356	2	20	1	389	16	24	315	232
7. Labuhan Batu	289	16	-	22	9,868	1	105	232	4	41	37	39	160	86
8. Asahan	1,042	27	-	180	22,338	10	185	373	13	29	9	54	129	61
9. Simalungun	358	64	-	24	14,759	161	78	371	7	79	8	26	146	66
10. Dairi	62	189	-	-	7,734	-	5	20	0	75	14	19	46	36
11. Karo	27	99	-	106	32,161	343	-	30	0	155	0	5	28	63
12. Deli Serdang	2,175	508	42	766	35,609	502	1,702	740	22	323	64	85	249	66
13. Langkat	691	5	-	207	14,337	25	2,126	397	0	18	20	51	114	48
14. Others (Municipalities)	175	27	-	102	5,315	1	122	88	0	49	4	24	23	10
Province Total	5,892	1,011	42	1,568	168,662	1,404	4,734	2,947	81	2,693	318	457	1,753	1,281
Indonesia	97,033	4,013	24,038	188,860	1,757,280	21,253	348,436	40,173	6,238	35,063	17,982	6,716	28,778	45,402

Source: Alat-alat Pertanian Menurut Propinsi dan Kabupaten di Indonesia, 2000, BPS

Table A-1.4.6 Production Features of Vegetables, Fruits, Estate Crops and Livestock in 2001: North Sumatra

Vegetables									
Commodity	Chilly	Potato	Cabbage	Tomato	Long Beans	Egg Plant	Chinese Cabbage	Shallot	French Beans
Harvested Area (ha)	18,860	13,730	10,920	7,760	5,510	4,980	4,550	4,410	3,710
Production (ton)	128,170	276,380	261,910	214,720	30,990	19,940	74,350	36,470	71,320
Fruits									
Commodity	Citrus	Durian	Mango	Pineapple	Jack Fruit	Duku	Cashew	Mangostin	Avocado
Harvested Area (ha)	14,700	8,100	3,900	2,200	2,100	1,000	900	820	700
Production (ton)	187,000	66,100	18,600	31,300	17,700	5,100	4,500	4,500	3,600
Estate Crops by Smallholders									
Commodity	Rubber	Oil Palm	Coffee	Cocoa	Incense	Candlenut	Cinnamon	Clove	Coconut
Planted Area (ha)	340,830	178,560	61,710	27,890	22,540	15,970	6,440	4,560	142,960
Production (ton)	232,850	2,304,090	39,200	19,160	-	-	-	1,540	111,340
Estate Crops by Public & Private Estate									
Commodity	Oil Palm	Rubber	Cocoa	Sugar Cane	Tea	Tobacco	-	-	-
Planted Area (ha)	273,930	51,170	16,310	13,880	8,580	2,580			
Livestock									
Kind	Cow	Milking Cow	Buffalo	Goat	Sheep	Pig	Broiler	Egg Layer	Domestic Hen
Population	248,100	64,500	259,100	703,400	199,300	807,400	27,565,000	16,117,000	21,361,000

Note: Rounded figures

Source: Sumatra Utara Dalam Angka, 2001

Table A-1.5.1 Availability of Irrigation O&M Staff by District in North Sumatra

	District / Municipal	Irrigation Scheme		Staff Alloaction						Staff Availability					
		Scheme (No.)	Area (ha)	OS (psn)	IO (psn)	P2B (psn)	P2A (psn)	TW (psn)	Total (psn)	OS (psn)	IO (psn)	P2B (psn)	P2A (psn)	TW (psn)	Total (psn)
1	Nias	32	5,964	0	4	5	8	11	28	0	0	0	0	0	0
2	Mandaling Natar	27	12,324	0	14	12	30	47	103	2	3	0	0	0	5
3	Tapanuli Selatan	93	22,373	0	11	8	10	28	57	2	9	1	1	0	13
4	Tapanuli Tengah	37	14,353	0	11	15	16	36	78	0	0	1	1	0	2
5	Tapanuli Utara	74	17,629	0	0	10	12	33	55	0	2	2	0	0	4
6	Toba Samosir	77	18,051	0	13	20	12	35	80	0	3	6	4	5	18
7	Labuhan Batu	16	7,420	5	7	10	14	56	92	4	0	0	0	0	4
8	Asahan	22	28,844	18	8	14	49	166	255	4	4	7	0	0	15
9	Simalungun	177	59,322	0	28	30	25	166	249	0	0	0	0	0	0
10	Dairi	87	17,509	23	4	38	10	45	120	2	3	2	0	1	0
11	Karo	46	11,699	0	17	15	11	73	116	6	3	4	0	8	21
12	Deli Serdang	33	48,163	0	54	35	42	124	255	0	0	0	0	0	0
13	Langkat	27	6,102	0	4	21	17	39	81	0	0	0	0	0	0
14	Inter-District (Lintas Kabupaten)	9	26,213	0	16	10	14	34	74	27	25	10	54	118	234
15	Kota Padang Sidimpuan	8	2,873	0	1	6	5	9	21	0	0	0	1	0	1
16	Kota Pematang Siantar	5	682	0	1	2	3	3	9	0	0	0	0	0	0
17	Kota Tebibg Tinggi	0	0	0	1	0	0	2	3	0	0	0	0	0	0
	Total	770	299,521	46	194	251	278	907	1,676	47	52	33	61	132	317

Source : Inventarisasi Luasan, Sarana/Presarane dan Personil O&P Daerah Irrigasi dan Rawa Tahun 2002, Dinas Pengairan Sumatera Utara

Remarks : T; Technical irrigation scheme, ST; Semi-technical irrigation scheme, SD; Simple irrigation scheme

Table A-1.5.2 Target and Realization of WUA Establishment by Level of Irrigation Scheme in North Sumatra

	District / Municipal	Technical Irrigation Scheme				Semi-technical Irrigation Scheme				Simple Irrigation Scheme				Total			
		Scheme		No. of WUA		Scheme		No. of WUA		Scheme		No. of WUA		Scheme		No. of WUA	
		No.	Area (ha)	Target	Establ.	No.	Area (ha)	Target	Establ.	No.	Area (ha)	Target	Establ.	No.	Area (ha)	Target	Establ.
1	Nias	1	1,258	5	5	13	2,696	22	12	18	2,010	33	6	32	5,964	60	23
2	Mandaling Natar	2	6,420	42	23	17	3,629	46	13	8	2,275	11	4	27	12,324	99	40
3	Tapanuli Selatan	4	6,080	54	43	42	8,834	181	66	47	7,459	68	15	93	22,373	303	124
4	Tapanuli Tengah	9	6,861	26	14	25	6,612	38	23	3	880	5	3	37	14,353	69	40
5	Tapanuli Utara	1	602	3	0	56	15,532	104	61	18	1,495	20	13	75	17,629	127	74
6	Toba Samosir	7	3,483	23	21	53	13,298	114	67	17	1,270	20	12	77	18,051	157	100
7	Labuhan Batu	4	4,541	12	10	5	1,344	8	6	7	1,535	8	8	16	7,420	28	24
8	Asahan	9	13,622	50	45	12	11,991	46	40	1	3,231	2	1	22	28,844	98	86
9	Simalungun	108	45,908	438	429	29	4,835	35	31	37	8,579	29	29	174	59,322	502	489
10	Dairi	0	0	0	0	51	12,198	110	55	36	5,311	52	35	87	17,509	162	90
11	Karo	0	0	0	0	46	11,699	67	65	0	0	0	0	46	11,699	67	65
12	Deli Serdang	15	23,086	240	80	17	21,077	187	38	1	4,000	7	1	33	48,163	434	119
13	Langkat	2	882	8	7	25	5,220	34	33	0	0	0	0	27	6,102	42	40
14	Inter-District (Lintas Kabupate	7	16,570	58	33	1	443	3	2	1	6,400	7	1	9	23,413	68	36
15	Kota Padang Sidimpuan	1	360	2	1	7	2,513	27	3	1	75	1	0	9	2,948	30	4
16	Kota Pematang Siantar	3	462	3	3	0	0	0	0	2	220	2	2	5	682	5	5
17	Kota Tebibg Tinggi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	173	130,135	964	714	399	121,921	1,022	515	197	44,740	265	130	769	296,796	2,251	1,359

Source : Inventarisasi Keberadaan Unit P3A Propinsi Sumatera Utara, April 1999, Dinas Pekerjaan Umum Pengairan Sumatera Utara

Table A-1.5.3 WUA Establishment and Performance in North Sumatra

	District/Municipal	No. of Gov't Irrigation Scheme	WUA Establishment		WUA Performance and Status								
			No. of WUA		Developed			Under Developing			Not Yet Developed		
			Target	Establ.	BBH	SBH	Total	BBH	SBH	Total	BBH	SBH	Total
1	Nias	32	60	23	0	0	0	12	0	12	11	0	11
2	Mandaling Natar	27	99	40	11	0	11	28	0	28	1	0	1
3	Tapanuli Selatan	93	303	124	4	0	4	64	0	64	55	1	56
4	Tapanuli Tengah	37	69	40	13	0	13	27	0	27	0	0	0
5	Tapanuli Utara	74	127	74	0	36	36	33	0	33	5	0	5
6	Toba Samosir	77	157	100	0	0	0	94	0	94	6	0	6
7	Labuhan Batu	16	28	24	0	1	1	8	5	13	9	1	10
8	Asahan	22	98	86	0	3	3	37	19	56	27	0	27
9	Simalungun	177	502	489	0	14	14	154	0	154	321	0	321
10	Dairi	87	162	90	0	0	0	77	8	85	5	0	5
11	Karo	46	67	65	13	1	14	0	0	0	51	0	51
12	Deli Serdang	33	434	119	3	1	4	44	35	79	37	0	37
13	Langkat	27	42	40	0	0	0	0	12	12	16	12	28
14	Inter-District (Lintas Kabupaten	9	68	36	0	0	0	15	8	23	7	6	13
15	Kota Padang Sidimpuan	8	30	4	0	0	0	2	0	2	1	1	2
16	Kota Pematang Siantar	5	5	5	0	0	0	5	0	5	0	0	0
17	Kota Tebibg Tinggi	0	0	0	0	0	0	0	0	0	0	0	0
	Total	770	2,251	1,359	44	56	100	600	87	687	552	21	573

Remarks : SBH : Already registered in local court of justice BBH : Not yet registered in local court of justice

Table A-1.6.1 Financial Condition of District/Municipal Governments in North Sumatra

District/Municipality	Per Capita Income and Revenues in Rupiah for 2001						Actual Receipts and Expenditures in million Rupiah for 2000				
	GRDP	Own Fiscal Capacity				DAU + Contin-gency	Total Receipt	Expenditures			Expenses for Water Resources & Irrigation Sector
		Own Source Revenue	Non-tax from Natural Resources	Share Taxes	Total			Total	Current	Develop-ment	
1 Nias	2,948,109	3,059	5,640	8,459	17,158	282,156	96,991	88,893	53,889	35,004	170
2 Mandaling Natar	3,231,487	6,500	13,477	11,210	31,187	393,965	61,845	56,464	33,069	23,395	40
3 Tapanuli Selatan	4,533,704	4,337	6,315	14,800	25,452	342,632	131,679	126,219	82,504	43,715	192
4 Tapanuli Tengah	3,668,485	7,522	12,237	19,194	38,953	446,309	55,456	54,774	30,953	23,821	207
5 Tapanuli Utara	3,319,474	10,665	6,242	10,650	27,557	463,704	97,406	91,489	52,267	39,222	20
6 Toba Samosir	3,826,558	14,527	6,715	10,260	31,502	419,585	57,342	49,981	33,821	16,160	85
7 Labuhan Batu	7,250,532	6,491	5,046	20,758	32,295	216,556	143,518	137,795	101,252	36,543	2,130
8 Asahan	6,537,456	12,283	2,183	22,065	36,531	230,563	127,415	117,302	88,250	29,052	428
9 Simalungun	4,276,175	7,984	2,386	24,638	35,008	322,888	143,518	137,795	101,252	36,543	2,130
10 Dairi	4,190,512	9,148	9,288	12,396	30,832	349,844	54,200	21,268	6,500	14,768	0
11 Karo	5,637,414	30,110	7,305	13,821	51,236	377,500	58,357	53,142	42,241	10,901	0
12 Deli Serdang	3,071,936	8,655	1,519	14,417	24,591	180,710	205,279	187,720	145,353	42,367	1,029
13 Langkat	4,779,307	9,599	14,833	22,811	47,243	235,790	119,431	115,182	84,251	30,931	198
14 Kota Sibolga	5,083,683	21,996	24,981	34,407	81,384	527,301	26,993	25,506	13,694	11,812	0
15 Kota Tanjung Balai	5,219,342	24,930	15,461	26,036	66,427	601,218	33,902	28,078	16,222	11,856	99
16 Kota Pematang Siantar	6,346,999	39,163	8,477	19,665	67,305	408,212	45,739	44,440	32,616	11,824	5
17 Kota Tebing Tinggi	5,490,974	22,167	16,321	25,599	64,087	599,052	33,825	30,713	16,643	14,070	49
18 Kota Medang	5,636,270	35,978	1,075	34,427	71,480	148,937	215,743	212,656	158,689	53,967	0
19 Kota Binjai	3,323,993	13,370	9,574	24,396	47,340	550,975	46,107	44,586	29,875	14,711	0
Consolidated Provincial Revenue/Total	5,811,463	30,908	6,520	27,014	64,442	298,978	1,754,746	1,624,003	1,123,341	500,662	6,782

Source: Actual Receipts and Expenditures of District/Municipality Government 1999/00 - 2000 by BPS and Decentralizing Indonesia by WB

Note: Due to the trasition period of changing fiscal year, the term of fiscal year 2000 is 9 months starting from April 1 and ending at December 31, 2000.

Table A-2.3.1 Selected Irrigation Schemes : North Sumatra

No.	Irrigation Scheme	District	Technical Level (*1)	Registered Area (ha)	Classification of Rehabilitation (*2)
1.	Gido Sebua	Nias	T	1,258	REH
2.	Batang Gadis	Mandaling Natal	T	6,628	REH
3.	Batang Ilung	Tapanuli Selatan	T	4,194	REH
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	REH
5.	Siborna	Tapanuli Selatan	ST	1,000	UPG
6.	Siaili Tukka	Tapanuli Tengah	T	1,057	UPG
7.	Badiri Lopian	Tapanuli Tengah	T	1,283	REH
8.	Pandurungan	Tapanuli Tengah	T	1,769	UPG
9.	Sihiong	Tapanuli Tengah	NT	2,000	UPG
10.	Aek Silang	Tapanuli Utara	ST	1,500	UPG
11.	Sarulla	Tapanuli Utara	ST	2,692	UPG
12.	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	UPG
13.	Sinamo	Tapanuli Utara	ST	1,000	UPG
14.	Aek Mandos I	Toba Samosir	ST	1,060	UPG
15.	Simangatasi II	Toba Samosir	T	1,515	REH
16.	Bulung Ihit	Labuhan Batu	T	5,000	REH
17.	Perkotaan	Asahan	T	3,457	UPG
18.	Sungai Balai	Asahan	ST	1,185	REH
19.	Panca Arga	Asahan	T	2,500	UPG
20.	Serbangan	Asahan	T	2,333	REH
21.	Silau Bonto	Asahan	NT	3,231	UPG
22.	Sungai Silau	Asahan	ST	1,315	UPG
23.	Padang Mahondang	Asahan	ST	3,231	UPG
24.	Simujur	Asahan	ST	2,560	UPG
25.	Purwodadi	Asahan	T	1,635	REH
26.	Pentara	Simalungun	ST	1,034	UPG
27.	Simantin Pane Dame	Simalungun	NT	1,000	UPG
28.	Panambean / Panet Tongah BK	Simalungun	T	1,723	REH
29.	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	REH
30.	Kerasaan	Simalungun	T	5,000	UPG
31.	Javacolonisasi/Purbogondo	Simalungun	T	1,030	REH
32.	Naga Sompah	Simalungun	T	1,360	REH
33.	Risma Duma	Dairi	ST	1,522	UPG
34.	Lae Ordi	Dairi	ST	1,200	UPG
35.	Parit Lompaten	Karo	ST	1,242	UPG
36.	Bandar Sidoras	Deli Serdang	ST	3,457	UPG
37.	Namu Rambe	Deli Serdang	T	1,036	REH
38.	Sei Belutu	Deli Serdang	ST	5,082	REH
39.	Langau	Deli Serdang	ST	2,000	UPG
40.	Medan Krio	Deli Serdang	T	3,016	UPG
41.	Rantau Panjang	Deli Serdang	ST	2,309	REH
42.	Pekan Kamis	Deli Serdang	ST	1,100	UPG
43.	Secanggang	Langkat	ST	1,400	UPG
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	UPG
45.	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	REH
46.	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	REH
47.	Bah Korah II	Simalungun/Siantar	T	1,995	REH
48.	Sijambi	Asahan/Tanjung Balai	T	1,013	UPG
49.	Rambung Mera	P. Siantar/Simalungun	T	1,104	REH
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	UPG
	Total			**108,341**	**UPG: 29 REH: 21**

Remarks:

*1. T : Technical
ST : Semi Technical
NT : Non Technical

*2. UPG: Upgrading
REH: Rehabilitation

Table A-4.2.1 Existing Condition of Water Resource Facility : North Sumatra

No.	Irrigation Scheme	District	Technical Level [1)]	Registered Area (ha)	Age of the Facilities (years)	Catchment Area (km^2)	Type of Facility	Type of Weir	Length of Weir (m)	Design Intake Discharge (m^3/s)	No. of Scouring Sluice Gate	No. of Intake Gate	Provision of Settling Basin	Provision of Inspection Bridge	Condition
1.	Gido Sebua	Nias	T	1,258	11	156	Headworks	Fixed weir	56	1.1	1	1	provided	provided	B
2.	Batang Gadis	Mandaling Natal	T	6,628	11	880	Headworks	Fixed weir	63	5.7	4	4	not provided	not provided	B
3.	Batang Ilung	Tapanuli Selatan	T	4,194	11	302	Headworks	Fixed weir	40	5.7	2	3	provided	provided	B
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	27	143	Headworks	Gabion weir	51	2.6	0	2	not provided	not provided	D
5.	Siborna	Tapanuli Selatan	ST	1,000	19	135	Headworks	Gabion weir	66	1.6	0	2	not provided	not provided	D
6.	Siaili Tukka	Tapanuli Tengah	T	1,057	17	100	Headworks	Fixed weir	17	1.7	1	2	not provided	not provided	D
7.	Badiri Lopian	Tapanuli Tengah	T	1,283	14	225	Free Intake	-	-	3.4	-	2	not provided	-	D
8.	Pandurungan	Tapanuli Tengah	T	1,769	19	306	Headworks	Fixed weir	30	2.3	1	3	not provided	not provided	D
9.	Sihiong	Tapanuli Tengah	NT	2,000	19	400	Headworks	Fixed weir	7	N/A	2	2	not provided	not provided	D
10.	Aek Silang	Tapanuli Utara	ST	1,500	13	164	Free Intake	-	-	3.0	-	1	not provided	-	C
11.	Sarulla	Tapanuli Utara	ST	1,692	28	228	Headworks	Gabion weir	25	1.5	0	1	not provided	not provided	C
12.	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	10	164	Headworks	Fixed weir	11	0.7	1	1	not provided	not provided	B
13.	Sinamo	Tapanuli Utara	ST	1,000	34	144	Headworks	Fixed weir	20	2.7	1	1	not provided	not provided	D
14.	Aek Mandos I	Toba Samosir	ST	1,060	10	155	Headworks	Fixed weir	55	0.9	1	2	not provided	not provided	C
15.	Simangatasi II	Toba Samosir	T	1,515	11	170	Headworks	Fixed weir	15	0.7	1	1	not provided	not provided	C
16.	Bulung Ihit	Labuhan Batu	T	5,000	5	420	Headworks	Fixed weir	17	6.0	2	2	provided	not provided	B
17.	Perkotaan	Asahan	T	3,457	14	850	Headworks	Movable weir	19	6.5	-	4	provided	provided	B
18.	Sungai Balai	Asahan	ST	1,185	5	290	Headworks	Fixed weir	30	1.7	1	2	not provided	not provided	C
19.	Panca Arga	Asahan	T	2,500	10	375	Headworks	Fixed weir	25	1.0	1	2	not provided	provided	C
20.	Serbangan	Asahan	T	2,333	10	88	Headworks	Fixed weir	35	2.4	2	5	not provided	provided	C
21.	Silau Bonto	Asahan	NT	3,231	10	85	Free Intake	-	-	N/A	-	-	not provided	not provided	D
22.	Sungai Silau	Asahan	ST	1,315	32	106	Free Intake	-	-	2.0	-	3	not provided	-	D
23.	Padang Mahondang	Asahan	ST	3,231	22	500	Free Intake	-	-	0.6	-	2	not provided	-	D
24.	Simujur	Asahan	ST	2,560	18	125	Free Intake	-	-	1.0	-	4	not provided	-	D
25.	Purwodadi	Asahan	T	1,635	14	154	Headworks	Movable weir	30	10.0	-	2	not provided	provided	C
26.	Pentara	Simalungun	ST	1,034	12	120	Headworks	Fixed weir	15	1.5	1	1	provided	not provided	C
27.	Simantin Pane Dame	Simalungun	NT	1,000	14	58	Free Intake	-	-	1.5	-	1	not provided	-	D
28.	Panambean / Panet Tongah BK	Simalungun	T	1,723	12	131	Headworks	Fixed weir	50	3.0	2	4	provided	not provided	B
29.	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	9	229	Headworks	Fixed weir	20	4.5	2	4	provided	provided	B
30.	Kerasaan	Simalungun	T	5,000	15	636	Headworks	Fixed weir	125	7.4	4	3	provided	not provided	C
31.	Javacolonisasi/Purbogondo	Simalungun	T	1,030	14	200	Headworks	Fixed weir	30	5.6	1	2	provided	not provided	B
32.	Naga Sompah	Simalungun	T	1,360	16	588	Free Intake	-	-	2.0	-	1	not provided	-	D
33.	Risma Duma	Dairi	ST	1,522	21	193	Headworks	Fixed weir	15	N/A	N/A	1	not provided	not provided	C
34.	Lae Ordi	Dairi	ST	1,200	14	178	Headworks	Fixed weir	20	0.8	1	2	not provided	provided	C
35.	Parit Lompaten	Karo	ST	1,242	20	200	Headworks	Fixed weir	25	1.5	0	1	not provided	not provided	D
36.	Bandar Sidoras	Deli Serdang	ST	3,457	18	166	Headworks	Fixed weir	73	6.8	2	4	not provided	provided	D
37.	Namu Rambe	Deli Serdang	T	1,036	37	260	Headworks	Fixed weir	50	2.1	2	2	provided	not provided	D
38.	Sei Belutu	Deli Serdang	ST	5,082	40	930	Free Intake	-	-	10.0	-	3	not provided	-	D
39.	Langau	Deli Serdang	ST	2,000	24	893	Free Intake	-	-	2.6	-	2	not provided	-	D
40.	Medan Krio	Deli Serdang	T	3,016	25	43	Headworks	Fixed weir	42	2.8	1	3	provided	provided	C
41.	Rantau Panjang	Deli Serdang	ST	2,309	33	1,031	Headworks	Fixed weir	N/A	N/A	N/A	N/A	not provided	not provided	D
42.	Pekan Kamis	Deli Serdang	ST	1,100	33	178	Free Intake	-	-	N/A	-	1	not provided	-	D
43.	Secanggang	Langkat	ST	1,400	18	88	Free Intake	-	-	7.5	-	2	not provided	-	D
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	22	883	Headworks	Fixed weir	70	1.8	N/A	3	not provided	-	C
45.	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	24	970	Headworks	Fixed weir	43	4.2	2	2	provided	provided	B
46.	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	24	970	Headworks	Fixed weir	43	7.5	2	2	provided	provided	B
47.	Bah Korah II	Simalungun/Siantar	T	1,995	12	336	Headworks	Fixed weir	30	5.3	4	4	provided	not provided	B
48.	Sijambi	Asahan/Tanjung Balai	T	1,013	10	250	Free Intake	-	-	1.2	2	2	not provided	-	D
49.	Rambung Mera	P. Siantar/Simalungun	T	946	16	159	Headworks	Fixed weir	60	2.1	6	3	provided	provided	B
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	11	228	Headworks	Fixed weir	72	3.2	6	6	provided	provided	B
	Total			**107,183**											
	Average			2,144	18	332			39						
	Itemized Total		T : 25 ST : 22 NT : 3				dam: 0 headworks: 37 free intake: 13	fixed weir: 32 movable weir: 2 gabion weir: 3					provided: 16 not provided: 34	provided: 14 not provided: 23	A : 0 B : 14 C : 14 D : 22

Note: 1): T: Technical, ST: Semi-technical, NT: Non-technical
N/A : no information was available
Condition: A: Functioning well, B: Partially deteriorated, C: Not functioning well, D: Serious condition for operation

Source: Inventory Survey Works for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-4.2.2 Problems and Constraints of Irrigation Scheme : 1. Water Resources Facility: North Sumatra

No.	Irrigation Scheme	District	Existing Technical Level	Registered Area (ha)			Type of Facility	Provision of Settling Basin	Year Constructed	Weir, Flood Way and Scouring Sluice												Intake for Headworks or Free Intake										O & M		Condition/Problem				Problems and Constraints: Summary		
										Civil Works								Gate and Metal Works				Civil Works				Gate and Metal Works													
				Total	Potensial Area	Non-Potential Area				W-16 Crack or damage on weir crest	W-17 Leakage from foundation and/or settlement of weir body	W-18 Incline, settlement or deflection of pier of weir	W-19 Settlement or breakage of apron	W-20 Settlement or washed away of stilling basin	W-21 Fallen down, incline or washed away of retaining wall of weir	W-22 Washed away of ripraps or blocks at downstream of stilling basin	W-23 Physical O&M problem due to overage facility	W-24 Leakage from gate leaf or guide frame	W-25 Insufficient strength against design load due to rust, decay of steel	W-26 Physical operational problem due to deflection	W-27 Problem on management due to lack of periodically maintenance	W-28 Insufficient diversion water due to river bed degradation	W-29 Insufficient diversion water due to sedimentation in front of intake	W-30 Incline, settlement or deflection of intake structure	W-31 Inflow of bed loads into canal and decrease canal flow capacity	W-32 Leakage from intake gate(s) or guide frame	W-33 Insufficient strength against design load due to rust, decay of steel	W-34 Physical operational problem due to deflection/ trouble	W-35 Problem on management due to lack of periodically maintenance	W-36 Overage, Lower strength of intake gate(s)	W-37 Difficulty on O & M due to facility problem	W-38 Difficulty on proper water distribution/discharge measurement	A Fully functioning	B Partly deteriorated, but functioning in a satisfactory range	C Not functioning well and/or affecting the downstream flow	D Serious condition for operation, replace and reconstruction is			
1.	Gido Sebua	Nias	T	1,258	1,258	0	Headworks	provided	1992	A	A	A	A	A	B	B	A	B	B	A	B	A	C	B	C	B	B	A	B	A	B	B	10	12	1	0	22	29	31
2.	Batang Gadis	Mandaling Natal	T	6,628	6,628	0	Headworks	not provided	1992	A	A	A	A	B	B	B	A	B	B	A	B	A	C	A	C	B	B	A	B	A	B	B	10	11	2	0	29	31	
3.	Batang Ilung	Tapanuli Selatan	T	4,194	4,194	0	Headworks	provided	1992	A	A	A	A	A	A	B	A	B	A	A	B	A	B	A	B	B	B	A	B	A	B	B	13	10	0	0	31		
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	912	100	Headworks	not provided	1976	D	D	D	D	D	D	D	B	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	1	0	22	17	22	31
5.	Siborna	Tapanuli Selatan	ST	1,000	1,000	0	Headworks	not provided	1984	D	D	D	D	D	C	C	B	C	C	C	D	D	D	C	D	C	C	C	C	C	C	D	0	1	12	10	17	22	29
6.	Siaili Tukka	Tapanuli Tengah	T	1,057	1,057	0	Headworks	not provided	1986	C	B	B	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	3	20	0	20	29	34
7.	Badiri Lopian	Tapanuli Tengah	T	1,283	1,283	0	Free Intake	not provided	1989	Free Intake												D	D	D	D	C	C	C	D	C	D	D	0	0	4	7	29	31	33
8.	Pandurungan	Tapanuli Tengah	T	1,769	1,769	0	Headworks	not provided	1984	C	C	D	D	C	D	D	B	D	D	D	D	C	D	D	D	C	C	C	D	C	C	D	0	1	8	14	18	31	35
9.	Sihiong	Tapanuli Tengah	NT	2,000	255	1,745	Headworks	not provided	1984	D	D	D	D	D	D	D	B	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	1	0	22	17	29	37
10.	Aek Silang	Tapanuli Utara	ST	1,500	1,500	0	Headworks	not provided	1990	Free Intake												B	C	B	D	C	C	C	C	C	C	C	0	2	8	1	29	31	38
11.	Sarulla	Tapanuli Utara	ST	2,692	1,214	1,478	Headworks	not provided	1975	C	D	D	D	D	D	D	B	D	D	D	D	B	D	D	D	D	D	D	D	D	D	D	0	2	1	20	18	29	31
12.	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	1,000	0	Headworks	not provided	1993	A	B	A	A	B	B	B	A	C	C	B	C	B	C	B	B	B	B	C	C	B	C	C	4	11	8	0	29	38	
13.	Sinamo	Tapanuli Utara	ST	1,000	1,000	0	Headworks	not provided	1969	D	D	D	D	D	D	D	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	0	1	22	17	22	37
14.	Aek Mandos I	Toba Samosir	ST	1,060	1,060	0	Headworks	not provided	1993	C	C	C	C	C	C	C	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1	0	22	0	17	20	29
15.	Simangatasi II	Toba Samosir	T	1,515	1,515	0	Headworks	not provided	1992	B	B	B	B	C	C	C	A	C	C	C	C	C	C	C	C	C	C	D	D	C	C	C	1	4	16	2	21	29	34
16.	Bulung Ihit	Labuhan Batu	T	5,000	3,300	1,700	Headworks	provided	1998	B	B	B	B	B	B	B	A	B	B	B	B	B	C	B	B	B	B	B	B	B	B	B	1	21	1	0	29		
17.	Perkotaan	Asahan	T	3,457	3,457	0	Headworks	provided	1989	B	B	B	B	B	D	C	A	C	C	B	C	A	C	A	C	C	C	B	C	B	B	B	3	10	9	1	21	25	31
18.	Sungai Balai	Asahan	ST	1,185	1,185	0	Headworks	not provided	1998	B	B	B	B	B	C	C	A	C	C	C	C	B	C	B	C	C	C	C	C	C	C	C	1	7	15	0	21	29	31
19.	Panca Arga	Asahan	T	2,500	2,500	0	Headworks	not provided	1993	B	B	C	C	B	B	B	A	C	C	C	C	B	B	B	B	C	C	C	C	C	C	C	1	9	13	0	18	26	34
20.	Serbangan	Asahan	T	2,333	2,333	0	Headworks	not provided	1993	B	B	C	B	C	C	C	A	D	D	C	C	B	D	C	C	C	C	C	C	B	C	C	1	5	14	3	20	25	29
21.	Silau Bonto	Asahan	NT	3,231	3,231	0	Free Intake	not provided	1993	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	29	31	35
22.	Sungai Silau	Asahan	ST	1,315	1,315	0	Free Intake	not provided	1971	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	29	31	37
23.	Padang Mahondang	Asahan	ST	3,231	3,231	0	Free Intake	not provided	1981	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	29	31	37
24.	Simujur	Asahan	ST	2,560	1,200	1,360	Free Intake	not provided	1985	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	28	29	31
25.	Purwodadi	Asahan	T	1,635	1,635	0	Headworks	not provided	1989	B	C	B	C	C	C	C	A	C	C	C	C	C	D	C	D	C	D	C	D	C	D	C	1	2	15	5	25	29	38
26.	Pentara	Simalungun	ST	1,034	1,034	0	Headworks	provided	1991	C	C	C	C	C	C	C	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1	0	22	0	29	31	
27.	Simantin Pane Dame	Simalungun	NT	1,000	1,000	0	Free Intake	not provided	1989	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	29	31	37
28.	Panambean / Panet Tongah BK	Simalungun	T	1,723	1,723	0	Headworks	provided	1991	B	B	B	B	B	C	C	A	C	C	C	C	B	B	B	B	C	B	B	C	B	B	B	1	14	8	0	21	27	35
29.	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	2,045	0	Headworks	provided	1994	B	B	B	B	B	C	B	A	B	B	B	B	B	C	B	C	C	B	C	C	C	C	C	1	13	9	0	21	29	31
30.	Kerasaan	Simalungun	T	5,000	5,000	0	Headworks	provided	1988	B	B	B	B	B	B	C	B	C	C	C	C	B	C	C	C	C	C	C	B	C	C	C	0	9	14	0	29	31	38
31.	Javacolonisasi/Purbogondo	Simalungun	T	1,030	1,030	0	Headworks	provided	1989	B	B	B	B	B	B	C	A	B	C	B	B	B	B	B	B	C	B	B	C	B	B	B	1	18	4	0	25	33	
32.	Naga Sompah	Simalungun	T	1,360	1,360	0	Free Intake	not provided	1987	Free Intake												B	D	D	D	D	D	D	D	D	D	D	0	1	0	10	29	34	
33.	Risma Duma	Dairi	ST	1,522	1,400	122	Headworks	not provided	1982	C	C	C	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	1	22	0	29	31	
34.	Lae Ordi	Dairi	ST	1,200	607	593	Headworks	not provided	1989	C	C	C	C	C	C	C	A	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	1	0	22	0	29	31	
35.	Parit Lompaten	Karo	ST	1,242	1,242	0	Headworks	not provided	1983	D	D	D	D	D	D	D	B	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	1	0	22	26	33	
36.	Bandar Sidoras	Deli Serdang	ST	3,457	3,017	440	Headworks	not provided	1985	D	D	D	D	D	D	D	B	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	1	0	22	18	25	29
37.	Namu Rambe	Deli Serdang	T	1,036	1,036	0	Headworks	provided	1966	D	D	D	D	D	D	D	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	0	1	22	17	26	29
38.	Sei Belutu	Deli Serdang	ST	5,082	5,082	0	Free Intake	not provided	1963	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	29	31	33
39.	Langau	Deli Serdang	ST	2,000	2,000	0	Free Intake	not provided	1979	Free Intake												D	D	C	D	D	D	D	D	D	D	D	0	0	1	10	29	31	33
40.	Medan Krio	Deli Serdang	T	3,016	3,016	0	Headworks	provided	1978	C	C	C	C	C	C	C	B	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C	0	2	21	0	27	29	35
41.	Rantau Panjang	Deli Serdang	ST	2,309	2,309	0	Headworks	not provided	1970	D	D	D	D	D	D	D	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	0	0	1	22	No use		
42.	Pekan Kamis	Deli Serdang	ST	1,100	1,100	0	Free Intake	not provided	1970	Free Intake												C	C	C	C	C	C	C	C	C	C	C	0	0	11	0	29	31	
43.	Secanggang	Langkat	ST	1,400	1,400	0	Free Intake	not provided	1985	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	No use		
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	1,558	0	Headworks	not provided	1981	C	C	C	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	1	22	0	29	31	34
45.	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	2,250	0	Headworks	provided	1979	B	B	B	B	B	B	B	B	C	C	C	C	B	C	B	C	B	B	B	B	B	B	B	0	17	6	0	25	29	31
46.	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	4,100	0	Headworks	provided	1979	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	0	23	0	0	27	35	
47.	Bah Korah II	Simalungun/Siantar	T	1,995	1,995	0	Headworks	provided	1991	B	B	B	B	B	B	C	A	B	B	B	B	B	C	B	C	B	B	B	B	B	B	B	1	19	3	0	29	31	
48.	Sijambi	Asahan/Tanjung Balai	T	1,013	1,013	0	Free Intake	not provided	1993	Free Intake												D	D	D	D	D	D	D	D	D	D	D	0	0	0	11	28	29	31
49.	Rambung Mera	P. Siantar/Simalungun	T	1,104	1,104	0	Headworks	provided	1987	B	B	B	B	B	C	B	B	B	B	B	B	B	C	B	C	B	B	B	B	B	B	B	0	20	3	0	21	29	31
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	4,350	0	Headworks	provided	1992	B	B	B	B	B	B	B	A	B	B	B	B	B	C	B	C	B	B	B	B	B	B	B	1	20	2	1	29	31	
	Total			**108,341**	**100,803**	**7,538**																											**54**	**273**	**342**	**326**			

Remarks:
- T : Technical
- ST : Semi Technical
- NT : Non Technical

Condition of Facility:
- A : Function well/no rehabilitation is needed.
- B : Partially deteriorated, minor rehabilitation is needed.
- C : Not functioning well and affecting the operation, large scale of rehabilitation is needed.
- D : Serious condition for operation, replace and reconstruction is needed.

Table A-4.2.3 Existing Condition of Irrigation Scheme : 2-1. Canals and Related Structures, Canals Works: North Sumatra

No.	Irrigation Scheme	District	Condition of Facility																						
			Main Canal											Secondary Canal											
			Canal								Inspection road			Canal								Inspection road		
			Length (m)			Lined			Earth	Total D	Length (m)	Condition	Evaluation of Condition	Length (m)			Lined			Earth	Total D	Length (m)	Condition	Evaluation of Condition
			Lined	Earth	Total	A	B	C	D						Lined	Earth	Total	A	B	C	D				
1.	Gido Sebua	Nias	2,702	0	2,702			2,702		0	0	0		C	3,477	8,113	11,590			3,477		8,113	8,113	0		C
2.	Batang Gadis	Mandaling Natal	21,325	950	22,275		21,325			950	950	22,275	B	B	41,768	2,000	43,768		41,768			2,000	2,000	35,014	C	B
3.	Batang Ilung	Tapanuli Selatan	6,360	0	6,360		6,360			0	0	3,180	C	B	48,910	4,600	53,510		48,910			4,600	4,600	32,106	C	B
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	0	5,443	5,443					5,443	5,443	0		D	0	8,261	8,261					8,261	8,261	0		D
5.	Siborna	Tapanuli Selatan	0	7,426	7,426					7,426	7,426	0		D	0	5,131	5,131					5,131	5,131	0		D
6.	Siaili Tukka	Tapanuli Tengah	0	1,783	1,783					1,783	1,783	1,426	C	D	4,668	1,764	6,432			4,668		1,764	1,764	5,146	C	C
7.	Badiri Lopian	Tapanuli Tengah	350	1,630	1,980				350	1,630	1,980	0		D	1,390	5,639	7,029				1,390	5,639	7,029	351	C	D
8.	Pandurungan	Tapanuli Tengah	200	2,065	2,265				200	2,065	2,265	0		D	1,545	18,739	20,284				1,545	18,739	20,284	0		D
9.	Sihiong	Tapanuli Tengah	100	200	300				100	200	300	0		D	100	500	600				100	500	600	0		D
10.	Aek Silang	Tapanuli Utara	1,500	0	1,500		1,500			0	0	900	C	B	0	4,500	4,500					4,500	4,500	2,700	C	D
11.	Sarulla	Tapanuli Utara	210	724	934			210		724	724	0		C	845	1,975	2,820			845		1,975	1,975	0		C
12.	Parmiahan Hutapaung	Tapanuli Utara	2,840	1,573	4,413		2,840			1,573	1,573	3,530	C	B	3,544	4,918	8,462			3,544		4,918	4,918	4,231	C	C
13.	Sinamo	Tapanuli Utara	500	325	825		500			325	325	825	C	B	0	7,620	7,620					7,620	7,620	7,620	C	D
14.	Aek Mandos I	Toba Samosir	360	0	360		360			0	0	180	C	B	0	4,944	4,944					4,944	4,944	2,966	C	D
15.	Simangatasi II	Toba Samosir	4,658	0	4,658		4,658			0	0	466	C	B	3,754	0	3,754		3,754			0	0	375	C	B
16.	Bulung Ihit	Labuhan Batu	450	5,070	5,520				450	5,070	5,520	4,416	B	D	2,875	23,675	26,550				2,875	23,675	26,550	23,895	C	D
17.	Perkotaan	Asahan	2,452	17,128	19,580			2,452		17,128	17,128	19,580	C	C	7,500	32,903	40,403			7,500		32,903	32,903	40,403	C	C
18.	Sungai Balai	Asahan	2,039	1,300	3,339			2,039		1,300	1,300	0		C	0	8,267	8,267					8,267	8,267	0		D
19.	Panca Arga	Asahan	157	0	157			157		0	0	0		C	2,172	5,328	7,500				2,172	5,328	7,500	0		D
20.	Serbangan	Asahan	2,100	4,690	6,790			2,100		4,690	4,690	6,790	C	C	3,400	13,311	16,711				3,400	13,311	16,711	0	C	D
21.	Silau Bonto	Asahan	0	0	0	No system provided						0		D	0	0	0	No system provided						0		D
22.	Sungai Silau	Asahan	0	1,650	1,650					1,650	1,650	0		D	0	16,500	16,500					16,500	16,500	0		D
23.	Padang Mahondang	Asahan	0	3,575	3,575					3,575	3,575	3,575	C	D	0	9,225	9,225					9,225	9,225	9,225	C	D
24.	Simujur	Asahan	0	2,300	2,300					2,300	2,300	1,840	C	D	0	15,700	15,700					15,700	15,700	15,700	C	D
25.	Purwodadi	Asahan	0	12,972	12,972					12,972	12,972	12,972	B	D	0	12,362	12,362					12,362	12,362	12,362	C	D
26.	Pentara	Simalungun	0	10,769	10,769					10,769	10,769	3,231	C	D	0	7,200	7,200					7,200	7,200	0		D
27.	Simantin Pane Dame	Simalungun	0	2,000	2,000					2,000	2,000	2,000	C	D	0	0	0						0	0		D
28.	Panambean / Panet Tongah BK	Simalungun	2,214	4,136	6,350			2,214		4,136	4,136	4,445	C	C	3,081	11,665	14,746			3,081		11,665	11,665	2,212	C	C
29.	Raja Hombang / T. Mangaraja	Simalungun	8,080	14,200	22,280			8,080		14,200	14,200	11,140	C	C	0	10,800	10,800					10,800	10,800	0		D
30.	Kerasaan	Simalungun	7,245	23,061	30,306			7,245		23,061	23,061	30,306	C	C	9,500	43,605	53,105		9,500			43,605	43,605	53,105	C	C
31.	Javacolonisasi/Purbogondo	Simalungun	5,770	5,510	11,280			5,770		6,510	6,510	11,280	B	C	604	3,446	4,050				604	3,446	4,050	0		D
32.	Naga Sompah	Simalungun	8,000	5,417	13,417		8,000			5,417	5,417	6,709	C	B	3,000	6,712	9,712			3,000		6,712	6,712	0		C
33.	Risma Duma	Dairi	0	0	0	No system provided						0	D	D	0	0	0	No system provided						0		D
34.	Lae Ordi	Dairi	3,000	9,000	12,000			3,000		9,000	9,000	12,000	D	C	0	6,000	6,000					6,000	6,000	6,000	C	D
35.	Parit Lompaten	Karo	1,800	9,980	11,780				1,800	9,980	11,780	11,780	D	D	256	14,262	14,518				256	14,262	14,518	14,518	C	D
36.	Bandar Sidoras	Deli Serdang	491	899	1,390				491	899	1,390	0		D	9,365	28,096	37,461				9,365	28,096	37,461	0		D
37.	Namu Rambe	Deli Serdang	2,193	3,597	5,790			2,193		3,597	3,597	0		C	200	10,836	11,036				200	10,836	11,036	0		D
38.	Sei Belutu	Deli Serdang	100	150	250				100	150	250	0		D	9,000	16,750	25,750			9,000		16,750	16,750	0		C
39.	Langau	Deli Serdang	0	1,900	1,900					1,900	1,900	0		D	350	2,750	3,100				350	2,750	3,100	0		D
40.	Medan Krio	Deli Serdang	2,750	0	2,750			2,750		0	0	0		C	600	22,700	23,300				600	22,700	23,300	0		D
41.	Rantau Panjang	Deli Serdang	0	0	0	No system provided						0		D	0	0	0	Damaged and out of services						0		D
42.	Pekan Kamis	Deli Serdang	0	400	400					400	400	0		D	0	6,200	6,200					6,200	6,200	0		D
43.	Secanggang	Langkat	1,446	10,954	12,400			1,446		10,954	10,954	0		D	250	13,740	13,990				250	13,740	13,990	0		D
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	1,500	3,400	4,900			1,500		3,400	3,400	0		C	500	4,900	5,400				500	4,900	5,400	0		D
45.	Namu Sira-sira Kiri	Langkat/Binjai	6,189	811	7,000			6,189		811	811	7,000	C	C	19,126	9,830	28,956			19,126		9,830	9,830	28,956	C	C
46.	Namu Sira-sira Kanan	Langkat/Binjai	1,200	1,500	2,700			1,200		1,500	1,500	2,700	C	C	31,000	16,226	47,226			31,000		16,226	16,226	37,781	C	C
47.	Bah Korah II	Simalungun/Siantar	8,519	7,272	15,791		8,519			7,272	7,272	11,054	C	B	893	3,403	4,296				893	3,403	4,296	0		D
48.	Sijambi	Asahan/Tanjung Balai	0	1,125	1,125					1,125	1,125	0		D	0	9,005	9,005					9,005	9,005	0		D
49.	Rambung Mera	P. Siantar/Simalungun	0	12,136	12,136					12,136	12,136	0		D	279	2,212	2,491				279	2,212	2,491	2,491	C	D
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	5,930	7,146	13,076			5,930		7,146	7,146	7,846	C	C	9,528	15,172	24,700			9,528		15,172	15,172	2,470	C	C
	Total		**114,730**	**206,167**	**320,897**	**0**	**54,062**	**57,177**	**3,491**	**207,167**	**210,658**	**203,445**			**223,480**	**481,485**	**704,965**	**0**	**103,932**	**94,769**	**24,779**	**481,485**	**506,264**	**339,628**		

Remarks:
T : Technical
ST : Semi Technical
NT : Non Technical

Condition of Facility:
A : Function well/no rehabilitation is needed.
B : Partially deteriorated, minor rehabilitation is needed.
C : Not functioning well and affecting the operation, large scale of rehabilitation is needed.
D : Serious condition for operation, replace and reconstruction is needed.

	Main Canal	Secondary Canal
A :	0	0
B :	9	3
C :	17	12
D :	24	35

Table A-4.2.4 Existing Condition of Irrigation Scheme : 2-2. Canals and Related Structures, Related Structures (1/2): North Sumatra

• Main Canal

No.	Irrigation Scheme	District	Condition of Facility																														Breakdown of Condition				Total
			Diversion (Main body only) (Bangunan Bagi)				Off-take (Bagi Sadap)				Box Culvert (Gorong-Gorong)				Drop/Chute (Terjunan)				Bridge (Jembatan)				Spillway (Pelimpah)				Cross Drain (Gorong^2 Silang)				Others (Lain-lain)								
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	
1.	Gido Sebua	Nias			1							5								3					1							1	0	8	2	1	11
2.	Batang Gadis	Mandaling Natal		2	1			12	5			39								7											1		0	61	6	0	67
3.	Batang Ilung	Tapanuli Selatan							4				11								4				1							13	0	0	33	0	33
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan				1			3				8				2								2	1						1	0	0	15	3	18
5.	Siborna	Tapanuli Selatan			3	2			3				6								2												0	0	14	2	16
6.	Siaili Tukka	Tapanuli Tengah			1	1							1				1								1								0	0	4	1	5
7.	Badiri Lopian	Tapanuli Tengah			2							1	1								3											1	0	1	7	0	8
8.	Pandurungan	Tapanuli Tengah				2											5																0	0	5	2	7
9.	Sihiong	Tapanuli Tengah	No system provided																														0	0	0	0	0
10.	Aek Silang	Tapanuli Utara		1																						1							0	1	0	1	2
11.	Sarulla	Tapanuli Utara											2												1								0	0	3	0	3
12.	Parmiahan Hutapaung	Tapanuli Utara		2								3				3	2														4		0	12	2	0	14
13.	Sinamo	Tapanuli Utara			2	1							1																				0	0	3	1	4
14.	Aek Mandos I	Toba Samosir			1					1																							0	0	1	1	2
15.	Simangatasi II	Toba Samosir		1				1																									0	2	0	0	2
16.	Bulung Ihit	Labuhan Batu		1				5				1				1				2													0	10	0	0	10
17.	Perkotaan	Asahan		3				28				11				2																	0	44	0	0	44
18.	Sungai Balai	Asahan							4	1										1											1		0	2	4	1	7
19.	Panca Arga	Asahan		1				1												1													0	3	0	0	3
20.	Serbangan	Asahan			5				3				4	2							3												0	0	15	2	17
21.	Silau Bonto	Asahan																															0	0	0	0	0
22.	Sungai Silau	Asahan				2															1												0	0	1	2	3
23.	Padang Mahondang	Asahan							3				3																				0	0	6	0	6
24.	Simujur	Asahan							4																								0	0	4	0	4
25.	Purwodadi	Asahan		1	9							23				5				12				5									0	46	9	0	55
26.	Pentara	Simalungun			1				2																5								0	0	8	0	8
27.	Simantin Pane Dame	Simalungun								3																							0	0	0	3	3
28.	Panambean / Panet Tongah BK	Simalungun		4	1			7	4			2				27	1			4				1							1		0	46	6	0	52
29.	Raja Hombang / T. Mangaraja	Simalungun		4				48	3			6				59	3			15													0	132	6	0	138
30.	Kerasaan	Simalungun		5	1			16	3			1				10	2			11	1							1					0	44	7	0	51
31.	Javacolonisasi/Purbogondo	Simalungun		2					13	5							25	2		13	14			4									0	19	52	7	78
32.	Naga Sompah	Simalungun		7				3	2			11				25	5			5				2				1			2		0	56	7	0	63
33.	Risma Duma	Dairi	No system provided																														0	0	0	0	0
34.	Lae Ordi	Dairi		11									1			1								2							1		0	14	2	0	16
35.	Parit Lompaten	Karo			6				5				7				12				9				7								0	0	46	0	46
36.	Bandar Sidoras	Deli Serdang				2			1																								0	0	1	2	3
37.	Namu Rambe	Deli Serdang			1				23				1				15				20				4				1				0	0	65	0	65
38.	Sei Belutu	Deli Serdang			1																												0	0	1	0	1
39.	Langau	Deli Serdang			1								1																				0	0	2	0	2
40.	Medan Krio	Deli Serdang			5				17								5				13										2		0	0	42	0	42
41.	Rantau Panjang	Deli Serdang			1																1												0	0	2	0	2
42.	Pekan Kamis	Deli Serdang		1																1				2									0	4	0	0	4
43.	Secanggang	Langkat		1																8				1							5		0	15	0	0	15
44.	Paya Lobang	Deli Serdan/Tebing Tinggi																		3											2		0	3	2	0	5
45.	Namu Sira-sira Kiri	Langkat/Binjai										9				19				3				4							6		0	41	0	0	41
46.	Namu Sira-sira Kanan	Langkat/Binjai		1												3				2				1									0	7	0	0	7
47.	Bah Korah II	Simalungun/Siantar		3				26	5							73	2			13				5	1			5			10	1	0	135	9	0	144
48.	Sijambi	Asahan/Tanjung Balai		2				4				4								1											5		0	16	0	0	16
49.	Rambung Mera	P. Siantar/Simalungun		2				6	15			4				24	3			19				2							1		0	58	18	0	76
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal		2		2		5	22			50		2		16				31				6							17		0	127	22	4	153
	Total		**0**	**57**	**43**	**13**	**0**	**162**	**144**	**10**	**0**	**170**	**47**	**4**	**0**	**268**	**83**	**2**	**0**	**155**	**71**	**0**	**0**	**35**	**23**	**2**	**0**	**7**	**1**	**0**	**0**	**53**	**20**	**2**	**0**	**907**	**432**	**33**	**1,372**

Remarks:
T : Technical
ST : Semi Technical
NT : Non Technical

Condition of Facility:
A : Function well/no rehabilitation is needed.
B : Partially deteriorated, minor rehabilitation is needed.
C : Not functioning well and affecting the operation, large scale of rehabilitation is needed.
D : Serious condition for operation, replace and reconstruction is needed.

Table A-4.2.5 Existing Condition of Irrigation Scheme : 2-2. Canals and Related Structures, Related Structures (2/2): North Sumatra

• Secondary Canal

No.	Irrigation Scheme	District	Condition of Facility																																Total
			Diversion (Main body only) (Bangunan Bagi)				Off-take (Bagi Sadap)				Box Culvert (Gorong-Gorong)				Drop/Chute (Terjunan)				Bridge (Jembatan)				Spillway (Pelimpah)				Cross Drain (Gorong-gorong Silang)				Others (Lain-lain)				Total				
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	
1.	Gido Sebua	Nias			11							4	2			9								2									1		0	15	14	0	29
2.	Batang Gadis	Mandaling Natal		4				126					133			141				20														0	291	133	0	424
3.	Batang Ilung	Tapanuli Selatan							38				83				9				33				5								70		0	0	238	0	238
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan							6	3			2												2								4		0	0	14	3	17
5.	Siborna	Tapanuli Selatan											3																						0	0	3	0	3
6.	Siaili Tukka	Tapanuli Tengah			5	6							4	2							2					1								1	0	0	11	10	21
7.	Badiri Lopian	Tapanuli Tengah			13								2	2			9							2					6	8			1	1	0	2	31	11	44
8.	Pandurungan	Tapanuli Tengah			19												7	19															1	2	0	0	27	21	48
9.	Sihiong	Tapanuli Tengah	No system provided																																0	0	0	0	0
10.	Aek Silang	Tapanuli Utara				2							1							1															0	1	1	2	4
11.	Sarulla	Tapanuli Utara											2																				1		0	0	3	0	3
12.	Parmiahan Hutapaung	Tapanuli Utara			2								7				21			4														0	4	30	0	34
13.	Sinamo	Tapanuli Utara				2																				1									0	0	0	3	3
14.	Aek Mandos I	Toba Samosir			2								1				2	4		2									2						0	2	7	4	13
15.	Simangatasi II	Toba Samosir			2								2			2	14			1															0	3	18	0	21
16.	Bulung Ihit	Labuhan Batu		1				23	2			3				1				6													5		0	39	2	0	41
17.	Perkotaan	Asahan		2				57				20				2																			0	81	0	0	81
18.	Sungai Balai	Asahan							10	3										5								5							0	15	10	3	28
19.	Panca Arga	Asahan						7		3		2									1	1											3	1	0	9	4	5	18
20.	Serbangan	Asahan				14				2			5	6			2																2	1	0	0	9	23	32
21.	Silau Bonto	Asahan																																	0	0	0	0	0
22.	Sungai Silau	Asahan			15				1				2				1				15	11												2	0	0	34	13	47
23.	Padang Mahondang	Asahan							9				1				1				5													2	0	0	16	2	18
24.	Simujur	Asahan																				2												1	0	0	0	3	3
25.	Purwodadi	Asahan		6	17			27				18				11								13								1			0	76	17	0	93
26.	Pentara	Simalungun						4				1				2	10																		0	7	10	0	17
27.	Simantin Pane Dame	Simalungun																																	0	0	0	0	0
28.	Panambean / Panet Tongah BK	Simalungun		2	1			31	8			8	2			167	2			8				3								15	1		0	234	14	0	248
29.	Raja Hombang / T. Mangaraja	Simalungun						29				4				42	3			11												3			0	89	3	0	92
30.	Kerasaan	Simalungun		4					65	3							25				1														0	4	91	3	98
31.	Javacolonisasi/Purbogondo	Simalungun							4	1							7				4												2		0	0	17	1	18
32.	Naga Sompah	Simalungun		4					3	1			10			26					2								4				4		0	30	23	1	54
33.	Risma Duma	Dairi	No system provided																																0	0	0	0	0
34.	Lae Ordi	Dairi			3				2																										0	0	5	0	5
35.	Parit Lompaten	Karo			13												1																		0	0	14	0	14
36.	Bandar Sidoras	Deli Serdang				3				26																								6	0	0	0	35	35
37.	Namu Rambe	Deli Serdang							10	13																									0	0	10	13	23
38.	Sei Belutu	Deli Serdang			2				18																										0	0	20	0	20
39.	Langau	Deli Serdang							4												5														0	0	9	0	9
40.	Medan Krio	Deli Serdang							19								20				16												3		0	0	58	0	58
41.	Rantau Panjang	Deli Serdang							2																										0	0	2	0	2
42.	Pekan Kamis	Deli Serdang			1			9				6								1				1								1			0	18	1	0	19
43.	Secanggang	Langkat		1				21								7				22															0	51	0	0	51
44.	Paya Lobang	Deli Serdan/Tebing Tinggi						2	2											7	4											2			0	9	8	0	17
45.	Namu Sira-sira Kiri	Langkat/Binjai		5				26				40				64				4				5								8			0	152	0	0	152
46.	Namu Sira-sira Kanan	Langkat/Binjai		7				27	2			4	4			202	20			21												27	1		0	288	27	0	315
47.	Bah Korah II	Simalungun/Siantar						7	1			7				33	6			8				3											0	58	7	0	65
48.	Sijambi	Asahan/Tanjung Balai		6	4			2				4								3												11	1		0	26	5	0	31
49.	Rambung Mera	P. Siantar/Simalungun		3				10				3				20	5			6					1							1			0	43	6	0	49
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal		2				65		16		31		2						11				2								6			0	117	0	18	135
	Total		**0**	**47**	**110**	**27**	**0**	**473**	**206**	**71**	**0**	**155**	**266**	**12**	**0**	**729**	**165**	**23**	**0**	**141**	**88**	**14**	**0**	**31**	**8**	**1**	**0**	**5**	**12**	**9**	**0**	**83**	**97**	**17**	**0**	**1,664**	**952**	**174**	**2,790**

Remarks:
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- ST : Semi Technical
- NT : Non Technical

Condition of Facility:
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- B : Partially deteriorated, minor rehabilitation is needed.
- C : Not functioning well and affecting the operation, large scale of rehabilitation is needed.
- D : Serious condition for operation, replace and reconstruction is needed.

Table A-4.2.6 Irrigation Facility Provision Ratio of Present Irrigation System: North Sumatra

No.	Irrigation Scheme	District	Technical Level [1)]	Registered Area (ha)	Age of the Facilities (years)	Density of Canal (m/ha)			Lined Canal Provision Ratio			Inspection Road Provision Ratio			Structure Provision Ratio (m/nos)		
						MC	SC	Total	MC	SC	Total	MC	SC	Total	MC	SC	Total
1.	Gido Sebua	Nias	T	1,258	11	3.1	13.1	16.2	100%	30%	43%	0%	0%	0%	246	400	357
2.	Batang Gadis	Mandaling Natal	T	6,628	11	4.0	7.9	11.8	96%	95%	96%	100%	80%	87%	332	103	135
3.	Batang Ilung	Tapanuli Selatan	T	4,194	11	1.8	15.1	16.9	100%	91%	92%	50%	60%	59%	193	225	221
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	27	10.9	16.5	27.4	0%	0%	0%	0%	0%	0%	302	486	392
5.	Siborna	Tapanuli Selatan	ST	1,000	19	7.8	5.4	13.2	0%	0%	0%	0%	0%	0%	464	1,710	661
6.	Siaili Tukka	Tapanuli Tengah	T	1,057	17	3.0	10.7	13.7	0%	73%	57%	80%	80%	80%	357	306	316
7.	Badiri Lopian	Tapanuli Tengah	T	1,283	14	2.2	7.8	10.0	18%	20%	19%	0%	5%	4%	248	160	173
8.	Pandurungan	Tapanuli Tengah	T	1,769	19	1.7	15.2	16.9	9%	8%	8%	0%	0%	0%	324	423	410
9.	Sihiong	Tapanuli Tengah	NT	2,000	19	0.4	0.8	1.2	33%	17%	22%	0%	0%	0%	No structure		
10.	Aek Silang	Tapanuli Utara	ST	1,500	13	1.0	3.0	4.0	100%	0%	25%	60%	60%	60%	750	1,125	1,000
11.	Sarulla	Tapanuli Utara	ST	1,692	28	0.6	1.7	2.2	22%	30%	28%	0%	0%	0%	311	940	626
12.	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	10	4.4	8.5	12.9	64%	42%	50%	80%	50%	60%	315	249	268
13.	Sinamo	Tapanuli Utara	ST	1,000	34	0.9	8.2	9.1	61%	0%	6%	100%	100%	100%	206	2,540	1,206
14.	Aek Mandos I	Toba Samosir	ST	1,060	10	0.3	4.7	5.0	100%	0%	7%	50%	60%	59%	180	380	354
15.	Simangatasi II	Toba Samosir	T	1,515	11	3.1	2.5	5.6	100%	100%	100%	10%	10%	10%	2,329	179	366
16.	Bulung Ihit	Labuhan Batu	T	5,000	5	4.1	19.6	23.7	8%	11%	10%	80%	90%	88%	552	648	629
17.	Perkotaan	Asahan	T	3,457	14	5.7	11.7	17.4	13%	19%	17%	100%	100%	100%	445	499	480
18.	Sungai Balai	Asahan	ST	1,185	5	3.0	7.3	10.3	61%	0%	18%	0%	0%	0%	477	295	332
19.	Panca Arga	Asahan	T	2,500	10	0.1	3.0	3.1	100%	29%	30%	0%	0%	0%	52	417	365
20.	Serbangan	Asahan	T	2,333	10	3.3	8.2	11.5	31%	20%	23%	100%	100%	100%	399	522	480
21.	Silau Bonto	Asahan	NT	3,231	10		No Canal			No canal			No canal			No canal	
22.	Sungai Silau	Asahan	ST	1,315	32	3.7	36.5	40.2	0%	0%	0%	0%	0%	0%	550	351	363
23.	Padang Mahondang	Asahan	ST	3,231	22	1.2	3.2	4.4	0%	0%	0%	100%	100%	100%	596	513	533
24.	Simujur	Asahan	ST	2,560	18	1.1	7.8	9.0	0%	0%	0%	80%	100%	97%	575	5,233	2,571
25.	Purwodadi	Asahan	T	1,635	14	7.9	7.6	15.5	0%	0%	0%	100%	100%	100%	236	133	171
26.	Pentara	Simalungun	ST	1,034	12	36.1	24.2	60.3	0%	0%	0%	30%	0%	18%	1,346	424	719
27.	Simantin Pane Dame	Simalungun	NT	1,000	14	2.0	0.0	2.0	0%	No canal	0%	100%	No canal	100%	667	No canal	667
28.	Panambean / Panet Tongah BK	Simalungun	T	1,723	12	3.7	8.6	12.3	35%	21%	25%	70%	15%	32%	122	59	70
29.	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	9	11.0	5.3	16.4	36%	0%	24%	50%	0%	34%	161	117	144
30.	Kerasaan	Simalungun	T	5,000	15	7.3	12.8	20.1	24%	18%	20%	100%	100%	100%	594	542	560
31.	Javacolonisasi/Purbogondo	Simalungun	T	1,030	14	11.1	4.0	15.1	51%	15%	42%	100%	0%	74%	145	225	160
32.	Naga Sompah	Simalungun	T	1,360	16	13.2	9.6	22.8	60%	31%	48%	50%	0%	29%	213	180	198
33.	Risma Duma	Dairi	ST	1,522	21	0.0	0.0	0.0		No canal			No canal			No canal	
34.	Lae Ordi	Dairi	ST	1,200	14	10.0	5.0	15.0	25%	0%	17%	100%	100%	100%	750	1,200	857
35.	Parit Lompaten	Karo	ST	1,242	20	9.5	11.7	21.2	15%	2%	8%	100%	100%	100%	256	1,037	438
36.	Bandar Sidoras	Deli Serdang	ST	3,457	18	0.4	10.8	11.2	35%	25%	25%	0%	0%	0%	463	1,070	1,022
37.	Namu Rambe	Deli Serdang	T	1,036	37	5.6	10.7	16.2	38%	2%	14%	0%	0%	0%	89	480	191
38.	Sei Belutu	Deli Serdang	ST	5,082	40	0.0	5.1	5.1	40%	35%	35%	0%	0%	0%	250	1,288	1,238
39.	Langau	Deli Serdang	ST	2,000	24	1.0	1.6	2.6	0%	11%	7%	0%	0%	0%	950	344	455
40.	Medan Krio	Deli Serdang	T	3,016	25	0.9	7.8	8.7	100%	3%	13%	0%	0%	0%	65	402	261
41.	Rantau Panjang	Deli Serdang	ST	2,309	33	0.0	0.0	0.0		No canal			No canal			No canal	
42.	Pekan Kamis	Deli Serdang	ST	1,100	33	0.4	5.6	6.0	0%	0%	0%	0%	0%	0%	100	326	287
43.	Secanggang	Langkat	ST	1,400	18	8.9	10.0	18.9	12%	2%	6%	0%	0%	0%	827	274	400
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	22	3.1	3.5	6.6	31%	9%	19%	0%	0%	0%	980	318	468
45.	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	24	5.2	21.4	26.6	88%	66%	70%	100%	100%	100%	171	191	186
46.	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	24	0.7	12.0	12.6	44%	66%	64%	100%	80%	81%	386	150	155
47.	Bah Korah II	Simalungun/Siantar	T	1,995	12	9.2	2.5	11.7	54%	21%	47%	70%	0%	55%	110	66	96
48.	Sijambi	Asahan/Tanjung Balai	T	1,013	10	1.1	8.9	10.0	0%	0%	0%	0%	0%	0%	70	290	216
49.	Rambung Mera	P. Siantar/Simalungun	T	946	16	12.9	2.6	15.5	0%	11%	2%	0%	100%	17%	160	51	117
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	11	3.0	5.7	8.7	45%	39%	41%	60%	10%	27%	85	183	131
	Total			**107,183**													
	Average of the province			2,144	18	3.5	7.8	11.3	36%	32%	33%	63%	51%	55%	234	253	246
	Itemized Total		T : 25 ST : 22 NT : 3														

Note: 1): T: Technical, ST: Semi-technical, NT: Non-technical
MC: Main Canal, SC: Secondary Canal

Source: Inventory Survey Works for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-4.2.7 Problems and Constraints of Irrigation Scheme : 2. Canals and Related Structures & 3. Terminal Facility and On Farm: North Sumatra

No.	Irrigation Scheme	District	Canal and Related Structure: General					Lined and Earth Canal					Related regulating structure				Related conveyance structure						Related crossing structure			Protection structure	O & M		Condition/Problem					Problems and Constraints: Summary					Overall Condition of Canal System	Terminal Facility and On Farm
			C-1 Sedimentation or obstruction of water flow	C-2 Leakage from canal	C-3 Collapse of canal	C-4 Inspection road along canal	C-5 General O&M problems	C-6 Overage, Lower strength of lined canal	C-7 Cracks of partial damage on lined canal	C-8 Leakage from lined canal	C-9 Deflection of lining toward inside of canal	C-10 Difficulty on maintenance of earth canal	C-11 Lower function of regulating structure on canal	C-12 Settlement or damage (breakdown) of regulating structure on canal	C-13 Physical operation problem on regulating structure on canal	C-14 No function of discharge measuring	C-15 Settlement/deflection on foundation of aqueduct	C-16 Damage/breakout on superstructure of aqueduct	C-17 Leakage from barrel of siphon	C-18 Insufficient covering for siphon under below river bed	C-19 Clogging of barrel of siphon	C-20 Clogging of road crossing (box/pipe culvert)	C-21 Settlement of foundation of bridge	C-22 Damage/breakout of superstructure of brigde	C-23 Clogging of barrel of cross drain	C-24 Difficulty on O & M due to facility problem	C-25 Difficulty on Proper water distribution/discharge measurement	A Fully functioning	B Partly deteriorated, but functioning in a satisfactory range	C Not functioning well and/or affecting the downstream flow	D Serious condition for operation, replace and reconstruction is needed	N.A. Not Applicable						
1.	Gido Sebua	Nias	C	B	A	D	C	C	B	B	C	C	C	B	B	C	C	C	N.A.	N.A.	N.A.	B	N.A.	B	C	C	C	1	6	12	1	5	1	4	24			D	C
2.	Batang Gadis	Mandaling Natal	B	B	B	B	B	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B	B	B	N.A.	B	B	0	23	1	0	1	9					B	C
3.	Batang Ilung	Tapanuli Selatan	B	B	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	C	B	C	0	15	10	0	0	3	10	25			C	C
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	C	C	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	N.A.	D	D	0	0	5	10	10	3	5	10	11	25	D	D
5.	Siborna	Tapanuli Selatan	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	4	11	24	25	D	D
6.	Siaili Tukka	Tapanuli Tengah	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	16	9	1	6	10	11	24	D	C
7.	Badiri Lopian	Tapanuli Tengah	C	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	1	18	6	3	4	10	11	24	D	C
8.	Pandurungan	Tapanuli Tengah	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	19	6	1	4	8	10	24	D	C
9.	Sihiong	Tapanuli Tengah	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	5	10	24	25	D	D
10.	Aek Silang	Tapanuli Utara	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	4	5	10	24	C	D
11.	Sarulla	Tapanuli Utara	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	4	5	10	24	D	D
12.	Parmiahan Hutapaung	Tapanuli Utara	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	19	6	1	5	10	11	24	C	D
13.	Sinamo	Tapanuli Utara	D	D	D	C	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	1	11	13	1	3	5	10	24	C	D
14.	Aek Mandos I	Toba Samosir	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	4	5	10	24	B	D
15.	Simangatasi II	Toba Samosir	D	C	C	C	D	C	C	C	C	N.A.	C	C	C	C	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	11	4	10	1	5	24	25		C	C
16.	Bulung Ihit	Labuhan Batu	C	D	D	D	D	C	C	C	C	D	D	D	D	D	C	C	C	C	C	C	C	C	N.A.	D	D	0	0	13	11	1	4	5	10	11	24	D	C
17.	Perkotaan	Asahan	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	N.A.	C	C	0	0	19	0	6	5	24		11		C	B
18.	Sungai Balai	Asahan	C	C	C	D	D	C	C	C	C	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	7	5	13	4	5	10	11	24	D	C
19.	Panca Arga	Asahan	C	D	C	D	C	C	C	C	C	D	C	C	C	C	C	C	C	C	C	N.A.	C	C	N.A.	D	D	0	0	18	5	2	2	4	10	24		D	D
20.	Serbangan	Asahan	C	C	D	C	C	B	C	C	C	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	N.A.	C	C	0	1	12	6	6	3	10	11	24		C	C
21.	Silau Bonto	Asahan	No system																							D	D	0	0	0	2	0	Not function					D	D
22.	Sungai Silau	Asahan	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	15	10	1	5	10	11	24	D	D
23.	Padang Mahondang	Asahan	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	15	10	1	5	10	11	24	D	D
24.	Simujur	Asahan	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	5	10	11	24	D	D
25.	Purwodadi	Asahan	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	15	10	1	5	10	11	24	D	C
26.	Pentara	Simalungun	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	17	8	1	5	10	11	24	D	D
27.	Simantin Pane Dame	Simalungun	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	16	9	1	5	10	11	24	D	D
28.	Panambean / Panet Tongah BK	Simalungun	C	C	C	C	D	C	C	C	C	D	C	C	C	C	C	C	C	C	C	C	C	C	N.A.	C	C	0	0	22	2	1	5	10	24			C	C
29.	Raja Hombang / T. Mangaraja	Simalungun	C	C	C	C	C	C	C	C	C	D	C	C	C	C	C	C	C	C	C	C	C	C	N.A.	C	C	0	0	23	1	1	10	24				C	D
30.	Kerasaan	Simalungun	C	C	C	C	C	C	C	C	C	D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	0	24	1	0	10	24				C	D
31.	Javacolonisasi/Purbogondo	Simalungun	B	B	B	D	C	B	B	B	C	D	C	C	C	C	N.A.	N.A.	N.A.	N.A.	N.A.	C	B	C	N.A.	B	C	0	8	9	2	6	4	10				C	C
32.	Naga Sompah	Simalungun	C	B	C	D	C	B	C	B	C	D	B	B	C	C	C	C	N.A.	N.A.	N.A.	B	B	B	B	C	C	0	9	11	2	3	4	10				C	C
33.	Risma Duma	Dairi	No function, totally damaged																							D	D	0	0	0	2	0	Not function					D	D
34.	Lae Ordi	Dairi	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	19	6	1	5	10	11	24	C	D
35.	Parit Lompaten	Karo	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	D	D	0	0	0	24	1	1	5	10	11	24	D	D
36.	Bandar Sidoras	Deli Serdang	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	D	D	0	0	0	24	1	1	5	10	11	24	D	D
37.	Namu Rambe	Deli Serdang	D	C	C	D	D	D	C	C	C	D	C	C	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	C	C	C	0	0	13	7	5	1	4	5	10	13	D	D
38.	Sei Belutu	Deli Serdang	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	16	9	1	4	5	10	24	D	D
39.	Langau	Deli Serdang	D	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	16	9	1	4	5	10	24	D	D
40.	Medan Krio	Deli Serdang	C	C	C	D	C	C	C	C	C	C	C	C	C	C	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	N.A.	C	D	0	0	17	2	6	4	25				C	D
41.	Rantau Panjang	Deli Serdang	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	15	10	1	5	10	11	24	D	D
42.	Pekan Kamis	Deli Serdang	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	D	N.A.	D	D	0	0	0	15	10	1	5	10	11	24	D	D
43.	Secanggang	Langkat	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	D	D	0	0	0	12	13	1	4	5	10	24	D	D
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	D	D	D	D	D	D	D	D	D	D	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	C	C	C	N.A.	D	D	0	0	3	12	10	1	4	5	10	24	D	D
45.	Namu Sira-sira Kiri	Langkat/Binjai	C	C	C	B	B	B	B	C	C	D	B	B	B	B	B	B	B	B	B	B	B	B	N.A.	B	C	0	17	6	1	1	1	10	25			C	D
46.	Namu Sira-sira Kanan	Langkat/Binjai	C	C	C	B	B	B	B	C	C	D	B	B	B	B	B	B	B	B	B	B	B	B	N.A.	B	C	0	17	6	1	1	1	10	25			C	C
47.	Bah Korah II	Simalungun/Siantar	C	C	C	B	B	B	B	C	C	D	B	B	B	B	B	B	B	B	B	B	B	B	N.A.	B	C	0	17	6	1	1	1	10	25			C	C
48.	Sijambi	Asahan/Tanjung Balai	C	C	C	C	C	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	D	D	0	0	5	15	5	10	11	24			D	C
49.	Rambung Mera	P. Siantar/Simalungun	C	C	C	C	C	N.A.	N.A.	N.A.	N.A.	D	D	D	D	D	D	D	D	D	D	D	D	D	N.A.	D	D	0	0	5	15	5	10	11	24			D	D
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	C	B	B	D	C	C	C	C	C	D	C	C	C	D	N.A.	N.A.	B	B	B	C	B	C	N.A.	C	C	0	6	13	3	3	4	10	14	24		C	C
	Total																											**1**	**119**	**273**	**485**	**326**							

Remarks:
T : Technical
ST : Semi Technical
NT : Non Technical

Condition of Facility:
A : Function well/no rehabilitation is needed.
B : Partially deteriorated, minor rehabilitation is needed.
C : Not functioning well and affecting the operation, large scale of rehabilitation is needed.
D : Serious condition for operation, replace and reconstruction is needed.

A : 0 B : 2 C : 18 D : 30 **A : 0 B : 1 C : 18 D : 31**

Table A-4.2.8 Present Agriculture Conditions in Target Schemes: North Sumatra - 1/3

District	Nias	M. Nat.	Tapanuli Selatan			Tapanuli Tengah				Tapanuli Utara			T. Uta.	Toba Samosir		L.Batu	Asahan	
Irrigation Scheme	Gido Sebua	Batang Gadis	Batang Ilung	Blk Sitongkon/ Napa Suron	Siborna	Siaili Tukka	Badiri Lopian	Pandurungan	Sihiong	Aek Silang	Sarulla	Parmiahan Hutapaung	Sinamo	Aek Mandos I	Simangatasi II	Bulung Ihit	Perkotaan	Sungai Balai
No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Technical Level	T	T	T	ST	ST	T	T	T	NT	ST	ST	ST	ST	ST	T	T	T	ST
1. Land Use																		
1.1 Potential Area																		
- Irrigated Paddy Field ha	883	5,575	3,546	500	595	255	899	1,034	0	200	1,214	200	100	999	1,514	1,355	3,339	1,130
- Rainfed Paddy Field ha	0	0	0	0	355	345	0	300	255	500	0	700	830	0	0	0	107	0
- Non-paddy Field ha		1,003	648	412	0	0	267	0	0	800	478	100	0	60	0	0	0	0
Upland Field ha																		
Tree Crops Land ha		1,003	648	412			267											
Uncultivated Land ha										800	478	100		60				
Total ha	883	6,578	4,194	912	950	600	1,166	1,334	255	1,500	1,692	1,000	930	1,059	1,514	1,355	3,446	1,130
1.2 Non-potential Area																		
- Rainfed Paddy Field ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Non-paddy Field ha	0	0	0	0	0	0	0	0	1,745	0	0	0	0	0	0	0	0	0
Upland Field ha																		
Tree Crops Land ha									1,221									
Uncultivated Land ha									524									
Total ha	0	0	0	0	0	0	0	0	1,745	0	0	0	0	0	0	0	0	0
1.3 Target Area (1.1 + 1.2) ha	883	6,578	4,194	912	950	600	1,166	1,334	2,000	1,500	1,692	1,000	930	1,059	1,514	1,355	3,446	1,130
1.4 Converted Land 1/ ha	375	50	0	100	50	457	117	435	0	0	0	0	70	1	1	3,645	11	55
1.5 Registered Area (1.3 + 1.4) ha	1,258	6,628	4,194	1,012	1,000	1,057	1,283	1,769	2,000	1,500	1,692	1,000	1,000	1,060	1,515	5,000	3,457	1,185
2. Cropping Pattern in Irrigated Area 2/	A	A	A	A	E	A	A	A	-	D	A	D	D	C	C	A	A	A
3. Cropped Area/Cropping Intensity																		
3.1 Cropped Area of Annual Crops																		
1) Wet Season																		
- Irrigated Paddy ha	450	5,575	3,546	500		255	899	1,034		200	764	200	100	999	800	1,355	2,812	1,130
- Paddy (rainfed cond.) 3/ ha	433				595						450				714			
- Rainfed Paddy ha					355	345		300	255	500		700	830				107	
- Palawija ha																		
Total ha	883	5,575	3,546	500	950	600	899	1,334	255	700	1,214	900	930	999	1,514	1,355	2,919	1,130
2) Dry Season I																		
- Palawija ha																		
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3) Dry Season II																		
- Irrigated Paddy ha	450	3,899	2,566	478		128	270	520			164					678	2,812	1,000
- Palawija ha										20		40	10					
Total ha	450	3,899	2,566	478	0	128	270	520	0	20	164	40	10	0	0	678	2,812	1,000
4) Annual																		
- Irrigated Paddy ha	900	9,474	6,112	978	0	383	1,169	1,554	0	200	928	200	100	999	800	2,033	5,624	2,130
- Paddy (rainfed cond.) 3/ ha	433	0	0	0	595	0	0	0	0	0	450	0	0	0	714	0	0	0
- Rainfed Paddy ha	0	0	0	0	355	345	0	300	255	500	0	700	830	0	0	0	107	0
- Palawija ha	0	0	0	0	0	0	0	0	0	20	0	40	10	0	0	0	0	0
Total ha	1,333	9,474	6,112	978	950	728	1,169	1,854	255	720	1,378	940	940	999	1,514	2,033	5,731	2,130
3.2 Overall Intensity of Annual Crops 4/																		
1) Wet Season %	100	100	100	100	100	100	100	100	33	47	72	90	100	94	100	100	85	100
2) Dry Season I %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3) Dry Season II %	51	70	72	96	0	21	30	39	0	1	10	4	1	0	0	50	82	88
4) Annual %																		
- Irrigated Paddy %	102	170	172	196	0	64	130	116	0	13	55	20	11	94	53	150	163	188
- Paddy (rainfed cond.) 3/ %	49	0	0	0	63	0	0	0	0	0	27	0	0	0	47	0	0	0
- Rainfed Paddy %	0	0	0	0	37	58	0	22	33	33	0	70	89	0	0	0	3	0
- Palawija %	0	0	0	0	0	0	0	0	0	1	0	4	1	0	0	0	0	0
Total %	151	170	172	196	100	121	130	139	33	48	81	94	101	94	100	150	166	188
3.3 Irrigation Performances 5/ %	102	170	172	196	0	150	130	150	-	110	76	120	110	100	53	150	168	188
3.4 Intensity in Irrigated Field 6/ %	151	170	172	196	100	150	130	150	-	110	114	120	110	100	100	150	168	188
4. Crop Yield & Production																		
4.1 Crop Yield																		
1) Wet Season																		
- Irrigated Paddy t/ha	3.0	4.0	5.0	4.0		4.0	4.0	4.0		3.5	3.5	3.5	3.5	3.5	3.5	4.0	4.0	4.0
- Paddy (rainfed cond.) 3/ t/ha	2.5				2.5						2.5				2.5			
- Rainfed Paddy t/ha					2.5	2.5		2.5	2.5	2.5		2.5	2.5				2.5	
- Palawija t/ha																		
2) Dry Season I																		
- Palawija t/ha																		
3) Dry Season I																		
- Irrigated Paddy t/ha	3.0	4.0	4.5	4.0		4.0	4.0	4.0			3.5					4.0	4.0	4.0
- Palawija t/ha										2.5		2.5	2.5					
4) Avg. Paddy Yield 7/ t/ha	2.8	4.0	4.8	4.0	2.5	3.3	4.0	3.8	2.5	2.8	3.2	2.7	2.6	3.5	3.0	4.0	4.0	4.0
4.2 Annual Crop Production																		
1) Irrigated Paddy ton	2,700	37,896	29,277	3,912	0	1,532	4,676	6,216	0	700	3,248	700	350	3,497	2,800	8,132	22,496	8,520
2) Paddy (rainfed cond.) 3/ ton	1,083	0	0	0	1,488	0	0	0	0	0	1,125	0	0	0	1,785	0	0	0
3) Rainfed Paddy ton	0	0	0	0	888	863	0	750	638	1,250	0	1,750	2,075	0	0	0	268	0
4) Total Paddy ton	3,783	37,896	29,277	3,912	2,375	2,395	4,676	6,966	638	1,950	4,373	2,450	2,425	3,497	4,585	8,132	22,764	8,520
5) Palawija ton	0	0	0	0	0	0	0	0	0	50	0	100	25	0	0	0	0	0

1/: Area converted to other land uses (alih fungsi)

2/: Cropping patter: A = paddy - paddy or paddy - paddy/fallow; B = paddy - paddy/palawija or paddy - paddy/palawija/fallow; C = paddy - fallow; D = paddy - palawija/fallow; E = other patterns 3/: Paddy grown in irrigated area under rainfed condition

4/: Cropping intensity to Target Area 5/: Cropping intensity in irrigated field (not including paddy grown under rainfed condition)

6/: Cropping intensity in irrigated field (including paddy under rainfed condition) 7/: Weighted annual average yield of irrigated & rainfed paddy

Table A-4.2.8 Present Agriculture Conditions in Target Schemes: North Sumatra - 2/3

District		Asahan - continued							Simalungun							Dairi		Karo	Deli S.
Irrigation Scheme		Panca Arga	Serbangan	Silau Bonto	Sungai Silau	Padang Mahondang	Simujur	Purwodadi	Pentara	Simantin Pane Dame	Panambean / Panet Tongah BK	Raja Hombang / T. Mangaraja	Kerasaan	J. Kolonisasi/ Purbolonggo	Naga Sompah	Risma Duma	Lae Ordi	Parit Lompaten	Bandar Sidoras
No.		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Technical Level		T	T	NT	ST	ST	ST	T	ST	NT	T	T	T	T	T	ST	ST	ST	ST
1. Land Use																			
1.1 Potential Area																			
- Irrigated Paddy Field	ha	1,829	2,044	20	200	724	1,200	1,635	40	0	1,722	2,023	3,869	1,015	1,015	0	15	619	2,462
- Rainfed Paddy Field	ha	671	0	0	0	2,181	0	0	0	0	0	0	0	0	0	800	185	621	995
- Non-paddy Field	ha	0	0	3,157	840	0	0	0	858	1,000	0	0	918	0	0	722	407	2	0
Upland Field	ha									1,000						722	407	2	
Tree Crops Land	ha			2,210	588				600				643						
Uncultivated Land	ha			947	252				258				275						
Total	ha	2,500	2,044	3,177	1,040	2,905	1,200	1,635	898	1,000	1,722	2,023	4,787	1,015	1,015	1,522	607	1,242	3,457
1.2 Non-potential Area																			
- Rainfed Paddy Field	ha	0	0	0	0	0	810	0	0	0	0	0	0	0	0	0	0	0	0
- Non-paddy Field	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	593	0	0
Upland Field	ha																593		
Tree Crops Land	ha																		
Uncultivated Land	ha																		
Total	ha	0	0	0	0	0	810	0	0	0	0	0	0	0	0	0	593	0	0
1.3 Target Area (1.1 + 1.2)	ha	2,500	2,044	3,177	1,040	2,905	2,010	1,635	898	1,000	1,722	2,023	4,787	1,015	1,015	1,522	1,200	1,242	3,457
1.4 Converted Land 1/	ha	0	289	54	275	326	550	0	136	0	1	22	213	15	345	0	0	0	0
1.5 Registered Area (1.3 + 1.4)	ha	2,500	2,333	3,231	1,315	3,231	2,560	1,635	1,034	1,000	1,723	2,045	5,000	1,030	1,360	1,522	1,200	1,242	3,457
2. Cropping Pattern in Irrigated Area 2/		A	A	A	D	A	A	A	B	-	A	B	B	A	B	-	A	A	A
3. Cropped Area/Cropping Intensity																			
3.1 Cropped Area of Annual Crops																			
1) Wet Season																			
- Irrigated Paddy	ha	1,000	1,842	20		724	1,200	1,635	40		1,653	2,007	2,697	1,010	1,003		15	325	2,462
- Paddy (rainfed cond.) 3/	ha	829			200													294	
- Rainfed Paddy	ha	671				2,181	810									800	185	621	995
- Palawija	ha									1,000	3	12	60	5	12	722	800	2	
Total	ha	2,500	1,842	20	200	2,905	2,010	1,635	40	1,000	1,656	2,019	2,757	1,015	1,015	1,522	1,000	1,242	3,457
2) Dry Season I																			
- Palawija	ha																		
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3) Dry Season II																			
- Irrigated Paddy	ha	786	1,760	20		300	712	1,619	20		1,702	1,251	2,715	989	489		15	325	1,970
- Palawija	ha				35				20		7	590	869	9	508				
Total	ha	786	1,760	20	35	300	712	1,619	40	0	1,709	1,841	3,584	998	997	0	15	325	1,970
4) Annual																			
- Irrigated Paddy	ha	1,786	3,602	40	0	1,024	1,912	3,254	60	0	3,355	3,258	5,412	1,999	1,492	0	30	650	4,432
- Paddy (rainfed cond.) 3/	ha	829	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	294	0
- Rainfed Paddy	ha	671	0	0	0	2,181	810	0	0	0	0	0	0	0	0	800	185	621	995
- Palawija	ha	0	0	0	35	0	0	0	20	1,000	10	602	929	14	520	722	800	2	0
Total	ha	3,286	3,602	40	235	3,205	2,722	3,254	80	1,000	3,365	3,860	6,341	2,013	2,012	1,522	1,015	1,567	5,427
3.2 Overall Intensity of Annual Crops 4/																			
1) Wet Season	%	100	90	2	44	100	100	100	13	100	96	100	67	100	100	100	83	100	100
2) Dry Season I	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3) Dry Season II	%	31	86	2	8	10	35	99	13	0	99	91	86	98	98	0	1	26	57
4) Annual	%																		
- Irrigated Paddy	%	71	176	4	0	35	95	199	20	0	195	161	131	197	147	0	3	52	128
- Paddy (rainfed cond.) 3/	%	33	0	0	44	0	0	0	0	0	0	0	0	0	0	0	0	24	0
- Rainfed Paddy	%	27	0	0	0	75	40	0	0	0	0	0	0	0	0	53	15	50	29
- Palawija	%	0	0	0	8	0	0	0	7	100	1	30	22	1	51	47	67	0	0
Total	%	131	176	4	52	110	135	199	27	100	195	191	153	198	198	100	85	126	157
3.3 Irrigation Performances 5/	%	98	176	200	18	141	159	199	200	-	195	191	164	198	198	-	200	105	180
3.4 Intensity in Irrigated Field 6/	%	143	176	200	118	141	159	199	200	-	195	191	164	198	198	-	200	153	180
4. Crop Yield & Production																			
4.1 Crop Yield																			
1) Wet Season																			
- Irrigated Paddy	t/ha	3.5	4.0	3.5		4.0	4.0	4.0	4.0		4.5	4.5	4.5	4.5	4.0		3.5	4.0	4.5
- Paddy (rainfed cond.) 3/	t/ha	2.5			2.5													2.5	
- Rainfed Paddy	t/ha	2.5				2.5	2.5									2.5	2.5	2.5	2.5
- Palawija	t/ha									2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
2) Dry Season I																			
- Palawija	t/ha																		
3) Dry Season I																			
- Irrigated Paddy	t/ha	3.5	4.0	3.5		3.5	4.0	4.0	4.0		4.5	4.0	4.5	4.5	4.5		3.5	4.0	4.0
- Palawija	t/ha				2.5				2.5		2.5	2.5	2.5	2.5	2.5				
4) Avg. Paddy Yield 7/	t/ha	3.0	4.0	3.5	2.5	2.9	3.6	4.0	4.0	-	4.5	4.3	4.5	4.5	4.2	2.5	2.6	3.1	4.0
4.2 Annual Crop Production																			
1) Irrigated Paddy	ton	6,251	14,408	140	0	3,946	7,648	13,016	240	0	15,098	14,036	24,354	8,996	6,213	0	105	2,600	18,959
2) Paddy (rainfed cond.) 3/	ton	2,073	0	0	500	0	0	0	0	0	0	0	0	0	0	0	0	735	0
3) Rainfed Paddy	ton	1,678	0	0	0	5,453	2,025	0	0	0	0	0	0	0	0	2,000	463	1,553	2,488
4) Total Paddy	ton	10,001	14,408	140	500	9,399	9,673	13,016	240	0	15,098	14,036	24,354	8,996	6,213	2,000	568	4,888	21,447
5) Palawija	ton	0	0	0	88	0	0	0	50	2,500	25	1,505	2,323	35	1,300	1,805	2,000	5	0

1/: Area converted to other land uses (alih fungsi)

2/: Cropping patter: A = paddy - paddy or paddy - paddy/fallow; B = paddy - paddy/palawija or paddy - paddy/palawija/fallow; C = paddy - fallow; D = paddy - palawija/fallow; E = other patterns 3/: Paddy grown in irrigated area under rainfed condition

4/: Cropping intensity to Target Area 5/: Cropping intensity in irrigated field (not including paddy grown under rainfed condition)

6/: Cropping intensity in irrigated field (including paddy under rainfed condition) 7/: Weighted annual average yield of irrigated & rainfed paddy

Table A-4.2.8 Present Agriculture Conditions in Target Schemes: North Sumatra - 3/3

District		Deli Saerdang						Langkat	Inter-district Scheme							Overall Province	
Irrigation Scheme		Namu Rambe	Sei Belutu	Langau	Medan Krio	Rantau Panjang	Pekan Kamis	Secanggang	Paya Lobang	Namu Sira-sira Kr & Kn	Namu Sira-sira Kr & Kn	Bah Korah II	Sijambi	Rambung Mera	Paya Sordang		
No.		37	38	39	40	41	42	43	44	45	46	47	48	49	50		
Technical Level		T	ST	ST	T	ST	ST	ST	ST	T	T	T	T	T	T		
1. Land Use																	
1.1 Potential Area																	
- Irrigated Paddy Field	ha	1,036	5,076	1,150	2,943	2,309	920	1,319	1,263	1,350	3,953	1,723	885	944	3,979	**72,620**	74%
- Rainfed Paddy Field	ha	0	0	750	0	0	180	0	295	0	0	0	95	0	371	**10,536**	11%
- Non-paddy Field	ha	0	0	0	57	0	0	81	0	0	0	0	28	0	0	**11,838**	12%
Upland Field	ha				57			81					28			**2,297**	2%
Tree Crops Land	ha															**6,371**	6%
Uncultivated Land	ha															**3,170**	3%
Total	ha	1,036	5,076	1,900	3,000	2,309	1,100	1,400	1,558	1,350	3,953	1,723	1,008	944	4,350	**94,994**	97%
1.2 Non-potential Area																	
- Rainfed Paddy Field	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**810**	1%
- Non-paddy Field	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2,338**	2%
Upland Field	ha															**593**	1%
Tree Crops Land	ha															**1,221**	1%
Uncultivated Land	ha															**524**	1%
Total	ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3,148**	3%
1.3 Target Area (1.1 + 1.2)	ha	1,036	5,076	1,900	3,000	2,309	1,100	1,400	1,558	1,350	3,953	1,723	1,008	944	4,350	**98,142**	100%
1.4 Converted Land 1/	ha	0	6	100	16	0	0	0	0	900	147	272	5	2	0	**9,041**	
1.5 Registered Area (1.3 + 1.4)	ha	1,036	5,082	2,000	3,016	2,309	1,100	1,400	1,558	2,250	4,100	1,995	1,013	946	4,350	**107,183**	
2. Cropping Pattern in Irrigated Area 2/		D	A	A	B	C	B	C	A	B	B	A	A	B	A		
3. Cropped Area/Cropping Intensity																	
3.1 Cropped Area of Annual Crops																	
1) Wet Season																	
- Irrigated Paddy	ha	1,036	4,020	767	2,943		815	1,290	1,263	1,350	3,953	1,485	885	944	3,562	**62,565**	74%
- Paddy (rainfed cond.) 3/	ha		1,056	383		2,309	105	29								**7,397**	9%
- Rainfed Paddy	ha			750			180		295				95		371	**11,346**	13%
- Palawija	ha				57			81				8	28			**2,790**	3%
Total	ha	1,036	5,076	1,900	3,000	2,309	1,100	1,400	1,558	1,350	3,953	1,493	1,008	944	3,933	**84,098**	100%
2) Dry Season I																	
- Palawija	ha	143														**143**	
Total		143	0	0	0	0	0	0	0	0	0	0	0	0	0	**143**	
3) Dry Season II																	
- Irrigated Paddy	ha		4,020	767	2,143		815		884	270	791	1,568	443	786	2,862	**42,987**	92%
- Palawija	ha	143			800		92			135	395			89		**3,762**	8%
Total	ha	143	4,020	767	2,943	0	907	0	884	405	1,186	1,568	443	875	2,862	**46,749**	100%
4) Annual																	
- Irrigated Paddy	ha	1,036	8,040	1,534	5,086	0	1,630	1,290	2,147	1,620	4,744	3,053	1,328	1,730	6,424	**105,552**	81%
- Paddy (rainfed cond.) 3/	ha	0	1,056	383	0	2,309	105	29	0	0	0	0	0	0	0	**7,397**	6%
- Rainfed Paddy	ha	0	0	750	0	0	180	0	295	0	0	0	95	0	371	**11,346**	9%
- Palawija	ha	286	0	0	857	0	92	81	0	135	395	8	28	89	0	**6,695**	5%
Total	ha	1,322	9,096	2,667	5,943	2,309	2,007	1,400	2,442	1,755	5,139	3,061	1,451	1,819	6,795	**130,990**	100%
3.2 Overall Intensity of Annual Crops 4/																	
1) Wet Season	%	100	100	100	100	100	100	100	100	100	100	87	100	100	90	**93**	
2) Dry Season I	%	14	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
3) Dry Season II	%	14	79	40	98	0	82	0	57	30	30	91	44	93	66	**52**	
4) Annual	%																
- Irrigated Paddy	%	100	158	81	170	0	148	92	138	120	120	177	132	183	148	**117**	
- Paddy (rainfed cond.) 3/	%	0	21	20	0	100	10	2	0	0	0	0	0	0	0	**8**	
- Rainfed Paddy	%	0	0	39	0	0	16	0	19	0	0	0	9	0	9	**13**	
- Palawija	%	28	0	0	29	0	8	6	0	10	10	0	3	9	0	**7**	
Total	%	128	179	140	198	100	182	100	157	130	130	178	144	193	156	**145**	
3.3 Irrigation Performances 5/	%	128	158	133	200	0	187	98	170	130	130	178	150	193	161	**151**	
3.4 Intensity in Irrigated Field 6/	%	128	179	167	200	100	199	100	170	130	130	178	150	193	161	**161**	
4. Crop Yield & Production																	
4.1 Crop Yield																	
1) Wet Season																	
- Irrigated Paddy	t/ha	4.0	4.0	4.0	4.0		4.5	4.0	4.0	4.5	4.5	4.5	4.0	4.5	4.5		
- Paddy (rainfed cond.) 3/	t/ha		2.5	2.5		2.5	2.5	2.5									
- Rainfed Paddy	t/ha			2.5			2.5		2.5				2.5		2.5		
- Palawija	t/ha				2.5			2.5				2.5	2.5				
2) Dry Season I																	
- Palawija	t/ha	2.5															
3) Dry Season I																	
- Irrigated Paddy	t/ha		3.5	3.5	4.0		4.0		4.5	4.5	4.5	4.5	3.5	4.5	4.5		
- Palawija	t/ha	2.5			2.5		2.5			2.5	2.5			2.5			
4) Avg. Paddy Yield 7/	t/ha	4.0	3.6	3.2	4.0	2.5	4.0	4.0	4.0	4.5	4.5	4.5	3.7	4.5	4.4	**3.9**	
4.2 Annual Crop Production																	
1) Irrigated Paddy	ton	4,144	30,150	5,753	20,344	0	6,928	5,160	9,030	7,290	21,348	13,739	5,091	7,785	28,908	**438,328**	
2) Paddy (rainfed cond.) 3/	ton	0	2,640	958	0	5,773	263	73	0	0	0	0	0	0	0	**18,493**	
3) Rainfed Paddy	ton	0	0	1,875	0	0	450	0	738	0	0	0	238	0	928	**28,365**	
4) Total Paddy	ton	4,144	32,790	8,585	20,344	5,773	7,640	5,233	9,768	7,290	21,348	13,739	5,328	7,785	29,836	**485,185**	
5) Palawija	ton	715	0	0	2,143	0	230	203	0	338	988	20	70	223	0	**16,738**	

1/: Area converted to other land uses (alih fungsi)

2/: Cropping patter: A = paddy - paddy or paddy - paddy/fallow; B = paddy - paddy/palawija or paddy - paddy/palawija/fallow; C = paddy - fallow; D = paddy - palawija/fallow; E = other patterns 3/: Paddy grown in irrigated area under rainfed condition

4/: Cropping intensity to Target Area 5/: Cropping intensity in irrigated field (not including paddy grown under rainfed condition)

6/: Cropping intensity in irrigated field (including paddy under rainfed condition) 7/: Weighted annual average yield of irrigated & rainfed paddy

Table A-4.2.9 Estimation of Irrigated Paddy Yield : North Sumatra

District/Irrigation Scheme	Irrigated Paddy Field	Tech. Level	Major Sub-district	Statistic Data (GKG t/ha) 1/												PSDA (GKG t/ha) 2/				Crop Cutting Survey 3/ Average of 2000 to 2002				Inventory Survey (GKG t/ha) 4/						Estimated Yield (GKG t/ha)			
				1998/1999			1999/2000			2000/2001			Average			Technical Level				Wet		Dry		Average of 00/01 - 02/03						Present		Planned Target	
				10-3	4-9A	4-9B	10-3	4-9A	4-9B	10-3	4-9A	4-9B	10-3	4-9A	4-9B	T	ST	NT	Rawa	No.	Avg.	No.	Avg.	Source	Wet	Dry	Source	Wet	Dry	Wet	Dry	Wet	Dry
Nias			District	3.3	3.3	3.3	3.7	3.5	3.3	3.7	3.5	3.3	3.6	3.4	3.3	3.8	3.7	3.3															
1. Gido Sebua	883	T	Gido	'95	2.4		'98	1.5																farmer	2.6	2.6				3.0	3.0	4.5	4.5
Mandaling Natal			District				4.6	4.6	4.5	4.6	4.7	4.2	4.6	4.7	4.4																			
2. Batang Gadis	5,575	T	Panyabungan		4.8						6.4			5.6										DIPERTA	5.0	3.9				4.0	4.0	5.0	5.0
Tapanuli Selatan			District	4.7	4.7	4.4	4.6	4.6	4.5	4.6	4.6	4.1	4.6	4.6	4.3	4.9	4.7	4.2	3.8														
3. Batang Ilung	3,546	T	Padang Bolak		5.4			5.4			5.9			5.6						36	7.0	8	7.5	farmer	5.8	5.8				5.0	4.5	5.5	5.5
4. Blk Sitongkon/Napa Suron	500	ST	Barumun		5.4			5.4			5.7			5.5																	4.0	4.0	5.0	5.0
5. Siborna	595	ST	Sosa		7.6			5.4			5.5			6.2						12	5.3			farmer	5.0	3.5	rainfed			2.5	-	4.5	4.5
50. Paya Sordang	3,979	T	Batang Angkola		5.4			5.5			5.4			5.4										farmer	4.3	4.3				4.5	4.5	5.5	5.5
Tapanuli Tengah			District	3.9	3.9	3.6	4.0	3.9	3.9	4.0	4.1	3.7	4.0	4.0	3.7	4.0	3.9	3.8	3.4														
6. Siaili Tukka	255	T	Sibolga					4.5			4.5			4.5										farmer	5.2	5.2				4.0	4.0	5.0	5.0
7. Badiri Lopian	899	T	Lumut					4.8			4.6			4.7						3	4.2			farmer	4.3	4.3				4.0	4.0	5.0	5.0
8. Pandurungan	1,034	T	Lumut					4.8			4.6			4.7						3	4.2			farmer	5.2	5.2				4.0	4.0	5.0	5.0
9. Sihiong	0	NT	Sibagangun																								rainfed			2.5		4.5	4.5
Tapanuli Utara			District	4.0	4.0	3.8	4.0	4.0	4.0	4.0	4.0	3.9	4.0	4.0	3.9	4.4	4.2	4.0	3.9														
10. Aek Silang	200	ST	Dolok Sanggul																	3	2.1			farmer	3.5	3.5				3.5	-	4.5	4.5
11. Sarulla	1,214	ST	Pahae Jae		4.0			4.0			4.2			4.1																	3.5	3.5	4.5	4.5
12. Parmiahan Hutapaung	200	ST	Dolok Sanggul																												3.5	-	4.5	4.5
13. Sinamo	100	ST	Pakkat	'98	4.0		'99	4.0			4.0			4.0																	3.5	-	4.5	4.5
Toba Samosir			District				4.0	4.0	4.0	4.0	4.0	3.9	4.0	4.0	4.0																			
14. Aek Mandos I	999	ST	Porsea	'98	4.3		'99	4.4			4.6			4.4								1	6.1								3.5	-	4.5	4.5
15. Simangatasi II	1,514	T	Silaen		4.1			4.1			4.2			4.1																	3.5	-	4.5	4.5
Labuhan Batu			District	4.0	4.0	3.8	4.0	4.0	3.9	4.0	4.0	3.9	4.0	4.0	3.9	4.4	4.3	4.1	3.4														
16. Bulung Ihit	1,355	T	Merbau		4.6																			farmer	5.0	5.0				4.0	4.0	5.0	5.0
Asahan			District	4.2	4.1	4.2	4.2	4.2	4.1	4.1	4.2	4.0	4.2	4.2	4.1	4.5	4.4	4.2	3.9														
17. Perkotaan	3,339	T	Air Putih		4.3			5.5			4.3			4.7						111	3.7	39	4.7	farmer	6.1	6.1				4.0	4.0	5.0	5.0
18. Sungai Balai	1,130	ST	Tanjung Tiram		4.2			4.3			3.7			4.1										farmer	4.3	6.1				4.0	4.0	5.0	5.0
19. Panca Arga	1,829	T	Meranti		4.3			4.1			4.0			4.1						3	4.5				3.2	3.2				3.5	3.5	4.5	4.5
20. Serbangan	1,983	T	Meranti		4.3			4.1			4.0			4.1						3	4.5			farmer	4.8	4.8	farmer	4.8	4.1	4.0	4.0	5.0	5.0
21. Silau Bonto	3,117	NT	Air Joman		4.2			3.7			3.9			3.9										farmer	3.9	3.9				3.5	3.5	4.5	4.5
22. Sungai Silau	625	ST	Simpang Empat		4.1			4.1			3.9			4.0						12	4.2			farmer	2.9		rainfed			2.5	-	4.5	4.5
23. Padang Mahondang	724	ST	Pulo Rakyat		4.1			4.1			4.7			4.3										farmer	3.8	3.8				4.0	3.5	5.0	5.0
24. Simujur	1,200	ST	Air Putih		4.3			5.5			4.3			4.7						11	4.6	7	4.8	farmer	4.3	3.9				4.0	4.0	5.0	5.0
25. Purwodadi	1,635	T	Lima Puluh		4.2			4.3			2.7			3.7						2	2.4	2	3.8	WUA	5.7	5.7				4.0	4.0	5.0	5.0
48. Sijambi	885	T	Simpang Empat		4.1			4.1			3.9			4.0											3.6	3.0				4.0	3.5	5.0	4.5
Simalungun			District	4.9	4.8	4.7	4.9	4.8	4.8	4.8	4.8	4.3	4.9	4.8	4.6	5.0	4.5	4.2															
26. Pentara	146	ST	Raya																					farmer	5.2	4.5				4.0	4.0	5.0	5.0
27. Simantin Pane Dame	0	NT	Panei		4.8			4.8			5.0			4.9													rainfed			-	-	4.5	4.5
28. Panambean/Panet Tongah BK	1,722	T	Panei		4.8			4.8			5.0			4.9						13	5.7	29	5.9	farmer	4.8	4.9				4.5	4.5	5.5	5.5
29. Raja Hombang /T.Mangaraja	1,982	T	Huta Bayu Raja		4.9			4.9			4.7			4.8						13	5.0									4.5	4.0	5.5	5.0
30. Kerasaan	3,869	T	Pem. Bandar		5.0			5.0			4.9			5.0						17	5.0	29	5.8							4.5	4.5	5.5	5.5
31. J. Kolonisasi/Purbolonggo	984	T	Joring Hataran		4.8			4.8			4.8			4.8						2	6.1	5	5.8	farmer	5.6	5.8				4.5	4.5	5.5	5.5
32. Naga Sompah	1,060	T	Pem. Bandar		5.0			5.0			4.9			5.0						17	5.0	29	5.8	farmer	4.6	4.6				4.0	4.5	5.0	5.5
47. Bah Korah II	1,900	T	Siantar		4.9			4.9			5.1			5.0						9	5.4	25	5.6	farmer	4.9	4.2				4.5	4.5	5.5	5.5
49. Rambung Mera	1,102	T	Siantar		4.9			4.9			5.1			5.0						9	5.4	25	5.6	farmer	4.5	4.7				4.5	4.5	5.0	5.5
Dairi			District	4.0	3.9	3.7	4.0	4.0	4.0	4.0	3.9	3.8	4.0	3.9	3.8		4.2	3.9															
33. Risma Duma	0	ST	Silima Pungga-pungga		5.7			5.6			5.6			5.6											3.2	2.9	rainfed			2.5	-	4.5	4.5
34. Lae Ordi	15	ST	Salak		3.5			3.5			3.5			3.5																3.5	3.5	4.5	4.5
Karo			District	4.1	3.9	3.9	4.1	4.1	4.0	4.1	4.1	3.8	4.1	4.0	3.9		4.5		4.1														
35. Parit Lompaten	619	ST	Juhar								6.1									6	5.9			farmer	5.2	4.3				4.0	4.0	5.0	5.0
Deli Serdang			District	4.7	4.7	4.3	4.7	4.6	4.6	4.7	4.6	4.2	4.7	4.6	4.4	5.0	4.7	4.2	3.9														
36. Bandar Sidoras	2,462	ST	Percut Seli Tuan		4.8						4.5			4.7						15	5.6	5	5.1							4.5	4.0	5.5	5.0
37. Namu Rambe	1,036	T	Namu Rambe		4.3						4.5			4.4																4.0	-	5.0	5.0
38. Sei Belutu	5,076	ST	Sei Rampah		4.7						4.6			4.7						7	5.2	4	3.5		4.3	4.9				4.0	3.5	5.0	5.0
39. Langau	1,150	ST	Bandar Khalifah		4.6						4.6			4.6						19	5.5	5	3.1	farmer	2.5	3				4.0	3.5	5.0	5.0
40. Medan Krio	2,943	T	Sunggal		4.6						4.7			4.7											3.5	3.5				4.0	4.0	5.0	5.0
41. Rantau Panjang	2,309	ST	Pantai Labu		5.1						4.5			4.8						33	4.1						rainfed			2.5	-	4.5	4.5
42. Pekan Kamis	920	ST	D. Masihull		4.6						4.3			4.5						29	4.8	12	3.9	farmer	5.2	5.2				4.5	4.0	5.5	5.0
44. Paya Lobang	1,263	ST	Tebing Tinggi		4.6						4.6			4.6										farmer	4.3	5.4				4.0	4.5	5.0	5.0
Langkat			District	4.1	4.1	4.2	4.2	4.1	4.1	4.1	4.2	4.0	4.1	4.1	4.1	4.8	4.4		4.1														
43. Secanggang	1,319	ST	Secanggang		5.0						4.8			4.9										farmer	4.3	4.3		3.5	3.5	4.0	-	5.0	5.0
45.. Namu Sira-sira Kiri	5,303	T	Sei Bingei		7.0						6.7			6.9						25	5.8	10	5.9		3.5	4.3				4.5	4.5	5.5	5.5
46. Namu Sira-sira Kanan			Kuala					6.0			6.5			6.3																			

1/: District data -- Statistik Padi & Palawija Sumatera Utara, 1999, 2000 & 2001, BPS N. Sumatra; Sub-district data --- Kabupaten Dalam Angka, 1999, 2000 & 2001, BPS Kabupaten

2/: Bahan Presentase Rapat Regional Pemantapan O&P Pengairan Tahun Anggaran 2000, aeptember 2000, Dinas Pekerjaan Umun Pengairan, Sumatera Utara

3/: Results of crop cutting survey carried out by BPS in 2000, 2001 & 2002 (GKG t/ha)

4/: Results of the Inventory Survey by the Study Team

Table A-4.2.10 Financial Crop Budget per Ha : North Sumatra

Items	Unit	Unit Price	Paddy														Maize					
			Rainfed Paddy				Irrigated Paddy										Composit		Hybrid			
		(Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)
1. Gross Return																			No-tillage		No-tillage	
Unit Yield	(t/ha)		2.5		3.0		3.5		4.0		4.5		5.0		5.5		2.5		4.0		5.0	
Unit Price	(Rp.000/t)			1,300		1,300		1,300		1,300		1,300		1,300		1,300		1,100		1,100		1,100
Gross Return	(Rp.000)			**3,250**		**3,900**		**4,550**		**5,200**		**5,850**		**6,500**		**7,150**		**2,750**		**4,400**		**5,500**
2. Production cost				**1,497**		**1,762**		**1,983**		**2,173**		**2,404**		**2,570**		**2,725**		**914**		**1,670**		**2,006**
2-1. Farm Inputs				*297*		*392*		*482*		*542*		*677*		*750*		*830*		*460*		*953*		*1,090*
Seed 1/	(kg)		30	60	30	60	30	60	30	60	30	90	30	90	30	90	30	120	20	440	20	440
Fertilizers				187		282		347		389		494		568		648		290		385		498
- Urea	(kg)	1.3	100	130	100	130	150	195	150	195	180	234	200	260	225	293	150	195	150	195	200	260
- SP36	(kg)	1.9	30	57	50	95	50	95	50	95	50	95	75	143	75	143	50	95	75	143	75	143
- KCl	(kg)	1.9	0	0	30	57	30	57	30	57	50	95	50	95	75	143		0	25	48	50	95
- ZA	(kg)	1.4	0	0	0	0	0	0	30	42	50	70	50	70	50	70		0		0		0
Agro chemicals				50		50		75		93		93		93		93		50		128		153
- Insecticide (liquid)	(lit)	50	1.0	50	1.0	50	1.5	75	1.5	75	1.5	75	1.5	75	1.5	75	1.0	50	1.0	50	1.5	75
- Insecticide (powder)	(kg)	30																				
- Rodenticide	(kg)	35							0.5	18	0.5	18	0.5	18	0.5	18			0.5	18	0.5	18
- Herbicide	(kg)	30																	2.0	60	2.0	60
2-2. Labour Costs				*684*		*828*		*936*		*1,044*		*1,116*		*1,188*		*1,242*		*180*		*270*		*360*
Contracted Works																						
- Planting/Transplanting 2/	(unit)		1	360	1	360	1	360	1	360	1	360	1	360	1	360						
- Harvesting	(unit)																					
Labour Requirements																						
- Hired Labor	(man-day)	18	18	324	26	468	32	576	38	684	42	756	46	828	49	882	10	180	15	270	20	360
- Family Labor	(man-day)		44		44		44		44		44		44		44		62		68		68	
Total	(man-day)		62		70		76		82		86		90		93		72		83		88	
2-3. Land Preparation				*380*		*380*		*380*		*380*		*380*		*380*		*380*		*0*		*0*		*0*
- Machinery	(unit)		1	380	1	380	1	380	1	380	1	380	1	380	1	380						
- Draft Animal	(unit)																					
2-4. Field Transportation	(L.S.)		2 %	*65*	2 %	*78*	2 %	*91*	2 %	*104*	2 %	*117*	2 %	*130*	2 %	*143*	2 %	*55*	2 %	*88*	2 %	*110*
2-5. Shelling Cost		70/t																*175*		*280*		*350*
2-6. Misceraneous Expenses	(L.S.)		5 %	*71*	5 %	*84*	5 %	*94*	5 %	*103*	5 %	*114*	5 %	*122*	5 %	*130*	5 %	*44*	5 %	*80*	5 %	*96*
				2.5		3.0		3.5		4.0		4.5		5.0		5.5		2.5		4.0		5.0
3. Net Return	Rp.000			**1,753**		**2,138**		**2,567**		**3,027**		**3,446**		**3,930**		**4,425**		**1,837**		**2,730**		**3,495**
	%			***54***		***55***		***56***		***58***		***59***		***60***		***62***		**67**		**62**		**64**
	Rounded	%		***1,750***		***2,140***		***2,570***		***3,030***		***3,450***		***3,930***		***4,420***		***1,840***		***2,730***		***3,490***

1/: Seed price: Paddy --- yield level < 4.5 Rp. 2,000; yield level ≧4.5 Rp. 3,000 Maize --- composite Rp. 4,000/kg; hybrid Rp. 22,000/ka

2/: Contract work for transplanting assumed --- Rp. 360,000/ha at financial price

Table A-4.2.11 Estimated Net Farm Income per Ha : North Sumatra - 1/2

Irrigation Scheme		Crop	Cropping Intensity & Cropped Area				Net Return per Ha (Rp. million)		Net Return per Ha of Farm (Rp. 000)
			Wet Season		Dry Season				
			Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Wet Season	Dry Season	
1. Gido Sebua	Technical	Irrigated Paddy	51	0.51	51	0.51	2.14	2.14	
Land Use	Irrigated Field	Paddy (rainfed)	49	0.49			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							3,040
2. Batang Gadis	Technical Irrigation	Irrigated Paddy	100	1.00	70	0.70	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,151
3. Batang Ilung	Technical Irrigation	Irrigated Paddy	100	1.00	72	0.72	3.93	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							6,414
4. Blk Sitongkon/	Semi-Tehnical	Irrigated Paddy	100	1.00	96	0.96	3.03	3.03	
Napa Suron	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,939
5. Siborna	Semi-Tehnical	Irrigated Paddy							
	Irrigated Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							1,750
6. Siaili Tukka	Technical Irrigation	Irrigated Paddy	100	1.00	50	0.50	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,545
7. Badiri Lopian	Technical Irrigation	Irrigated Paddy	100	1.00	30	0.30	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							3,939
8. Pandurungan	Technical Irrigation	Irrigated Paddy	100	1.00	50	0.50	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,545
9. Sihiong	Rainfed Area	Irrigated Paddy							
	Rainfed Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							1,750
10. Aek Silang	Semi-technical	Irrigated Paddy	100	1.00			2.57		
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			10	0.10		1.84	2,754
11. Sarulla	Semi-technical	Irrigated Paddy	63	0.63	14	0.14	2.57	2.57	
	Irrigated Field	Paddy (rainfed)	37	0.37			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							2,626
12. Parmiahan Hutapaun	Semi-technical	Irrigated Paddy	100	1.00			2.57		
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			20	0.20		1.84	2,938
13. Sinamo	Rainfed Area	Irrigated Paddy							
	Rainfed Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)			10	0.10		1.84	1,934
14. Aek Mandos I	Technical Irrigation	Irrigated Paddy	100	1.00			2.57		
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							2,570
15. Simangatasi II	Technical Irrigation	Irrigated Paddy	53	0.53			2.57		
	Irrigated Field	Paddy (rainfed)	47	0.47			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							2,185
16. Bulung Ihit	Technical Irrigation	Irrigated Paddy	100	1.00	50	0.50	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,545
17. Perkotaan	Technical Irrigation	Irrigated Paddy	84	0.84	84	0.84	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,090
18. Sungai Balai	Semi-technical	Irrigated Paddy	100	1.00	88	0.88	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,696
19. Panca Arga	Technical Irrigation	Irrigated Paddy	55	0.55	43	0.43	2.57	2.57	
	Irrigated Field	Paddy (rainfed)	45	0.45			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							3,306
20. Serbangan	Technical Irrigation	Irrigated Paddy	90	0.90	86	0.86	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,333
21. Silau Bonto	Non-technical	Irrigated Paddy	100	1.00	100	1.00	2.57	2.57	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,140
22. Sungai Silau	Semi-technical	Irrigated Paddy							
	Irrigated Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)			18	0.18		1.84	2,081
23. Padang Mahondang	Semi-technical	Irrigated Paddy	100	1.00	41	0.41	3.03	2.57	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,084
24. Simujur	Semi-technical	Irrigated Paddy	100	1.00	59	0.59	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,818
25. Purwodadi	Technical	Irrigated Paddy	100	1.00	99	0.99	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							6,030
26. Pentara	Semi-technical	Irrigated Paddy	100	1.00	50	0.50	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			50	0.50			4,545

Table A-4.2.11 Estimated Net Farm Income per Ha : North Sumatra - 2/2

Irrigation Scheme		Crop	Cropping Intensity & Cropped Area				Net Return per Ha (Rp. million)		Net Return per Ha of Farm (Rp. 000)
			Wet Season		Dry Season				
			Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Wet Season	Dry Season	
27. Simantin Pane Dame	Rainfed Area	Irrigated Paddy							
	Upland Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	100	1.00			1.84		1,840
28. Panambean / Panet T	Technical	Irrigated Paddy	96	0.96	99	0.99	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			0.6	0.01		1.84	6,739
29. Raja Hombang / T. M	Technical	Irrigated Paddy	99	0.99	62	0.62	3.45	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	1	0.01	29	0.29	1.84	1.84	5,846
30. Kerasaan	Technical	Irrigated Paddy	70	0.70	70	0.70	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	2	0.02	22	0.22	1.84	1.84	5,272
31. J. Kolonisasi/Purbol	Technical	Irrigated Paddy	100	1.00	97	0.97	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			1	0.01		1.84	6,815
32. Naga Sompah	Technical	Irrigated Paddy	99	0.99	48	0.48	3.03	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	1	0.01	50	0.50	1.84	1.84	5,594
33. Risma Duma	Rainfed Area	Irrigated Paddy							
	Rainfed Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							1,750
34. Lae Ordi	Rainfed Area	Irrigated Paddy							
	Upland Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	80	0.80			1.84		1,472
35. Parit Lompaten	Semi-technical	Irrigated Paddy	53	0.53	53	0.53	3.03	3.03	
	Irrigated Field	Paddy (rainfed)	47	0.47			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							4,034
36. Bandar Sidoras	Semi-technical	Irrigated Paddy	100	1.00	80	0.80	3.45	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,874
37. Namu Rambe	Technical	Irrigated Paddy	100	1.00			3.03		
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			28	0.28		1.84	3,545
38. Sei Belutu	Semi-technical	Irrigated Paddy	79	0.79	79	0.79	3.03	2.57	
	Irrigated Field	Paddy (rainfed)	21	0.21			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							4,792
39. Langau	Semi-technical	Irrigated Paddy	67	0.67	67	0.67	3.03	2.57	
	Irrigated Field	Paddy (rainfed)	33	0.33			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							4,330
40. Medan Krio	Technical	Irrigated Paddy	100	1.00	73	0.73	3.03	3.03	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			27	0.27		1.84	5,739
41. Rantau Panjang	Semi-technical	Irrigated Paddy							
	Irrigated Field	Paddy (rainfed)	100	1.00			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							1,750
42. Pekan Kamis	Semi-technical	Irrigated Paddy	89	0.89	89	0.89	3.45	3.03	
	Irrigated Field	Paddy (rainfed)	11	0.11			1.75		
Holding Size (ha)	1 ha	Palawija (maize)			10	0.10		1.84	6,144
43. Secanggang	Semi-technical	Irrigated Paddy	98	0.98			3.03		
	Irrigated Field	Paddy (rainfed)	2	0.02			1.75		
Holding Size (ha)	1 ha	Palawija (maize)							3,004
44. Paya Lobang	Semi-technical	Irrigated Paddy	100	1.00	70	0.70	3.03	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,445
45. Namu Sira-sira Kiri	Technical	Irrigated Paddy	100	1.00	20	0.20	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			10	0.10		1.84	4,324
46. Namu Sira-sira Kana	Technical	Irrigated Paddy	100	1.00	20	0.20	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			10	0.10		1.84	4,324
47. Bah Korah II	Technical	Irrigated Paddy	86	0.86	91	0.91	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)	0.5	0.01			1.84		6,116
48. Sijambi	Technical	Irrigated Paddy	100	1.00	50	0.50	3.03	2.57	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							4,315
49. Rambung Mera	Technical	Irrigated Paddy	100	1.00	83	0.83	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)			9	0.09		1.84	6,479
50. Paya Sordang	Technical	Irrigated Paddy	90	0.90	72	0.72	3.45	3.45	
	Irrigated Field	Paddy (rainfed)							
Holding Size (ha)	1 ha	Palawija (maize)							5,589
Average of	Irrigated Paddy Field								4,558
	Rainfed Paddy Field								1,811
	Upland Field								1,656
	Overall								4,278

Table A-4.2.12 Summary Sheet for Results of Inventory Survey on Agriculture Support Services and Agricultural Constraints : North Sumatra - 1/2

Irrigation Scheme	Technical Level	Registered Area (ha)	Irrigated Area (ha)	1. Agriculture Extension & Institutions										2. Marketing							3. Constraints *****											
				1.1	1.2	1.3	1.4	1.5		1.6	1.7	1.8			Paddy			Palawija		2.4		3.1		3.2		3.3		3.4		3.5		3.6	
				PPLs	BPPs	KUD	KUD Mandiri	Farm Credit		Farm Inputs	Seed Procurement	Farmers Organizations			2.1 Practices		2.2 Channel		2.3 Channel		Rice Mills	Storage Facilities	Engineering		Agronomic		Paddy Marketing		Palawija / Vegetable Marketing		KT		Extension	
								1.5.1	1.5.2			KT	UPJA	KOP	1st	2nd	1st	2nd	1st	2nd			1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1. Gido Sebua	T	1,258	883	5	1	1	0	c	b	a	c				a	c	a	c	b	a	b	a	a	e	c	d	a	d	a	d	a	b	a	c
2. Batang Gadis	T	6,628	5,575	7	1	4	2	d	d	a	a		22	1	a	d	a	c	b	a	a	c	d	b	b	c	d	b	-	-	a	b	c	a
3. Batang Ilung	T	4,194	3,546	4	1	1	0	d	d	a	a	26			c	b	e	d	-	-	c	a	a	f	b	c	a	b	-	-			c	d
4. Blk Sitongkon/Napa Suron	ST	1,012	500	1	1	0	0	d	d	a	a				d	a	a		-	-	b	a	b		b	c	b		-	-	a	c	a	b
5. Siborna	ST	1,000	595	0	0	0	0	d	d	c	a				d	c	a	c	-	-	b	a	a		c	a			-	-			d	a
6. Siaili Tukka	T	1,057	255	1	1	2	0	b	a	a	a				a	c	a	c	b	a	b	c	e	d	c	b	a	c	a	c	a	c	b	c
7. Badiri Lopian	T	1,283	899	4	1	0	0	d	d	a	a			2	-	-	-	-	a	b	b	a	a		b	a	-	-	d	b	c	b	c	d
8. Pandurungan	T	1,769	1,034	4	1	0	0	c	d	b	b				a	c	a	c	b	a	b	c	a	d	c	d	a	d	a	d	b	d	a	b
9. Sihiong	NT	2,000	0	4	1	0	0	a	d	c	c				-	-	-	-	b	a	b	c	d	f	a	b	a	c	a	c	-	-	c	b
10. Aek Silang	ST	1,500	200	2	1	1	0	c	d	b	b				c	b	e	a	b	a	b	a	f	d	c	b	a	e	a	c	e	b	e	b
11. Sarulla	ST	1,692	1,214	1	1	0	0	d	d	a	a				a	d	a	c	-	-	b	a	d	e	a	c	a	c	-	-	a	c	a	d
12. Parmiahan Hutapaung	ST	1,000	200	3	1	0	0	c	c	b	b				c	b	e	a	b	a	b	a	d	e	b	c	a	e	a	d	d	a	e	b
13. Sinamo	ST	1,000	100	2	1	0	0	c	d	b	b				b	c	a	c	b	a	b	c	d	e	b	c	a	d	a	e	a	c	e	b
14. Aek Mandos I	ST	1,060	999	2	1	0	0	c	c	b	b				a	b	a	c	b	a	b	a	d	e	c	b	a	b	c	d	a	c	e	b
15. Simangatasi II	T	1,515	1,514	2	1	1	0	c	d	b	b				b	c	c	e	b	a	b	c	d	e	d	b	d	a	a	e	a	c	e	b
16. Bulung Ihit	T	5,000	1,355	4	1	1	0	a	a	a	a				a	c	a	b	-	-	a	a	a	e	a	c	a	e	-	-	a	d	c	d
17. Perkotaan	T	3,457	3,339	5	1	1	1	a	a	a	a		9	4	a	b	a		a		b	d	a	b	c	b	a	d	a	d	b		c	
18. Sungai Balai	ST	1,185	1,130	1	0	0	0	a	a	a	a			1	a		a		-	-			b	e	c	b	a	d	-	-	b	c	a	c
19. Panca Arga	T	2,500	1,829	1	0	0	0	a	a	a	a			1	a		a		-	-	c	c	a	e	b	c	a	d	-	-	b	c	a	c
20. Serbangan	T	2,333	2,044	2	0	1	0	a	a	a	a	22			a	d	a	c	a	b	c	c	a	b	c		d	a	d	a	b	c	a	c
21. Silau Bonto	NT	3,231	20	3	0	0	0	d	d	a	a				a	e	a	c	a	b	c	d	a	b	a	c	d	a	d	a	a	c	a	b
22. Sungai Silau	ST	1,315	200	1	1	1	0	a	a	a	a				a	b	a	c	a	b	b	c	d	e	a	c	d	a	d	b	a	b	a	c
23. Padang Mahondang	ST	3,231	724	5	2	1	0	d	d	a	a		1		a	b	a	c	a	b	b	c	a	d	a	b	a	d	a	d	c		a	b
24. Simujur	ST	2,560	1,200	1	0	0	0	b	c	a	a				a	e	a	c	-	-			a	b	a	c	a	d	d	a	a	c	a	b
25. Purwodadi	T	1,635	1,635	1	1	1	0	a	b	a	a	16			a	d	a	c	a	b	b	c	a	e	a	c	d	a	d	a	c	b	c	a

Inquiries and Coises for Answers Employed in the Inventory Survey

1. Agriculture Extension & Institutions

1.1 No. of PPLs working in the DI or deployed in sub-districts located in DI
1.2 No. of BPPs providing extension services in the DI
1.3 No. of KUDs in and around the DI
1.4 No. of KUD Mandiri among KUDs in and around the DI
1.5 Accessibility to farm credits in the DI
 1.5.1 Accessibility to farm credit by farmers in the DI
  a. No difficulty to receive farm credit
  b. Some difficulty to receive farm credit, but can get
  c. Very difficult to receive farm credit
  d. Almost no access to farm credit
 1.5.2 Coverage of farm credit in the DI
  a. Over 70 % of farmers supported by farm credit c. 20 - 40 % supported
  b. 40 - 70 % of farmers supported by farm credit d. less than 20% supporte
1.6 Procurement of farm inputs (fertilizer/chemical)
 a. No difficulty to procure b. Some difficulty c. Very difficult
1.7 Procurement of quality seeds
 a. No difficulty to procure b. Some difficulty c. Very difficult
1.8 Farmers Organizations
 No. of Kelompok Tani formed in the DI
 No. of UPJA formed in the DI
 No. of KOPTAN formed in the DI

2. Marketing

2.1 Prevailing Practices for Marketing of paddy
 a. Sold just after harvest at field
 b. Sold paddy after drying
 c. Sold after milling
 d. Sold after storing
 e. Other
2.2 Prevailing marketing channel of paddy in DI
 a. Paddy (gabah) to collector/middlemen
 b. Paddy (gabah) to KUD
 c. Paddy (gabah) to rice mill
 d. Rice (beras) to collector/middlemen
 e. Other
2.3 Prevailing marketing channel of palawija in DI
 a. Sold to collector/middlemen
 b. Sold at local market
 c. Sold to KUD
 e. Other
2.4 Availability of Post-harvest Facilities
 Rice Mills a. Surplus b. Enough c. Not enough
 Storage Facilities a. Enough b. Not enough c. Not existing

3. Constraints ***** 1st = primary constraint 2nd = secondary constraint

3.1 Engineering (Irrigation & Drainage)
 a. Water shortage at on-farm level in dry season
 b. Poor drainage
 c. Flooding
 d. Poor O&M at main & 2ry canals
 e. Poor O&M at tertiary level and below
 f. Other
3.2 Agronomic
 a. Farmers not following recommended practices
 b. Rat
 c. Pest & diseases
 d. Other
3.3 Paddy Marketing
 a. Low marketing prices
 b. Unstable marketing prices
 c. Limited market outlet
 d. Limited bargaining power of farmers
 e. Poor quality of products
 f. Other
3.4 Palawija & Vegetable Marketing
 a. Low marketing prices
 b. Unstable marketing prices
 c. Limited market outlet
 d. Limited bargaining power of farmers
 e. Poor quality of products
 f. Low competitiveness with other producing areas
 g. Other
3.5 Farmer Organizations (*kelompok tani/KT*)
 a. Most members are not active
 b. Economic activities are limited
 c. Managerial capacity of KTs are limited
 d. No collaboration among KTs
 e. Other
3.6 Extension
 a. Implementation of extension programs is limited
 b. Shortage of operation funds of PPLs
 c. Extension activities of PPLs are limited
 d. Capability & experiences of PPLs are limited
 e. Other

Table A-4.2.12 Summary Sheet for Results of Inventory Survey on Agriculture Support Services and Agricultural Constraints : North Sumatra - 2/2

Irrigation Scheme	Technical Level	Registered Area (ha)	Irrigated Area (ha)	1. Agriculture Extension & Institutions										2. Marketing							3. Constraints *****									
				1.1	1.2	1.3	1.4	1.5		1.6	1.7	1.8			Paddy				Palawija		2.4		3.1		3.2		3.3		3.4		3.5		3.6	
				PPLs	BPPs	KUD	KUD Mandiri	Farm Credit		Farm Inputs	Seed Procurement	Farmers Organizations			2.1 Practices		2.2 Channel		2.3 Channel		Rice Mills	Storage Facilities	Engineering		Agronomic		Paddy Marketing		Palawija / Vegetable Marketing		KT		Extension	
								1.5.1	1.5.2			KT	UPJA	KOP	1st	2nd	1st	2nd	1st	2nd			1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
26. Pentara	ST	1,034	40		1	0	0	d	d	a	a			2	a	c	a	d	a	c	b	a	a	b	b	d	b	a	a	g	c	b	c	d
27. Simantin Pane Dame	NT	1,000	0	7	1	4	2	d	d	a	a		22	1	a	d	a	c	-	-	a	c	d	b	b	a	d	b	-	-	a	b	c	a
28. Panambean/Panet Tong. BK	T	1,723	1,722	3	1	1	0	c	c	a	a			1	a	c	a	c	a	b	b	b	f	f	b	c	b	d	b	d	c	b	c	d
29. Raja Hombang/T. Mangaraja	T	2,045	2,023	8	1	1	0	a	a	a	a				a		a	c	-	-	b	c	b	e	a	c	a	d	-	-	a	c	a	c
30. Kerasaan	T	5,000	3,869	8	1	1	0	a	a	a	a	16		2	a	b	a				b	c	b	e	a	c					a	c	c	a
31. J. Kolonisasi/Purbolonggo	T	1,030	1,015	1	1	1	0	d	d	a	a			2	a	c	a	c	a	c	b	a	e	a	c	b	a	d	b	d	c	b	c	d
32. Naga Sompah	T	1,360	1,015	4	1	1	1	c	d	a	a			2	a	c	a	c	a	c	b	a	a	f	b	c	b	d	b	d	a	b	c	d
33. Risma Duma	ST	1,522	0	0	0	0	0	b	c	a	a				b	c	a	c	a	b	c	c	f		b	c			b		-	-	a	e
34. Lae Ordi	ST	1,200	15	2	1	2	0	c		c	c				b	d	d		a	b	c	b	a	b	b	c	a		a	b	a			
35. Parit Lompaten	ST	1,242	619	5	1	6	0	b	d	a	a		4	6	a	b	c	d	e	a	b	a	a	d	b	c	a	b	a	b	d		a	b
36. Bandar Sidoras	ST	3,457	2,462	6	1	8	3	a	c	a	a				a	c	a	c	a	d	b	a	b	f	a	c	a	d	a	d	a	c	a	b
37. Namu Rambe	T	1,036	1,036	2	2	6	4	a	b	a	a			6	c	b	c	e	c	b			d	e	a	b	a	b	a	b	a	c	b	d
38. Sei Belutu	ST	5,082	5,076	6	1	0	0	b	c	a	a			1	a	b	c	a	a	b	b	c	c	e	c	b	a	d	c	d	a	c	e	b
39. Langau	ST	2,000	1,150	2	1	0	0	a	a	a	a				a	b	a	c	-	-	b	c	a	b	a	b	d	a	-	-	d	a	e	a
40. Medan Krio	T	3,016	2,943	4	2	3	0	a	b	a	a		6	3	a	b	c	a	b	a	d	e	a	c	b	a	b	a	a	b	a	d	d	a
41. Rantau Panjang	ST	2,309	2,309	3	1	0	0	c	c	a	a				a	b	a	c	a	b	b	c	f		c	b	d	a	-	-	a	e	b	e
42. Pekan Kamis	ST	1,100	920	2	1	0	0	b	b	a	a				a	b	a	c	-	-	b	c	b	c	a		a	d	-	-			e	c
43. Secanggang	ST	1,400	1,319	2	2	3	0	a	b	a	a		6	3	a	b	a	a	b	a	a		a	b	b	c	b	d	a	b	a	b	d	a
44. Paya Lobang	ST	1,558	1,263	5	1	1	1	c	a	a	a			2	a	c	a	c	-	-	c	b	a	c	a	c	d	a	-	-	a		a	c
45. Namu Sira-sira, Kr & Kn	T	2,250	1,350	4	2	4	0	a	b	a	a		4		a	c	c	a	b	a	b	a	e	b	a	d	b	a	b	a	a	c	b	a
46. Namu Sira-sira Kanan	T	4,100	3,953	4	2	4	0	a	b	a	a		11		a	c	c	a	b	a	b	a	e	b	a	d	b	a	b	a	a	c	b	a
47. Bah Korah II	T	1,995	1,723	5	1	1	1	c	d	a	a				a	b	a	b	a	b	b	b	a	b	b	c	b	d	b	d	c	b	a	c
48. Sijambi	T	1,013	885	1	1	1	0	a	a	a	a				a	b	a	c	-	-	b	c	b	f	b	c	a	b	-	-	a	b	a	
49. Rambung Mera	T	946	944	1	0	1	1	d	d	a	a				a	b	a	c	a	b	b	b	a	b	b	c	b	d	b	d	a	c	a	c
50. Paya Sordang	T	4,350	3,979	4	1	2	0	d	d	a	a	40			a	e	a	c			b	b	d	e	b	c	a	d			a	c	a	d

Inquiries and Coises for Answers Employed in the Inventory Survey

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1.2 No. of BPPs providing extension services in the DI
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1.4 No. of KUD Mandiri among KUDs in and around the DI
1.5 Accessibility to farm credits in the DI
1.5.1 Accessibility to farm credit by farmers in the DI
a. No difficulty to receive farm credit
b. Some difficulty to receive farm credit, but can get
c. Very difficult to receive farm credit
d. Almost no access to farm credit
1.5.2 Coverage of farm credit in the DI
a. Over 70 % of farmers supported by farm credit
b. 40 - 70 % of farmers supported by farm credit
c. 20 - 40 % supported
d. less than 20% supporte
1.6 Procurement of farm inputs (fertilizer/chemical)
a. No difficulty to procure b. Some difficulty c. Very difficult
1.7 Procurement of quality seeds
a. No difficulty to procure b. Some difficulty c. Very difficult
1.8 Farmers Organizations
No. of Kelompok Tani formed in the DI
No. of UPJA formed in the DI
No. of KOPTAN formed in the DI

2. Marketing

2.1 Prevailing Practices for Marketing of paddy
a. Sold just after harvest at field
b. Sold paddy after drying
c. Sold after milling
d. Sold after storing
e. Other
2.2 Prevailing marketing channel of paddy in DI
a. Paddy (gabah) to collector/middlemen
b. Paddy (gabah) to KUD
c. Paddy (gabah) to rice mill
d. Rice (beras) to collector/middlemen
e. Other
2.3 Prevailing marketing channel of palawija in DI
a. Sold to collector/middlemen
b. Sold at local market
c. Sold to KUD
e. Other
2.4 Availability of Post-harvest Facilities
Rice Mills a. Surplus b. Enough c. Not enough
Storage Facilities a. Enough b. Not enough c. Not existing

3. Constraints ***** 1st = primary constraint 2nd = secondary constraint

3.1 Engineering (Irrigation & Drainage)
a. Water shortage at on-farm level in dry season
b. Poor drainage
c. Flooding
d. Poor O&M at main & 2ry canals
e. Poor O&M at tertiary level and below
f. Other
3.2 Agronomic
a. Farmers not following recommended practices
b. Rat
c. Pest & diseases
d. Other
3.3 Paddy Marketing
a. Low marketing prices
b. Unstable marketing prices
c. Limited market outlet
d. Limited bargaining power of farmers
e. Poor quality of products
f. Other
3.4 Palawija & Vegetable Marketing
a. Low marketing prices
b. Unstable marketing prices
c. Limited market outlet
d. Limited bargaining power of farmers
e. Poor quality of products
f. Low competitiveness with other producing areas
g. Other
3.5 Farmer Organizations (*kelompok tani/KT*)
a. Most members are not active
b. Economic activities are limited
c. Managerial capacity of KTs are limited
d. No collaboration among KTs
e. Other
3.6 Extension
a. Implementation of extension programs is limited
b. Shortage of operation funds of PPLs
c. Extension activities of PPLs are limited
d. Capability & experiences of PPLs are limited
e. Other

Table A-4.2.13 Current Condition of WUA in Study Area : North Sumatra

	District	Irrigation Scheme in Study Area	WUA Establishment			WUA Performance and Status					
			Target	Estab-lished	Realized Ratio (%)	Developed		Under Developing		Not Yet Developed	
						BBH	SBH	BBH	SBH	BBH	SBH
1	Nias	Gido Sebua	5	5	100	0	0	5	0	0	0
2	Mandaling Natal	Batang Gadis	40	23	58	0	0	23	0	0	0
3	Tapanuli Selatan	Batang Ilung	40	40	100	0	0	40	0	0	0
4		Bik Sitonekon / N.S.	16	1	6	0	0	0	0	1	0
5		Siboma	1	1	100	0	0	1	0	0	0
6	Tapanuli Tengah	Siaili Tukka	3	3	100	0	0	3	0	0	0
7		Badiri Lopian	5	3	60	0	0	3	0	0	0
8		Pandurungan	4	3	75	0	0	3	0	0	0
9		Sihiong	3	1	33	0	0	1	0	0	0
10	Tapanuli Utara	Aek Silang	5	1	20	0	0	1	0	0	0
11		Sallura	4	1	25	0	1	0	0	0	0
12		Parmiahan Hatapung	4	1	25	0	0	0	0	1	0
13		Sinamo	4	0	0	0	0	0	0	0	0
14	Toba Samosir	Aek Mandosi I	4	2	50	0	0	2	0	0	0
15		Simangatasi II	6	6	100	0	0	6	0	0	0
16	Labuhan Batu	Bulung Ihit	5	5	100	0	0	0	5	0	0
17	Asahan	Perkotaan	10	9	90	0	3	6	0	0	0
18		Sungai Balai	12	10	83	0	0	7	3	0	0
19		Panca Arga	4	4	100	0	0	0	1	3	0
20		Serbangan	19	17	89	0	0	0	6	11	0
21		Silau Bonto	3	1	33	0	0	0	1	0	0
22		Sungai Silau	3	3	100	0	0	3	0	0	0
23		Padang Mahondang	2	1	50	0	0	0	0	1	0
24		Simujur	3	6	200	0	0	2	0	4	0
25		Purwodari	5	5	100	0	0	3	2	0	0
26	Simalunggun	Pentara	1	1	100	0	0	0	0	1	0
27		Simantin Pane Dame	0	0	0	0	0	0	0	0	0
28		Panambean / P.T. / B.K.	16	16	100	0	2	0	0	14	0
29		Raja Hombang / T.M	17	17	100	0	0	2	0	15	0
30		Kerasaan	27	27	100	0	0	19	0	8	0
31		Javacolonisasi / Pur.	22	22	100	0	3	10	0	9	0
32		Naga Sompah	7	7	100	0	0	3	0	4	0
33	Dairi	Risma Duma	6	1	17	0	0	0	0	1	0
34		Lae Ordi	6	1	17	0	0	1	0	0	0
35	Karo	Parit Lompaten	4	4	100	0	0	0	0	4	0
36	Deli Serdang	Bandar Sidoras	24	5	21	0	0	5	0	0	0
37		Nam Rambe	11	8	73	1	0	3	2	2	0
38		Sei Belutu	51	8	16	0	0	0	7	1	0
39		Langau	19	3	16	0	0	1	0	2	0
40		Medan Krio	29	7	24	0	1	0	5	1	0
41		Rantau Panjang	23	3	13	0	0	0	0	3	0
42		Pekan Kamis	12	2	17	0	0	0	2	0	0
43	Langkat	Secanggang	3	2	67	0	0	0	0	2	0
44	D. Serdang/T. Tinggi	Paya Lombang	13	2	15	0	0	2	0	0	0
45	Langkat/Binjai	Nam Sira-Sira Kiri	9	8	89	0	0	0	3	1	4
46	Langkat/Binjai	Nam Sira-Sira Kanan	10	5	50	0	0	0	3	0	2
47	Simalunggun/Siantar	Bah Korah II	9	4	44	0	0	4	0	0	0
48	Asahan/Tamjun Balai	Sijambi	4	1	25	0	0	0	0	1	0
49	Siantar/Simalunggun	Rambung Mera	1	1	100	0	0	1	0	0	0
50	T. Selatan/M. Natal	Paya Sordang	40	30	75	0	0	1	0	28	1
		Total	574	337	59	1	10	161	40	118	7

Remarks SBH : Already registered in local court of justice
BBH : Not yet registered in local court of justice

Table A-5.2.1 Summary: Existing Condition and Development Plan: North Sumatra

No.	Irrigation Scheme	District	Existing Condition												Development Plan									
			Technical Level [1]	Registered Area (ha)	Age of Facility as of year 2003 (years)	Water Resources Facility			Canal and Related Facility					Terminal Facility and On Farm	Subject Area (ha)	Water Resources Facility		Canal and Related Facility					Terminal Facility and On Farm	
						Facility	Settling Basin	Condition	MC length (km)	SC length (km)	Nos. of Related Structures (nos.)	Condition		Condition		Grade of Rehabilitation	Settling Basin	Grade of Rehabilitation		MC length (km)	SC length (km)	Nos. of Related Structures (nos.)	Land/On-farm Development (ha)	
												MC	SC					MC	SC				Potential Area	Non-Potential Area
1	Gido Sebua	Nias	T	1,258	11	Headworks	provided	B	2.702	11.590	40	D	D	C	883	RG2	minor rehabili.	RG4	RG4	1.891	8.113	33	883	-
2	Batang Gadis	Mandaling Natal	T	6,628	11	Headworks	not provided	B	22.275	43.768	491	B	C	C	5,575	RG2	new construction	RG3 & RG4	RG3 & RG4	18.711	36.765	489	5,575	-
3	Batang Ilung	Tapanuli Selatan	T	4,194	11	Headworks	provided	B	6.360	53.510	271	C	C	C	3,546	RG2	replacement	RG3 & RG4	RG3 & RG4	5.406	45.484	274	3,546	-
4	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	27	Headworks	not provided	D	5.443	8.261	35	D	D	D	500	RG4	new construction	RG4	RG4	2.934	4.857	22	500	-
5	Siborna	Tapanuli Selatan	ST	1,000	19	Headworks	not provided	D	7.426	5.131	19	D	D	D	950	RG4	new construction	RG4	RG4	8.169	6.157	23	950	-
6	Siaili Tukka	Tapanuli Tengah	T	1,057	17	Headworks	not provided	D	1.783	6.432	26	D	C	C	600	RG4	new construction	RG4	RG3 & RG4	1.016	3.666	17	600	-
7	Badiri Lopian	Tapanuli Tengah	T	1,283	14	Free Intake	not provided	D	1.980	7.029	52	D	D	C	899	RG4	new construction	RG4	RG4	1.386	4.920	43	899	-
8	Pandurungan	Tapanuli Tengah	T	1,769	19	Headworks	not provided	D	2.265	20.284	55	D	D	C	1,334	RG4	new construction	RG4	RG4	1.699	15.213	49	1,334	-
9	Sihiong	Tapanuli Tengah	NT	2,000	19	Headworks	not provided	D	0.300	0.600	0	D	D	D	779	RG4	new construction	RG4	RG4	0.883	7.911	25	255	524
10	Aek Silang	Tapanuli Utara	ST	1,500	13	Free Intake	not provided	C	1.500	4.500	6	C	D	D	1,500	RG3	new construction	RG3 & RG4	RG4	1.650	5.400	8	1,500	-
11	Sarulla	Tapanuli Utara	ST	1,692	28	Headworks	not provided	C	0.934	2.820	6	D	D	D	1,692	RG3	new construction	RG4	RG4	1.027	3.384	8	1,692	-
12	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	10	Headworks	not provided	B	4.413	8.462	48	C	C	D	1,000	RG2	new construction	RG3 & RG4	RG3 & RG4	4.854	10.154	63	1,000	-
13	Sinamo	Tapanuli Utara	ST	1,000	34	Headworks	not provided	D	0.825	7.620	7	C	D	D	930	RG4	new construction	RG4	RG4	0.908	9.144	42	930	-
14	Aek Mandos I	Toba Samosir	ST	1,060	10	Headworks	not provided	C	0.360	4.944	15	B	D	D	1,059	RG3	new construction	RG3 & RG4	RG4	0.396	5.933	20	1,059	-
15	Simangatasi II	Toba Samosir	T	1,515	11	Headworks	not provided	C	4.658	3.754	23	C	C	C	1,514	RG3	new construction	RG3 & RG4	RG3 & RG4	4.658	3.754	27	1,514	-
16	Bulung Ihit	Labuhan Batu	T	5,000	5	Headworks	provided	B	5.520	26.550	51	D	D	C	1,355	RG2	minor rehabili.	RG4	RG4	1.490	7.169	16	1,355	-
17	Perkotaan	Asahan	T	3,457	14	Headworks	provided	B	19.580	40.403	125	C	C	B	3,446	RG2	large rehabili.	RG3 & RG4	RG3 & RG4	19.580	40.403	146	3,446	-
18	Sungai Balai	Asahan	ST	1,185	5	Headworks	not provided	C	3.339	8.267	35	D	D	C	1,130	RG3	new construction	RG4	RG4	3.673	9.920	46	1,130	-
19	Panca Arga	Asahan	T	2,500	10	Headworks	not provided	C	0.157	7.500	21	D	D	D	2,500	RG3 [2]	new construction	RG4	RG4	0.157	7.500	25	2,500	-
20	Serbangan	Asahan	T	2,333	10	Headworks	not provided	C	6.790	16.711	49	C	D	C	2,044	RG3 [2]	new construction	RG3 & RG4	RG4	5.975	16.202	50	2,044	-
21	Silau Bonto	Asahan	NT	3,231	10	Free Intake	not provided	D	0.000	0.000	0	D	D	D	967	RG4 [2]	new construction	RG4	RG4	0.825	6.990	35	967	-
22	Sungai Silau	Asahan	ST	1,315	32	Free Intake	not provided	D	1.650	16.500	50	D	D	D	452	RG4 [3]	new construction	RG4	RG4	0.617	6.732	23	452	-
23	Padang Mahondang	Asahan	ST	3,231	22	Free Intake	not provided	D	3.575	9.225	24	D	D	D	2,905	RG4	new construction	RG4	RG4	3.539	9.963	28	2,905	-
24	Simujur	Asahan	ST	2,560	18	Free Intake	not provided	D	2.300	15.700	7	D	D	D	2,010	RG4	new construction	RG4	RG4	1.999	14.884	21	1,200	810
25	Purwodadi	Asahan	T	1,635	14	Headworks	not provided	C	12.972	12.362	148	D	D	C	1,635	RG3	new construction	RG4	RG4	12.972	12.362	172	1,635	-
26	Pentara	Simalungun	ST	1,034	12	Headworks	provided	C	10.769	7.200	25	D	D	D	298	RG3	no rehabili.	RG4	RG4	3.435	2.506	9	298	-
27	Simantin Pane Dame	Simalungun	NT	1,000	14	Free Intake	not provided	D	2.000	0.000	3	D	D	D	1,000	RG4	new construction	RG4	RG4	2.400	-	4	1,000	-
28	Panambean / Panet Tongah BK	Simalungun	T	1,723	12	Headworks	provided	B	6.350	14.746	300	C	D	C	1,722	RG2	no rehabili.	RG3 & RG4	RG4	6.350	14.746	355	1,722	-
29	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	9	Headworks	provided	B	22.280	10.800	230	C	D	D	2,023	RG2	no rehabili.	RG3 & RG4	RG4	22.280	10.800	262	2,023	-
30	Kerasaan	Simalungun	T	5,000	15	Headworks	provided	C	30.306	53.105	149	C	D	D	4,144	RG3	replacement	RG3 & RG4	RG4	25.154	44.077	144	4,144	-
31	Javacolonisasi/Purbogondo	Simalungun	T	1,030	14	Headworks	provided	B	11.280	4.050	96	C	D	C	1,015	RG2	minor rehabili.	RG3 & RG4	RG4	11.280	4.050	107	1,015	-
32	Naga Sompah	Simalungun	T	1,360	16	Free Intake	not provided	D	13.417	9.712	117	C	D	C	1,015	RG4	new construction	RG3 & RG4	RG4	10.063	7.284	101	1,015	-
33	Risma Duma	Dairi	ST	1,522	21	Headworks	not provided	C	0.000	0.000	0	D	D	D	1,522	RG3	new construction	RG4	RG4	2.265	22.128	65	1,522	-
34	Lae Ordi	Dairi	ST	1,200	14	Headworks	not provided	C	12.000	6.000	21	C	D	D	1,200	RG3	new construction	RG3 & RG4	RG4	13.200	7.200	26	607	593
35	Parit Lompaten	Karo	ST	1,242	20	Headworks	not provided	D	11.780	14.518	60	C	D	D	1,242	RG4	new construction	RG4	RG4	12.958	17.422	74	1,242	-
36	Bandar Sidoras	Deli Serdang	ST	3,457	18	Headworks	not provided	D	1.390	37.461	38	D	D	D	3,457	RG4	new construction	RG4	RG4	1.529	44.953	51	3,457	-
37	Namu Rambe	Deli Serdang	T	1,036	37	Headworks	provided	D	5.790	11.036	88	D	D	D	1,036	RG4	replacement	RG4	RG4	5.790	11.036	99	1,036	-
38	Sei Belutu	Deli Serdang	ST	5,082	40	Free Intake	not provided	D	0.250	25.750	21	D	D	D	5,076	RG4	new construction	RG4	RG4	0.275	30.900	28	5,076	-
39	Langau	Deli Serdang	ST	2,000	24	Free Intake	not provided	D	1.900	3.100	11	D	D	D	1,900	RG4	new construction	RG4	RG4	2.090	3.720	15	1,900	-
40	Medan Krio	Deli Serdang	T	3,016	25	Headworks	provided	C	2.750	23.300	100	C	D	D	3,000	RG3	replacement	RG4	RG4	2.750	23.300	116	3,000	-
41	Rantau Panjang	Deli Serdang	ST	2,309	33	Headworks	not provided	D	0.000	0.000	4	D	D	D	2,309	RG4	new construction	RG4	RG4	6.790	16.711	57	2,309	-
42	Pekan Kamis	Deli Serdang	ST	1,100	33	Free Intake	not provided	D	0.400	6.200	23	D	D	D	1,100	RG4	new construction	RG4	RG4	0.440	7.440	30	1,100	-
43	Secanggang	Langkat	ST	1,400	18	Free Intake	not provided	D	12.400	13.990	66	D	D	D	1,400	RG4	new construction	RG4	RG4	13.640	16.788	87	1,400	-
44	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	22	Headworks	not provided	C	4.900	5.400	22	D	D	D	1,558	RG3	new construction	RG4	RG4	5.390	6.480	29	1,558	-
45	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	24	Headworks	provided	B	7.000	28.956	193	C	C	D	1,350	RG2	minor rehabili.	RG4	RG4	4.200	17.374	137	1,350	-
46	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	24	Headworks	provided	B	2.700	47.266	322	C	C	C	3,953	RG2	minor rehabili.	RG4	RG4	2.700	47.226	386	3,953	-
47	Bah Korah II	Simalungun/Siantar	T	1,995	12	Headworks	provided	B	15.791	4.296	209	C	D	C	1,723	RG2	minor rehabili.	RG3 & RG4	RG4	13.580	3.695	203	1,723	-
48	Sijambi	Asahan/Tanjung Balai	T	1,013	10	Free Intake	not provided	D	1.125	9.005	47	D	D	C	1,008	RG4 [3]	new construction	RG4	RG4	1.125	9.005	55	1,008	-
49	Rambung Mera	P. Siantar/Simalungun	T	946	16	Headworks	provided	B	12.136	2.491	125	D	D	D	944	RG2	minor rehabili.	RG4	RG4	12.136	2.491	142	944	-
50	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	11	Headworks	provided	B	13.076	24.700	288	C	D	C	4,350	RG2	minor rehabili.	RG3 & RG4	RG4	13.076	24.700	330	4,350	-

Note: 1): T: Technical, ST: Semi-technical, NT: Non-technical

2): Water will be supplied from integrated headworks for Panca Arga, Serbangan, and Silau Bonto schemes.

3): Water will be supplied from integrated headworks for Sungai Silau and Sijambi schemes.

Condition: A: Functioning well, B: Partially deteriorated, C: Not functioning well, D: Serious condition for operation

Grade of rehabilitation: RG1: No rehabilitation, RG2: Minor rehabilitation, RG3: Large scale rehabilitation, RG4: Replacement or new construction

Table A-5.2.2 Irrigation System Rehabilitation Cost of the Schemes: North Sumatra

No.	Irrigation Scheme	District	Technical Level [1]	Registered Area (ha)	Subject Area (ha)	Area Increment (ha)	Age of the Facilities (years)	Irrigation System Rehabilitation Cost (million Rp.)										Rehabilitation Cost per ha (US$/ha)
								Water Resources Facility			Irrigation Works			Drainage Works	On-Farm Develop-ment	Project Facilities	Total	
								Dam/ Headworks	Settling Basin	Sub-total	Canals	Related Structures	Sub-total					
1.	Gido Sebua	Nias	T	1,258	883	-375	11	1,183	449	1,632	8,611	1,697	10,308	1,031	1,810	1,260	16,041	2,194
2.	Batang Gadis	Mandaling Natal	T	6,628	5,575	-1,053	11	272	3,572	3,843	49,300	20,679	69,979	6,998	11,429	2,590	94,838	2,055
3.	Batang Ilung	Tapanuli Selatan	T	4,194	3,546	-648	11	232	2,554	2,786	38,329	12,519	50,848	5,085	7,269	1,570	67,559	2,301
4.	Blk Sitongkon/Napa Suron	Tapanuli Selatan	ST	1,012	500	-512	27	7,402	1,380	8,782	8,536	1,139	9,674	967	1,025	1,260	21,709	5,244
5.	Siborna	Tapanuli Selatan	ST	1,000	950	-50	19	8,935	1,497	10,432	17,359	1,344	18,702	1,870	2,129	1,260	34,394	4,373
6.	Siaili Tukka	Tapanuli Tengah	T	1,057	600	-457	17	2,984	1,380	4,363	3,484	1,712	5,195	520	1,407	1,260	12,745	2,566
7.	Badiri Lopian	Tapanuli Tengah	T	1,283	899	-384	14	4,673	1,497	6,170	6,153	2,741	8,894	889	1,843	1,260	19,057	2,560
8.	Pandurungan	Tapanuli Tengah	T	1,769	1,334	-435	19	1,140	1,614	2,754	15,946	4,727	20,674	2,067	2,888	1,260	29,644	2,684
9.	Sihiong	Tapanuli Tengah	NT	2,000	779	-1,221	19	1,684	1,497	3,181	7,721	3,732	11,453	1,145	3,339	1,260	20,379	3,160
10.	Aek Silang	Tapanuli Utara	ST	1,500	1,500	0	13	5,358	2,084	7,442	5,942	993	6,935	693	5,791	1,260	22,121	1,781
11.	Sarulla	Tapanuli Utara	ST	1,692	1,692	0	28	1,090	2,084	3,175	5,665	641	6,307	631	4,938	1,260	16,310	1,164
12.	Parmiahan Hutapaung	Tapanuli Utara	ST	1,000	1,000	0	10	1,027	1,497	2,524	12,112	2,565	14,676	1,468	2,716	1,260	22,645	2,735
13.	Sinamo	Tapanuli Utara	ST	1,000	930	-70	34	843	1,497	2,340	7,698	4,875	12,573	1,257	2,332	1,260	19,762	2,567
14.	Aek Mandos I	Toba Samosir	ST	1,060	1,059	-1	10	814	1,614	2,428	5,084	1,490	6,574	657	2,355	1,260	13,276	1,514
15.	Simangatasi II	Toba Samosir	T	1,515	1,514	-1	11	1,027	2,084	3,112	8,669	1,530	10,199	1,020	3,104	1,260	18,694	1,491
16.	Bulung Ihit	Labuhan Batu	T	5,000	1,355	-3,645	5	272	625	897	8,047	384	8,431	843	2,778	1,260	14,209	1,267
17.	Perkotaan	Asahan	T	3,457	3,446	-11	14	1,376	1,277	2,653	62,483	3,842	66,325	6,633	7,119	1,570	84,300	2,955
18.	Sungai Balai	Asahan	ST	1,185	1,130	-55	5	1,183	1,614	2,797	12,707	1,153	13,861	1,386	2,317	1,260	21,620	2,311
19.	Panca Arga	Asahan	T	2,500	2,500	0	10	52,328 [2]	2,906	55,234	8,478	1,386	9,864	986	5,469	1,570	73,123	3,533
20.	Serbangan	Asahan	T	2,333	2,044	-289	10	42,761 [2]	2,374	45,136	18,948	5,394	24,342	2,434	4,190	1,570	77,672	4,590
21.	Silau Bonto	Asahan	NT	3,231	967	-2,264	10	20,171 [2]	1,120	21,291	8,232	4,936	13,168	1,317	4,894	1,260	41,930	5,237
22.	Sungai Silau	Asahan	ST	1,315	452	-863	32	7,552 [3]	528	8,080	6,841	1,588	8,429	843	1,702	1,260	20,314	5,428
23.	Padang Mahondang	Asahan	ST	3,231	2,905	-326	22	13,353	2,554	15,907	14,221	1,675	15,896	1,590	7,073	1,570	42,036	1,748
24.	Simujur	Asahan	ST	2,560	2,010	-550	18	7,272	2,084	9,356	15,478	1,360	16,838	1,684	4,536	1,570	33,984	2,042
25.	Purwodadi	Asahan	T	1,635	1,635	0	14	1,270	2,084	3,354	24,815	7,319	32,134	3,213	3,352	1,260	43,313	3,200
26.	Pentara	Simalungun	ST	1,034	298	-736	12	1,139	0	1,139	6,863	475	7,338	734	1,404	1,260	11,875	4,813
27.	Simantin Pane Dame	Simalungun	NT	1,000	1,000	0	14	3,385	1,497	4,881	2,680	175	2,854	285	5,125	1,260	14,406	1,740
28.	Panambean / Panet Tongah BK	Simalungun	T	1,723	1,722	-1	12	1,183	0	1,183	19,579	10,849	30,429	3,043	3,530	1,260	39,445	2,767
29.	Raja Hombang / T. Mangaraja	Simalungun	T	2,045	2,023	-22	9	1,260	0	1,260	35,068	8,497	43,565	4,357	4,147	1,570	54,899	3,278
30.	Kerasaan	Simalungun	T	5,000	4,144	-856	15	1,260	3,063	4,323	76,382	6,335	82,717	8,272	9,341	1,570	106,222	3,096
31.	Javacolonisasi/Purbogondo	Simalungun	T	1,030	1,015	-15	14	1,144	484	1,628	14,505	5,206	19,712	1,971	2,081	1,260	26,651	3,172
32.	Naga Sompah	Simalungun	T	1,360	1,015	-345	16	3,477	1,614	5,091	16,917	3,335	20,252	2,025	2,081	1,260	30,709	3,654
33.	Risma Duma	Dairi	ST	1,522	1,522	0	21	1,144	2,084	3,228	20,762	9,570	30,332	3,033	5,750	1,260	43,603	3,460
34.	Lae Ordi	Dairi	ST	1,200	1,200	0	14	688	1,614	2,302	19,080	1,601	20,681	2,068	5,630	1,260	31,941	3,215
35.	Parit Lompaten	Karo	ST	1,242	1,242	0	20	635	1,614	2,249	31,778	5,306	37,084	3,708	2,871	1,260	47,172	4,588
36.	Bandar Sidoras	Deli Serdang	ST	3,457	3,457	0	18	10,171	2,554	12,725	52,665	5,132	57,797	5,780	7,597	1,570	85,468	2,986
37.	Namu Rambe	Deli Serdang	T	1,036	1,036	0	37	814	1,614	2,428	18,106	4,366	22,472	2,247	2,124	1,260	30,532	3,560
38.	Sei Belutu	Deli Serdang	ST	5,082	5,076	-6	40	7,035	3,063	10,098	34,923	1,280	36,203	3,620	10,406	2,590	62,917	1,497
39.	Langau	Deli Serdang	ST	2,000	1,900	-100	24	11,171	2,084	13,255	7,618	814	8,432	843	4,279	1,260	28,070	1,784
40.	Medan Krio	Deli Serdang	T	3,016	3,000	-16	25	825	2,554	3,379	28,435	7,100	35,534	3,553	6,325	1,570	50,362	2,028
41.	Rantau Panjang	Deli Serdang	ST	2,309	2,309	0	33	4,673	2,084	6,757	24,650	8,396	33,046	3,305	4,733	1,570	49,412	2,585
42.	Pekan Kamis	Deli Serdang	ST	1,100	1,100	0	33	4,257	1,614	5,871	8,146	1,428	9,574	957	2,347	1,260	20,010	2,197
43.	Secanggang	Langkat	ST	1,400	1,400	0	18	4,257	2,084	6,341	35,709	2,159	37,868	3,787	3,119	1,260	52,375	4,519
44.	Paya Lobang	Deli Serdan/Tebing Tinggi	ST	1,558	1,558	0	22	814	2,084	2,898	14,254	940	15,194	1,519	3,345	1,260	24,217	1,877
45.	Namu Sira-sira Kiri	Langkat/Binjai	T	2,250	1,350	-900	24	460	625	1,085	20,507	4,686	25,193	2,519	2,768	1,260	32,825	2,937
46.	Namu Sira-sira Kanan	Langkat/Binjai	T	4,100	3,953	-147	24	916	766	1,682	44,920	13,893	58,813	5,881	8,104	1,570	76,050	2,324
47.	Bah Korah II	Simalungun/Siantar	T	1,995	1,723	-272	12	1,376	625	2,001	20,137	9,061	29,198	2,920	3,532	1,260	38,911	2,728
48.	Sijambi	Asahan/Tanjung Balai	T	1,013	1,008	-5	10	21,054 [3]	1,472	22,526	9,087	1,994	11,082	1,108	2,201	1,260	38,177	4,575
49.	Rambung Mera	P. Siantar/Simalungun	T	946	944	-2	16	1,318	449	1,768	21,227	5,347	26,574	2,657	1,935	1,260	34,194	4,375
50.	Paya Sordang	Tapanuli Sel/Mandailing Natal	T	4,350	4,350	0	11	1,376	919	2,295	37,191	14,655	51,847	5,185	9,108	1,570	70,004	1,944
	Total			**107,183**	**90,550**	**-16,633**		**272,034**	**80,031**	**352,065**	**1,002,050**	**224,019**	**1,226,070**	**122,607**	**211,688**	**69,690**	**1,982,120**	**146,401**
	Average				1,811		18											2,644
	Rp. per ha							3.004	0.884	3.888	11.066	2.474	13.540	1.354	2.338	0.770	21.890	
	Itemized Total		T : 25 ST : 22 NT : 3															

Note: 1): T: Technical, ST: Semi-technical, NT: Non-technical

2): Water will be supplied from integrated headworks for Panca Arga, Serbangan, and Silau Bonto schemes.

3): Water will be supplied from integrated headworks for Sungai Silau and Sijambi schemes.

Source: JICA Study Team for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-5.3.1 Agricultural Land Use Plan of the Subject Area: North Sumatra

Irrigation Scheme	Technical Level 2/	Subject Area for Rehabilitation Plan										Increment (Land Use Changes; II - I)					
		I. Present/Before-project Status (ha)							II. With-project Status (ha)			Paddy Field					
		A. Paddy field			Non Paddy Field (gross)			Total	Irrigated Paddy Field	Non-irrigable Land 3/	Total	Irrigated Field	Rainfed Field	Sub-total	Non Paddy Field	Non-irrigable Land 3/	Total
		Irrigated Field	Rainfed Field	Sub-total	Upland Field	Un-cultivated Land	Sub-total										
1. Gido Sebua	T	883	0	883	0	0	0	883	883	0	883	0	0	0	0	0	0
2. Batang Gadis	T	5,575	0	5,575	0	0	0	5,575	5,575	0	5,575	0	0	0	0	0	0
3. Batang Ilung	T	3,546	0	3,546	0	0	0	3,546	3,546	0	3,546	0	0	0	0	0	0
4. Blk Sitongkon/Napa Suron	ST	500	0	500	0	0	0	500	500	0	500	0	0	0	0	0	0
5. Siborna	ST	595	355	950	0	0	0	950	950	0	950	355	-355	0	0	0	0
6. Siaili Tukka	T	255	345	600	0	0	0	600	600	0	600	345	-345	0	0	0	0
7. Badiri Lopian	T	899	0	899	0	0	0	899	899	0	899	0	0	0	0	0	0
8. Pandurungan	T	1,034	300	1,334	0	0	0	1,334	1,334	0	1,334	300	-300	0	0	0	0
9. Sihiong	NT	0	255	255	0	524	524	779	622	157	779	622	-255	367	-524	157	0
10. Aek Silang	ST	200	500	700	0	800	800	1,500	1,260	240	1,500	1,060	-500	560	-800	240	0
11. Sarulla	ST	1,214	0	1,214	0	478	478	1,692	1,549	143	1,692	335	0	335	-478	143	0
12. Parmiahan Hutapaung	ST	200	700	900	0	100	100	1,000	970	30	1,000	770	-700	70	-100	30	0
13. Sinamo	ST	100	830	930	0	0	0	930	930	0	930	830	-830	0	0	0	0
14. Aek Mandos I	ST	999	0	999	0	60	60	1,059	1,041	18	1,059	42	0	42	-60	18	0
15. Simangatasi II	T	1,514	0	1,514	0	0	0	1,514	1,514	0	1,514	0	0	0	0	0	0
16. Bulung Ihit	T	1,355	0	1,355	0	0	0	1,355	1,355	0	1,355	0	0	0	0	0	0
17. Perkotaan	T	3,339	107	3,446	0	0	0	3,446	3,446	0	3,446	107	-107	0	0	0	0
18. Sungai Balai	ST	1,130	0	1,130	0	0	0	1,130	1,130	0	1,130	0	0	0	0	0	0
19. Panca Arga	T	1,829	671	2,500	0	0	0	2,500	2,500	0	2,500	671	-671	0	0	0	0
20. Serbangan	T	2,044	0	2,044	0	0	0	2,044	2,044	0	2,044	0	0	0	0	0	0
21. Silau Bonto	NT	20	0	20	0	947	947	967	683	284	967	663	0	663	-947	284	0
22. Sungai Silau	ST	200	0	200	0	252	252	452	376	76	452	176	0	176	-252	76	0
23. Padang Mahondang	ST	724	2,181	2,905	0	0	0	2,905	2,905	0	2,905	2,181	-2,181	0	0	0	0
24. Simujur	ST	1,200	810	2,010	0	0	0	2,010	2,010	0	2,010	810	-810	0	0	0	0
25. Purwodadi	T	1,635	0	1,635	0	0	0	1,635	1,635	0	1,635	0	0	0	0	0	0
26. Pentara	ST	40	0	40	0	258	258	298	221	77	298	181	0	181	-258	77	0
27. Simantin Pane Dame	NT	0	0	0	1,000	0	1,000	1,000	700	300	1,000	700	0	700	-1,000	300	0
28. Panambean / Panet Tongah BK	T	1,722	0	1,722	0	0	0	1,722	1,722	0	1,722	0	0	0	0	0	0
29. Raja Hombang / T. Mangaraja	T	2,023	0	2,023	0	0	0	2,023	2,023	0	2,023	0	0	0	0	0	0
30. Kerasaan	T	3,869	0	3,869	0	275	275	4,144	4,062	82	4,144	193	0	193	-275	82	0
31. J. Kolonisasi/Purbolonggo	T	1,015	0	1,015	0	0	0	1,015	1,015	0	1,015	0	0	0	0	0	0
32. Naga Sompah	T	1,015	0	1,015	0	0	0	1,015	1,015	0	1,015	0	0	0	0	0	0
33. Risma Duma	ST	0	800	800	722	0	722	1,522	1,305	217	1,522	1,305	-800	505	-722	217	0
34. Lae Ordi	ST	15	185	200	1,000	0	1,000	1,200	900	300	1,200	885	-185	700	-1,000	300	0
35. Parit Lompaten	ST	619	621	1,240	2	0	2	1,242	1,241	1	1,242	622	-621	1	-2	1	0
36. Bandar Sidoras	ST	2,462	995	3,457	0	0	0	3,457	3,457	0	3,457	995	-995	0	0	0	0
37. Namu Rambe	T	1,036	0	1,036	0	0	0	1,036	1,036	0	1,036	0	0	0	0	0	0
38. Sei Belutu	ST	5,076	0	5,076	0	0	0	5,076	5,076	0	5,076	0	0	0	0	0	0
39. Langau	ST	1,150	750	1,900	0	0	0	1,900	1,900	0	1,900	750	-750	0	0	0	0
40. Medan Krio	T	2,943	0	2,943	57	0	57	3,000	2,983	17	3,000	40	0	40	-57	17	0
41. Rantau Panjang	ST	2,309	0	2,309	0	0	0	2,309	2,309	0	2,309	0	0	0	0	0	0
42. Pekan Kamis	ST	920	180	1,100	0	0	0	1,100	1,100	0	1,100	180	-180	0	0	0	0
43. Secanggang	ST	1,319	0	1,319	81	0	81	1,400	1,376	24	1,400	57	0	57	-81	24	0
44. Paya Lobang	ST	1,263	295	1,558	0	0	0	1,558	1,558	0	1,558	295	-295	0	0	0	0
45. Namu Sira-sira Kiri	T	1,350	0	1,350	0	0	0	1,350	1,350	0	1,350	0	0	0	0	0	0
46. Namu Sira-sira Kanan	T	3,953	0	3,953	0	0	0	3,953	3,953	0	3,953	0	0	0	0	0	0
47. Bah Korah II	T	1,723	0	1,723	0	0	0	1,723	1,723	0	1,723	0	0	0	0	0	0
48. Sijambi	T	885	95	980	28	0	28	1,008	1,000	8	1,008	115	-95	20	-28	8	0
49. Rambung Mera	T	944	0	944	0	0	0	944	944	0	944	0	0	0	0	0	0
50. Paya Sordang	T	3,979	371	4,350	0	0	0	4,350	4,350	0	4,350	371	-371	0	0	0	0
Total		**72,620**	**11,346**	**83,966**	**2,890**	**3,694**	**6,584**	**90,550**	**88,576**	**1,974**	**90,550**	**15,956**	**-11,346**	**4,610**	**-6,584**	**1,974**	**0**

1/: Tree crops lands are excluded from the subject area for rehabilitation plan 2/: Irrigation technical level before rehabilitation

3/: Assuming non-paddy field (gross) converted to irrigated paddy field (net) 70 % & non-irrigable area 30% including right-of-ways

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 1/7

District	Nias				M. Natal				Tapanuli Selatan								Tapanuli Selatan - continued				Tapanuli Tengah											
Irrigation Scheme	1. Gido Sebua				2. Batang Gadis				3. Batang Ilung				4. Blk Sitongkon/Napa Suron				5. Siborna				6. Siaili Tukka				7. Badiri Lopian				8. Pandurungan			
I. Present/Before Project																																
1. Land Use	Irri. Paddy Field 883 ha				Irri. Paddy Field 5,575 ha				Irri. Paddy Field 3,546 ha				Irri. Paddy Field 500 ha				Irri. Paddy Field 595 ha				Irri. Paddy Field 255 ha				Irri. Paddy Field 899 ha				Irri. Paddy Field 1,034 ha			
	Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field 355 ha				Rainfed Paddy Field 345 ha				Rainfed Paddy Field ha				Rainfed Paddy Field 300 ha			
	Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha			
	Subject Area 883 ha				*Subject Area 5,575 ha*				*Subject Area 3,546 ha*				*Subject Area 500 ha*				*Subject Area 950 ha*				*Subject Area 600 ha*				*Subject Area 899 ha*				*Subject Area 1,334 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	450		450	900	5,575		3,899	9,474	3,546		2,566	6,112	500		478	978				0	255		128	383	899		270	1,169	1,034		520	1,554
- Paddy (Rainfed) 1/	433			433				0				0				0	595			595				0				0				0
- Palawija 2/ ha				0				0				0				0				0				0				0				0
- Rainfed Paddy ha				0				0				0				0	355			355	345			345				0	300			300
- Palawija 3/ ha				0				0				0				0				0				0				0				0
Total ha	883	0	450	1,333	5,575	0	3,899	9,474	3,546	0	2,566	6,112	500	0	478	978	950	0	0	950	600	0	128	728	899	0	270	1,169	1,334	0	520	1,854
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	51	0	51	102	100	0	70	170	100	0	72	172	100	0	96	196	0	0	0	0	100	0	50	150	100	0	30	130	100	0	50	150
- Paddy (Rainfed) 1/ %	49	0	0	49	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
- Palawija 2/ %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated Field 5/ %	51	0	51	102	100	0	70	170	100	0	72	172	100	0	96	196	0	0	0	0	100	0	50	150	100	0	30	130	100	0	50	150
- Rainfed Paddy %																	100			100	100			100					100			100
- Palawija 3/ %																																
Overall to Subject Area %	100	0	51	151	100	0	70	170	100	0	72	172	100	0	96	196	100	0	0	100	100	0	21	121	100	0	30	130	100	0	39	139
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	3.0		3.0	3.0	4.0		4.0	4.0	5.0		4.5	4.8	4.0		4.0	4.0					4.0		4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0
- Paddy (Rainfed) 1/	2.5																2.5															
- Palawija 2/ t/ha				-				-				-				-				-				-				-				-
- Rainfed Paddy t/ha				-				-				-				-	2.5			-	2.5			-				-	2.5			-
- Palawija 3/ t/ha				-				-				-				-				-				-				-				-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	1,350	0	1,350	2,700	22,300	0	15,596	37,896	17,730	0	11,547	29,277	2,000	0	1,912	3,912	0	0	0	0	1,020	0	512	1,532	3,596	0	1,080	4,676	4,136	0	2,080	6,216
- Paddy (Rainfed) 1/ton	1,083			1,083	0			0	0			0	0			0	1,488			1,488	0			0	0			0	0			0
- Palawija 2/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Rainfed Paddy ton	0			0	0			0	0			0	0			0	888			888	863			863	0			0	750			750
- Palawija 3/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Paddy Production ton	2,433	0	1,350	3,783	22,300	0	15,596	37,896	17,730	0	11,547	29,277	2,000	0	1,912	3,912	2,375	0	0	2,375	1,883	0	512	2,395	3,596	0	1,080	4,676	4,886	0	2,080	6,966
	Palawija represented by maize (composite)																															
6. Av. Paddy Yield 6/ t/ha	-	-	-	2.8	-	-	-	4.0	-	-	-	4.8	-	-	-	4.0	-	-	-	2.5	-	-	-	3.3	-	-	-	4.0	-	-	-	3.8
II. With Project																																
1. Land Use	Irri. Paddy Field 883 ha				Irri. Paddy Field 5,575 ha				Irri. Paddy Field 3,546 ha				Irri. Paddy Field 500 ha				Irri. Paddy Field 950 ha				Irri. Paddy Field 600 ha				Irri. Paddy Field 899 ha				Irri. Paddy Field 1,334 ha			
	Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha			
	Subject Area 883 ha				*Subject Area 5,575 ha*				*Subject Area 3,546 ha*				*Subject Area 500 ha*				*Subject Area 950 ha*				*Subject Area 600 ha*				*Subject Area 899 ha*				*Subject Area 1,334 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	883		618	1,501	5,575		5,018	10,593	3,546		3,546	7,092	500		500	1,000	950		475	1,425	600		300	900	899		629	1,528	1,334		934	2,268
- Palawija 2/ ha			88	88			279	279		177		177		100		100			95	95			60	60			90	90			133	133
Total ha	883	0	706	1,589	5,575	0	5,297	10,872	3,546	177	3,546	7,269	500	100	500	1,100	950	0	570	1,520	600	0	360	960	899	0	719	1,618	1,334	0	1,067	2,401
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100	0	70	170	100	0	90	190	100	0	100	200	100	0	100	200	100	0	50	150	100	0	50	150	100	0	70	170	100	0	70	170
- Palawija 2/ %		0	10	10		0	5	5		5	0	5		20	0	20		0	10	10		0	10	10		0	10	10		0	10	10
Total %	100	0	80	180	100	0	95	195	100	5	100	205	100	20	100	220	100	0	60	160	100	0	60	160	100	0	80	180	100	0	80	180
Overall to Subject Area %	*100*	*0*	*80*	*180*	*100*	*0*	*95*	*195*	*100*	*5*	*100*	*205*	*100*	*20*	*100*	*220*	*100*	*0*	*60*	*160*	*100*	*0*	*60*	*160*	*100*	*0*	*80*	*180*	*100*	*0*	*80*	*180*
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.5		4.5	4.5	5.0		5.0	5.0	5.5		5.5	5.5	5.0		5.0	5.0	4.5		4.5	4.5	5.0		5.0	5.0	5.0		5.0	5.0	5.0		5.0	5.0
- Palawija 2/ t/ha			5.0	-			5.0	-		5.0		-		5.0		-			5.0	-			5.0	-			5.0	-			5.0	-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	3,974	0	2,781	6,755	27,875	0	25,090	52,965	19,503	0	19,503	39,006	2,500	0	2,500	5,000	4,275	0	2,138	6,413	3,000	0	1,500	4,500	4,495	0	3,145	7,640	6,670	0	4,670	11,340
- Palawija 2/ ton		0	440	440		0	1,395	1,395		885	0	885		500	0	500		0	475	475		0	300	300		0	450	450		0	665	665
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.5	-	-	-	5.0	-	-	-	5.5	-	-	-	5.0	-	-	-	4.5	-	-	-	5.0	-	-	-	5.0	-	-	-	5.0
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																																
1. Land Use	Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 355 ha				Irri. Paddy Field 345 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 300 ha			
	Subject Area 0 ha				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	0	0	168	168	0	0	1,119	1,119	0	0	980	980	0	0	22	22	0	0	475	475	0	0	172	172	0	0	359	359	0	0	414	414
- Others ha	0	0	88	88		0	279	279		177	0	177		100	0	100		0	95	95		0	60	60		0	90	90		0	133	133
Total ha	0	0	256	256	0	0	1,398	1,398	0	177	980	1,157	0	100	22	122	0	0	570	570	0	0	232	232	0	0	449	449	0	0	547	547
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	49	0	19	68	0	0	20	20	0	0	28	28	0	0	4	4	100	0	50	150	0	0	0	0	0	0	40	40	0	0	20	20
- Others %	0	0	10	10	0	0	5	5	0	5	0	5	0	20	0	20	0	0	10	10	0	0	10	10	0	0	10	10	0	0	10	10
Total %	49	0	29	78	0	0	25	25	0	5	28	33	0	20	4	24	100	0	60	160	0	0	10	10	0	0	50	50	0	0	30	30
4. Paddy Production ton	-	-	-	2,972	-	-	-	15,069	-	-	-	9,729	-	-	-	1,088	-	-	-	4,038	-	-	-	2,106	-	-	-	2,964	-	-	-	4,374
5. Av. Paddy Yield 6/ t/ha	-	-	-	1.7	-	-	-	1.0	-	-	-	0.7	-	-	-	1.0	-	-	-	2.0	-	-	-	1.7	-	-	-	1.0	-	-	-	1.2

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area

5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 2/7

District	Tapanuli Tengah - continued				Tapanuli Utara																Toba Samosir				Toba Samosir - continued				L. Batu			
Irrigation Scheme	9. Sihiong				10. Aek Silang				11. Sarulla				12. Parmiahan Hutapaung				13. Sinamo				14. Aek Mandos I				15. Simangatasi II				16. Bulung Ihit			
I. Present/Before Project																																
1. Land Use	Irri. Paddy Field			0 ha	Irri. Paddy Field			200 ha	Irri. Paddy Field			1,214 ha	Irri. Paddy Field			200 ha	Irri. Paddy Field			100 ha	Irri. Paddy Field			999 ha	Irri. Paddy Field			1,514 ha	Irri. Paddy Field			1,355 ha
	Rainfed Paddy Field			255 ha	Rainfed Paddy Field			500 ha	Rainfed Paddy Field			ha	Rainfed Paddy Field			700 ha	Rainfed Paddy Field			830 ha	Rainfed Paddy Field			ha	Rainfed Paddy Field			ha	Rainfed Paddy Field			ha
	Uncultivated Land			524 ha	Uncultivated Land			800 ha	Uncultivated Land			478 ha	Uncultivated Land			100 ha	Uncultivated Land			ha	Uncultivated Land			60 ha	Uncultivated Land			ha	Uncultivated Land			ha
	Subject Area			*779 ha*	*Subject Area*			*1,500 ha*	*Subject Area*			*1,692 ha*	*Subject Area*			*1,000 ha*	*Subject Area*			*930 ha*	*Subject Area*			*1,059 ha*	*Subject Area*			*1,514 ha*	*Subject Area*			*1,355 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha				0	200			200	764		164	928	200			200	100			100	999			999	800			800	1,355		678	2,033
- Paddy (Rainfed) 1/				0				0	450			450				0				0				0	714			714				0
- Palawija 2/ ha				0			20	20				0			40	40			10	10				0				0				0
- Rainfed Paddy ha	255			255	500			500				0	700			700	830			830				0				0				0
- Palawija 3/ ha				0				0				0				0				0				0				0				0
Total ha	255	0	0	255	700	0	20	720	1,214	0	164	1,378	900	0	40	940	930	0	10	940	999	0	0	999	1,514	0	0	1,514	1,355	0	678	2,033
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %					100	0	0	100	63	0	14	76	100	0	0	100	100	0	0	100	100	0	0	100	53	0	0	53	100	0	50	150
- Paddy (Rainfed) 1/ %					0	0	0	0	37	0	0	37	0	0	0	0	0	0	0	0	0	0	0	0	47	0	0	47	0	0	0	0
- Palawija 2/ %					0	0	10	10	0	0	0	0	0	0	20	20	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated Field 5/ %					100	0	10	110	63	0	14	76	100	0	20	120	100	0	10	110	100	0	0	100	53	0	0	53	100	0	50	150
- Rainfed Paddy %	100			100	100			100					100			100	100			100												
- Palawija 3/ %																																
Overall to Subject Area %	33	0	0	33	47	0	1	48	72	0	10	81	90	0	4	94	100	0	1	101	94	0	0	94	100	0	0	100	100	0	50	150
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha				#DIV/0!	3.5			3.5	3.5		3.5	3.5	3.5			3.5	3.5			3.5	3.5			3.5	3.5			3.5	4.0		4.0	4.0
- Paddy (Rainfed) 1/									2.5																2.5							
- Palawija 2/ t/ha				-			2.5	-				-			2.5	-			2.5	-				-				-				-
- Rainfed Paddy t/ha	2.5			-	2.5			-				-	2.5			-	2.5			-				-				-				-
- Palawija 3/ t/ha				-				-				-				-				-				-				-				-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	0	0	0	0	700	0	0	700	2,674	0	574	3,248	700	0	0	700	350	0	0	350	3,497	0	0	3,497	2,800	0	0	2,800	5,420	0	2,712	8,132
- Paddy (Rainfed) 1/ton	0			0	0			0	1,125			1,125	0			0	0			0	0			0	1,785			1,785	0			0
- Palawija 2/ ton	0	0	0	0	0	0	50	50	0	0	0	0	0	0	100	100	0	0	25	25	0	0	0	0	0	0	0	0	0	0	0	0
- Rainfed Paddy ton	638			638	1,250			1,250	0			0	1,750			1,750	2,075			2,075	0			0	0			0	0			0
- Palawija 3/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Paddy Production ton	638	0	0	638	1,950	0	0	1,950	3,799	0	574	4,373	2,450	0	0	2,450	2,425	0	0	2,425	3,497	0	0	3,497	4,585	0	0	4,585	5,420	0	2,712	8,132
					Palawija represented by maize (composite)								Palawija represented by maize (composite)				Palawija represented by maize (composite)																
6. Av. Paddy Yield 6/ t/ha	-	-	-	2.5	-	-	-	2.8	-	-	-	3.2	-	-	-	2.7	-	-	-	2.6	-	-	-	3.5	-	-	-	3.0	-	-	-	4.0
II. With Project																																
1. Land Use	Irri. Paddy Field			622 ha	Irri. Paddy Field			1,260 ha	Irri. Paddy Field			1,549 ha	Irri. Paddy Field			970 ha	Irri. Paddy Field			930 ha	Irri. Paddy Field			1,041 ha	Irri. Paddy Field			1,514 ha	Irri. Paddy Field			1,355 ha
	Non-irrigable Lar			157 ha	Non-irrigable Lar			240 ha	Non-irrigable Lar			143 ha	Non-irrigable Lar			30 ha	Non-irrigable Land			ha	Non-irrigable Lar			18 ha	Non-irrigable Land			ha	Non-irrigable Land			ha
	Subject Area			*779 ha*	*Subject Area*			*1,500 ha*	*Subject Area*			*1,692 ha*	*Subject Area*			*1,000 ha*	*Subject Area*			*930 ha*	*Subject Area*			*1,059 ha*	*Subject Area*			*1,514 ha*	*Subject Area*			*1,355 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	622		311	933	1,260		630	1,890	1,549		775	2,324	970		485	1,455	930		465	1,395	1,041		521	1,562	1,514		757	2,271	1,355		949	2,304
- Palawija 2/ ha			62	62			126	126			155	155			97	97			93	93			104	104			151	151			136	136
Total ha	622	0	373	995	1,260	0	756	2,016	1,549	0	930	2,479	970	0	582	1,552	930	0	558	1,488	1,041	0	625	1,666	1,514	0	908	2,422	1,355	0	1,085	2,440
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100	0	50	150	100	0	50	150	100	0	50	150	100	0	50	150	100	0	50	150	100	0	50	150	100	0	50	150	100	0	70	170
- Palawija 2/ %		0	10	10		0	10	10		0	10	10		0	10	10		0	10	10		0	10	10		0	10	10		0	10	10
Total %	100	0	60	160	100	0	60	160	100	0	60	160	100	0	60	160	100	0	60	160	100	0	60	160	100	0	60	160	100	0	80	180
Overall to Subject Area %	*80*	*0*	*48*	*128*	*84*	*0*	*50*	*134*	*92*	*0*	*55*	*147*	*97*	*0*	*58*	*155*	*100*	*0*	*60*	*160*	*98*	*0*	*59*	*157*	*100*	*0*	*60*	*160*	*100*	*0*	*80*	*180*
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	5.0		5.0	5.0
- Palawija 2/ t/ha			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	2,799	0	1,400	4,199	5,670	0	2,835	8,505	6,971	0	3,488	10,458	4,365	0	2,183	6,548	4,185	0	2,093	6,278	4,685	0	2,345	7,029	6,813	0	3,407	10,220	6,775	0	4,745	11,520
- Palawija 2/ ton		0	310	310		0	630	630		0	775	775		0	485	485		0	465	465		0	520	520		0	755	755		0	680	680
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	5.0
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																																
1. Land Use	Irri. Paddy Field			622 ha	Irri. Paddy Field			1,060 ha	Irri. Paddy Field			335 ha	Irri. Paddy Field			770 ha	Irri. Paddy Field			830 ha	Irri. Paddy Field			42 ha	Irri. Paddy Field			0 ha	Irri. Paddy Field			0 ha
	Subject Area			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	367	0	311	678	560	0	630	1,190	335	0	611	946	70	0	485	555	0	0	465	465	42	0	521	563	0	0	757	757	0	0	271	271
- Others ha		0	62	62		0	106	106		0	155	155		0	57	57		0	83	83		0	104	104		0	151	151		0	136	136
Total ha	367	0	373	740	560	0	736	1,296	335	0	766	1,101	70	0	542	612	0	0	548	548	42	0	625	667	0	0	908	908	0	0	407	407
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	100	0	50	150	0	0	50	50	37	0	37	74	0	0	50	50	0	0	50	50	0	0	50	50	47	0	50	97	0	0	20	20
- Others %	0	0	10	10	0	0	0	0	0	0	10	10	0	0	-10	-10	0	0	0	0	0	0	10	10	0	0	10	10	0	0	10	10
Total %	100	0	60	160	0	0	50	50	37	0	47	84	0	0	40	40	0	0	50	50	0	0	60	60	47	0	60	107	0	0	30	30
4. Paddy Production ton	-	-	-	3,561	-	-	-	6,555	-	-	-	6,085	-	-	-	4,098	-	-	-	3,853	-	-	-	3,533	-	-	-	5,635	-	-	-	3,388
5. Av. Paddy Yield 6/ t/ha	-	-	-	2.0	-	-	-	1.7	-	-	-	1.3	-	-	-	1.8	-	-	-	1.9	-	-	-	1.0	-	-	-	1.5	-	-	-	1.0

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area

5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 3/7

District	Asahan																											
Irrigation Scheme	17. Perkotaan				18. Sungai Balai				19. Panca Arga				20. Serbangan				21. Silau Bonto				22. Sungai Silau				23. Padang Mahondang				24. Simujur			
I. Present/Before Project																												
1. Land Use	Irri. Paddy Field 3,339 ha				Irri. Paddy Field 1,130 ha				Irri. Paddy Field 1,829 ha				Irri. Paddy Field 2,044 ha				Irri. Paddy Field 20 ha				Irri. Paddy Field 200 ha				Irri. Paddy Field 724 ha				Irri. Paddy Field 1,200 ha			
	Rainfed Paddy Field 107 ha				Rainfed Paddy Field ha				Rainfed Paddy Field 671 ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field 2,181 ha				Rainfed Paddy Field 810 ha			
	Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land 947 ha				Uncultivated Land 252 ha				Uncultivated Land ha				Uncultivated Land ha			
	Subject Area 3,446 ha				*Subject Area 1,130 ha*				*Subject Area 2,500 ha*				*Subject Area 2,044 ha*				*Subject Area 967 ha*				*Subject Area 452 ha*				*Subject Area 2,905 ha*				*Subject Area 2,010 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	2,812		2,812	5,624	1,130		1,000	2,130	1,000		786	1,786	1,842		1,760	3,602	20		20	40				0	724		300	1,024	1,200		712	1,912
- Paddy (Rainfed) 1/				0				0	829			829				0				0	200			200				0				0
- Palawija 2/ ha				0				0				0				0				0			35	35				0				0
- Rainfed Paddy ha	107			107				0	671			671				0				0				0	2,181			2,181	810			810
- Palawija 3/ ha				0				0				0				0				0				0				0				0
Total ha	2,919	0	2,812	5,731	1,130	0	1,000	2,130	2,500	0	786	3,286	1,842	0	1,760	3,602	20	0	20	40	200	0	35	235	2,905	0	300	3,205	2,010	0	712	2,722
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	84	0	84	168	100	0	88	188	55	0	43	98	90	0	86	176	100	0	100	200	0	0	0	0	100	0	41	141	100	0	59	159
- Paddy (Rainfed) 1/ %	0	0	0	0	0	0	0	0	45	0	0	45	0	0	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	0	0
- Palawija 2/ %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0	0
Irrigated Field 5/ %	84	0	84	168	100	0	88	188	55	0	43	98	90	0	86	176	100	0	100	200	0	0	18	18	100	0	41	141	100	0	59	159
- Rainfed Paddy %	100			100					100			100													100			100	100			100
- Palawija 3/ %																																
Overall to Subject Area %	85	0	82	166	100	0	88	188	100	0	31	131	90	0	86	176	2	0	2	4	44	0	8	52	100	0	10	110	100	0	35	135
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.0		4.0	4.0	4.0		4.0	4.0	3.5		3.5	3.5	4.0		4.0	4.0	3.5		3.5	3.5					4.0		3.5	3.9	4.0		4.0	4.0
- Paddy (Rainfed) 1/									2.5												2.5			2.5								
- Palawija 2/ t/ha				-				-				-				-				-			2.5	-				-				-
- Rainfed Paddy t/ha	2.5			-				-	2.5			-				-				-				-	2.5			-	2.5			-
- Palawija 3/ t/ha				-				-				-				-				-				-				-				-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	11,248	0	11,248	22,496	4,520	0	4,000	8,520	3,500	0	2,751	6,251	7,368	0	7,040	14,408	70	0	70	140	0	0	0	0	2,896	0	1,050	3,946	4,800	0	2,848	7,648
- Paddy (Rainfed) 1/ton	0			0	0			0	2,073			2,073	0			0	0			0	500			500	0			0	0			0
- Palawija 2/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	88	0	0	0	0	0	0	0	0
- Rainfed Paddy ton	268			268	0			0	1,678			1,678	0			0	0			0	0			0	5,453			5,453	2,025			2,025
- Palawija 3/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Paddy Production ton	11,516	0	11,248	22,764	4,520	0	4,000	8,520	7,250	0	2,751	10,001	7,368	0	7,040	14,408	70	0	70	140	500	0	0	500	8,349	0	1,050	9,399	6,825	0	2,848	9,673
																					Palawija represented by maize (composite)											
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.0	-	-	-	4.0	-	-	-	3.0	-	-	-	4.0	-	-	-	3.5	-	-	-	2.5	-	-	-	2.9	-	-	-	3.6
II. With Project																												
1. Land Use	Irri. Paddy Field 3,446 ha				Irri. Paddy Field 1,130 ha				Irri. Paddy Field 2,500 ha				Irri. Paddy Field 2,044 ha				Irri. Paddy Field 683 ha				Irri. Paddy Field 376 ha				Irri. Paddy Field 2,905 ha				Irri. Paddy Field 2,010 ha			
	Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Lar 284 ha				Non-irrigable Lar 76 ha				Non-irrigable Land ha				Non-irrigable Land ha			
	Subject Area 3,446 ha				*Subject Area 1,130 ha*				*Subject Area 2,500 ha*				*Subject Area 2,044 ha*				*Subject Area 967 ha*				*Subject Area 452 ha*				*Subject Area 2,905 ha*				*Subject Area 2,010 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	3,446		3,101	6,547	1,130		1,130	2,260	2,500		1,500	4,000	2,044		2,044	4,088	683		478	1,161	376		263	639	2,905		1,452	4,357	2,010		1,206	3,216
- Palawija 2/ ha			172	172		113		113			250	250		204		204			68	68			38	38			145	145			201	201
Total ha	3,446	0	3,273	6,719	1,130	113	1,130	2,373	2,500	0	1,750	4,250	2,044	204	2,044	4,292	683	0	546	1,229	376	0	301	677	2,905	0	1,597	4,502	2,010	0	1,407	3,417
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100	0	90	190	100	0	100	200	100	0	60	160	100	0	100	200	100	0	70	170	100	0	70	170	100	0	50	150	100	0	60	160
- Palawija 2/ %		0	5	5		10	0	10		0	10	10		10	0	10		0	10	10		0	10	10		0	5	5		0	10	10
Total %	100	0	95	195	100	10	100	210	100	0	70	170	100	10	100	210	100	0	80	180	100	0	80	180	100	0	55	155	100	0	70	170
Overall to Subject Area %	*100*	*0*	*95*	*195*	*100*	*10*	*100*	*210*	*100*	*0*	*70*	*170*	*100*	*10*	*100*	*210*	*71*	*0*	*56*	*127*	*83*	*0*	*67*	*150*	*100*	*0*	*55*	*155*	*100*	*0*	*70*	*170*
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	5.0		5.0	5.0	5.0		5.0	5.0	4.5		4.5	4.5	5.0		5.0	5.0	4.5		4.5	4.5	4.5		4.5	4.5	5.0		5.0	5.0	5.0		5.0	5.0
- Palawija 2/ t/ha			5.0	-		5.0		-			5.0	-		5.0		-			5.0	-			5.0	-			5.0	-			5.0	-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	17,230	0	15,505	32,735	5,650	0	5,650	11,300	11,250	0	6,750	18,000	10,220	0	10,220	20,440	3,074	0	2,151	5,225	1,692	0	1,184	2,876	14,525	0	7,260	21,785	10,050	0	6,030	16,080
- Palawija 2/ ton		0	860	860		565	0	565		0	1,250	1,250		1,020	0	1,020		0	340	340		0	190	190		0	725	725		0	1,005	1,005
6. Av. Paddy Yield 6/ t/ha	-	-	-	5.0	-	-	-	5.0	-	-	-	4.5	-	-	-	5.0	-	-	-	4.5	-	-	-	4.5	-	-	-	5.0	-	-	-	5.0
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																												
1. Land Use	Irri. Paddy Field 107 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 671 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 663 ha				Irri. Paddy Field 176 ha				Irri. Paddy Field 2,181 ha				Irri. Paddy Field 810 ha			
	Subject Area 0 ha				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	527	0	289	816	0	0	130	130	0	0	714	714	202	0	284	486	663	0	458	1,121	176	0	263	439	0	0	1,152	1,152	0	0	494	494
- Others ha		0	172	172		113	0	113		0	250	250		204	0	204		0	68	68		0	3	3		0	145	145		0	201	201
Total ha	527	0	461	988	0	113	130	243	0	0	964	964	202	204	284	690	663	0	526	1,189	176	0	266	442	0	0	1,297	1,297	0	0	695	695
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	16	0	6	22	0	0	12	12	45	0	17	62	10	0	14	24	0	0	-30	-30	100	0	70	170	0	0	9	9	0	0	1	1
- Others %	0	0	5	5	0	10	0	10	0	0	10	10	0	10	0	10	0	0	10	10	0	0	-7	-7	0	0	5	5	0	0	10	10
Total %	16	0	11	27	0	10	12	22	45	0	27	72	10	10	14	34	0	0	-20	-20	100	0	63	163	0	0	14	14	0	0	11	11
4. Paddy Production ton	-	-	-	9,972	-	-	-	2,780	-	-	-	7,999	-	-	-	6,032	-	-	-	5,085	-	-	-	2,376	-	-	-	12,387	-	-	-	6,407
5. Av. Paddy Yield 6/ t/ha	-	-	-	1.0	-	-	-	1.0	-	-	-	1.5	-	-	-	1.0	-	-	-	1.0	-	-	-	2.0	-	-	-	2.1	-	-	-	1.4

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area
5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 4/7

District	Asahan - continued	Simalungun																													
Irrigation Scheme	25. Purwodadi	26. Pentara								27. Simantin Pane Dame				28. Panambean/Panet Tongah BK				29. Raja Hombang/T. Mangaraja				30. Kerasaan				31. J. Kolonisasi/Purbolonggo				32. Naga Sompah			
I. Present/Before Project																															
1. Land Use	Irri. Paddy Field 1,635 ha	Irri. Paddy Field 40 ha								Irri. Paddy Field ha				Irri. Paddy Field 1,722 ha				Irri. Paddy Field 2,023 ha				Irri. Paddy Field 3,869 ha				Irri. Paddy Field 1,015 ha				Irri. Paddy Field 1,015 ha			
	Rainfed Paddy Field ha	Rainfed Paddy Field ha								Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha			
	Uncultivated Land ha	Uncultivated Land 258 ha								Upland Field 1,000 ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land 275 ha				Uncultivated Land ha				Uncultivated Land ha			
	Subject Area 1,635 ha	*Subject Area 298 ha*								*Subject Area 1,000 ha*				*Subject Area 1,722 ha*				*Subject Area 2,023 ha*				*Subject Area 4,144 ha*				*Subject Area 1,015 ha*				*Subject Area 1,015 ha*			
2. Cropped Area	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	1,635 1,619 3,254	40		20	60								0	1,653		1,702	3,355	2,007		1,251	3,258	2,697		2,715	5,412	1,010		989	1,999	1,003		489	1,492
- Paddy (Rainfed) 1/	0				0								0				0				0				0				0				0
- Palawija 2/ ha	0			20	20								0	3		7	10	12		590	602	60		869	929	5		9	14	12		508	520
- Rainfed Paddy ha	0				0								0				0				0				0				0				0
- Palawija 3/ ha	0				0					1,000			1,000				0				0				0				0				0
Total ha	1,635 0 1,619 3,254	40	0	40	80	1,000	0	0	1,000					1,656	0	1,709	3,365	2,019	0	1,841	3,860	2,757	0	3,584	6,341	1,015	0	998	2,013	1,015	0	997	2,012
3. Cropping Intensity 4/	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100 0 99 199	100	0	50	150									96	0	99	195	99	0	62	161	70	0	70	140	100	0	97	197	99	0	48	147
- Paddy (Rainfed) 1/ %	0 0 0 0	0	0	0	0									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Palawija 2/ %	0 0 0 0	0	0	50	50									0	0	0	1	1	0	29	30	2	0	22	24	0	0	1	1	1	0	50	51
Irrigated Field 5/ %	100 0 99 199	100	0	100	200									96	0	99	195	100	0	91	191	71	0	93	164	100	0	98	198	100	0	98	198
- Rainfed Paddy %																																	
- Palawija 3/ %						100	0	0	100																								
Overall to Subject Area %	100 0 99 199	13	0	13	27	100	0	0	100					96	0	99	195	100	0	91	191	67	0	86	153	100	0	98	198	100	0	98	198
4. Crop Yield	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.0 4.0 4.0	4.0		4.0	4.0									4.5		4.5	4.5	4.5		4.0	4.3	4.5		4.5	4.5	4.5		4.5	4.5	4.0		4.5	4.2
- Paddy (Rainfed) 1/																																	
- Palawija 2/ t/ha	-			2.5	-								-	2.5		2.5	-	2.5		2.5	-	2.5		2.5	-	2.5		2.5	-	2.5		2.5	-
- Rainfed Paddy t/ha	-				-								-				-				-				-				-				-
- Palawija 3/ t/ha	-				-	2.5			-				-				-				-				-				-				-
5. Crop Production	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	6,540 0 6,476 13,016	160	0	80	240	0	0	0	0					7,439	0	7,659	15,098	9,032	0	5,004	14,036	12,137	0	12,218	24,354	4,545	0	4,451	8,996	4,012	0	2,201	6,213
- Paddy (Rainfed) 1/ton	0	0			0	0			0				0	0			0	0			0	0			0	0			0	0			0
- Palawija 2/ ton	0 0 0 0	0	0	50	50	0	0	0	0					8	0	18	25	30	0	1,475	1,505	150	0	2,173	2,323	13	0	23	35	30	0	1,270	1,300
- Rainfed Paddy ton	0	0			0	0			0				0	0			0	0			0	0			0	0			0	0			0
- Palawija 3/ ton	0 0 0 0	0	0	0	0	2,500	0	0	2,500					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Paddy Production ton	6,540 0 6,476 13,016	160	0	80	240	0	0	0	0					7,439	0	7,659	15,098	9,032	0	5,004	14,036	12,137	0	12,218	24,354	4,545	0	4,451	8,996	4,012	0	2,201	6,213
		Palawija represented by maize (composite)				Palawija represented by maize (composite)								Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)			
6. Av. Paddy Yield 6/ t/ha	- - - 4.0	-	-	-	4.0	-	-	-	-					-	-	-	4.5	-	-	-	4.3	-	-	-	4.5	-	-	-	4.5	-	-	-	4.2
II. With Project																															
1. Land Use	Irri. Paddy Field 1,635 ha	Irri. Paddy Field 221 ha								Irri. Paddy Field 700 ha				Irri. Paddy Field 1,722 ha				Irri. Paddy Field 2,023 ha				Irri. Paddy Field 4,062 ha				Irri. Paddy Field 1,015 ha				Irri. Paddy Field 1,015 ha			
	Non-irrigable Land ha	Non-irrigable Lan 77 ha								Non-irrigable Lan 300 ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Lan 82 ha				Non-irrigable Land ha				Non-irrigable Land ha			
	Subject Area 1,635 ha	*Subject Area 298 ha*								*Subject Area 1,000 ha*				*Subject Area 1,722 ha*				*Subject Area 2,023 ha*				*Subject Area 4,144 ha*				*Subject Area 1,015 ha*				*Subject Area 1,015 ha*			
2. Cropped Area	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	1,635 1,635 3,270	221		111	332	700		350	1,050					1,722		1,722	3,444	2,023		2,023	4,046	4,062		3,250	7,312	1,015		1,015	2,030	1,015		1,015	2,030
- Palawija 2/ ha	328 328			22	22			70	70						344		344		607		607			812	812		204		204		305		305
Total ha	1,635 328 1,635 3,598	221	0	133	354	700	0	420	1,120					1,722	344	1,722	3,788	2,023	607	2,023	4,653	4,062	0	4,062	8,124	1,015	204	1,015	2,234	1,015	305	1,015	2,335
3. Cropping Intensity 7/	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100 0 100 200	100	0	50	150	100	0	50	150					100	0	100	200	100	0	100	200	100	0	80	180	100	0	100	200	100	0	100	200
- Palawija 2/ %	20 0 20	0	0	10	10	0	0	10	10					20	0	20	20	30	0	30	30	0	0	20	20	20	0	20	20	30	0	30	30
Total %	100 20 100 220	100	0	60	160	100	0	60	160	100	20	100	220	100	30	100	230	100	0	100	200	100	20	100	220	100	30	100	230				
Overall to Subject Area %	*100 20 100 220*	*74 0 45 119*				*70 0 42 112*				*100 20 100 220*				*100 30 100 230*				*98 0 98 196*				*100 20 100 220*				*100 30 100 230*							
4. Crop Yield	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	5.0 5.0 5.0	5.0		5.0	5.0	4.5		4.5	4.5					5.5		5.5	5.5	5.5		5.0	5.3	5.5		5.5	5.5	5.5		5.5	5.5	5.0		5.5	5.3
- Palawija 2/ t/ha	5.0			5.0	-			5.0	-					5.0		-	-			5.0	-			5.0	-		5.0	-	-		5.0	-	-
5. Crop Production	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	8,175 0 8,175 16,350	1,105	0	555	1,660	3,150	0	1,575	4,725					9,471	0	9,471	18,942	11,127	0	10,115	21,242	22,341	0	17,875	40,216	5,583	0	5,583	11,165	5,075	0	5,583	10,658
- Palawija 2/ ton	1,640 0 1,640	0	0	110	110	0	0	350	350					1,720	0	1,720		3,035	0	3,035		0	0	4,060	4,060		1,020	0	1,020		1,525	0	1,525
6. Av. Paddy Yield 6/ t/ha	- - - 5.0	-	-	-	5.0	-	-	-	4.5					-	-	-	5.5	-	-	-	5.3	-	-	-	5.5	-	-	-	5.5	-	-	-	5.3
	Palawija represented by maize (hybrid)	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																															
1. Land Use	Irri. Paddy Field 0 ha	Irri. Paddy Field 181 ha								Irri. Paddy Field 700 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 193 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha			
	Subject Area 0 ha	*Subject Area 0 ha*								*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*			
2. Cropped Area	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	0 0 16 16	181	0	91	272	700	0	350	1,050	69	0	20	89	16	0	772	788	1,365	0	535	1,900	5	0	26	31	12	0	526	538				
- Others ha	328 0 328	0	2	2		0	70	-930		344	-7	334		607	-590	5		0	-57	-117		204	-9	190		305	-508	-215					
Total ha	0 328 16 344	181	0	93	274	-300	0	420	120	66	344	13	423	4	607	182	793	1,305	0	478	1,783	0	204	17	221	0	305	18	323				
3. Cropping Intensity 7/	Wet Dry I Dry II Annual	Wet	Dry I	Dry II	Annual					Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	0 0 1 1	0	0	0	0	100	0	50	150	4	0	1	5	1	0	38	39	30	0	10	40	0	0	3	3	3	1	0	52	53			
- Others %	0 20 0 20	0	0	-40	-40	0	0	10	10	0	20	0	19	-1	30	-29	0	-2	0	-2	-4	0	20	-1	19	-1	30	-50	-21				
Total %	0 20 1 21	0	0	-40	-40	100	0	60	160	4	20	1	25	0	30	9	39	29	0	7	36	0	20	2	22	0	30	2	32				
4. Paddy Production ton	- - - 3,334	-	-	-	1,420	-	-	-	4,725	-	-	-	3,845	-	-	-	7,206	-	-	-	15,862	-	-	-	2,170	-	-	-	4,445				
5. Av. Paddy Yield 6/ t/ha	- - - 1.0	-	-	-	1.0	-	-	-	4.5	-	-	-	1.0	-	-	-	0.9	-	-	-	1.0	-	-	-	1.0	-	-	-	1.1				

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area

5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 5/7

District	Dairi								Karo				Deli Saerdang															
Irrigation Scheme	33. Risma Duma				34. Lae Ordi				35. Parit Lompaten				36. Bandar Sidoras				37. Namu Rambe				38. Sei Belutu				39. Langau				40. Medan Krio			
I. Present/Before Project																												
1. Land Use	Irri. Paddy Field			ha	Irri. Paddy Field		15	ha	Irri. Paddy Field		619	ha	Irri. Paddy Field		2,462	ha	Irri. Paddy Field		1,036	ha	Irri. Paddy Field		5,076	ha	Irri. Paddy Field		1,150	ha	Irri. Paddy Field		2,943	ha
	Rainfed Paddy Field			800 ha	Rainfed Paddy Field			185 ha	Rainfed Paddy Field			621 ha	Rainfed Paddy Field			995 ha	Rainfed Paddy Field			ha	Rainfed Paddy Field			ha	Rainfed Paddy Field			750 ha	Rainfed Paddy Field			ha
	Upland Field			722 ha	Upland Field			1,000 ha	Upland Field			2 ha	Uncultivated Land			ha	Uncultivated Land			ha	Uncultivated Land			ha	Uncultivated Land			ha	Upland Field			57 ha
	Subject Area			*1,522 ha*	*Subject Area*			*1,200 ha*	*Subject Area*			*1,242 ha*	*Subject Area*			*3,457 ha*	*Subject Area*			*1,036 ha*	*Subject Area*			*5,076 ha*	*Subject Area*			*1,900 ha*	*Subject Area*			*3,000 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha				0	15		15	30	325		325	650	2,462		1,970	4,432	1,036			1,036	4,020		4,020	8,040	767		767	1,534	2,943		2,143	5,086
- Paddy (Rainfed) 1/				0				0	294			294				0				0	1,056			1,056	383			383				0
- Palawija 2/ ha				0				0				0				0		143	143	286				0				0			800	800
- Rainfed Paddy ha	800			800	185			185	621			621	995			995				0				0	750			750				0
- Palawija 3/ ha	722			722	800			800	2			2				0				0				0				0	57			57
Total ha	1,522	0	0	1,522	1,000	0	15	1,015	1,242	0	325	1,567	3,457	0	1,970	5,427	1,036	143	143	1,322	5,076	0	4,020	9,096	1,900	0	767	2,667	3,000	0	2,943	5,943
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %					100	0	100	200	53	0	53	105	100	0	80	180	100	0	0	100	79	0	79	158	67	0	67	133	100	0	73	173
- Paddy (Rainfed) 1/ %					0	0	0	0	47	0	0	47	0	0	0	0	0	0	0	0	21	0	0	21	33	0	0	33	0	0	0	0
- Palawija 2/ %					0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	28	0	0	0	0	0	0	0	0	0	0	27	27
Irrigated Field 5/ %					100	0	100	200	53	0	53	105	100	0	80	180	100	14	14	128	79	0	79	158	67	0	67	133	100	0	100	200
- Rainfed Paddy %	100			100	100			100	100			100	100			100									100			100				
- Palawija 3/ %					80	0	0	80	100	0	0	100																	100	0	0	100
Overall to Subject Area %	100	0	0	100	83	0	1	85	100	0	26	126	100	0	57	157	100	14	14	128	100	0	79	179	100	0	40	140	100	0	98	198
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha					3.5		3.5	3.5	4.0		4.0	4.0	4.5		4.0	4.3	4.0			4.0	4.0		3.5	3.8	4.0		3.5	3.8	4.0		4.0	4.0
- Paddy (Rainfed) 1/									2.5												2.5				2.5							
- Palawija 2/ t/ha				-				-				-				-		2.5	2.5	-				-				-			2.5	-
- Rainfed Paddy t/ha	2.5			-	2.5			-	2.5			-	2.5			-				-				-	2.5			-				-
- Palawija 3/ t/ha	2.5			-	2.5			-	2.5			-				-				-				-				-	2.5			-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	0	0	0	0	53	0	53	105	1,300	0	1,300	2,600	11,079	0	7,880	18,959	4,144	0	0	4,144	16,080	0	14,070	30,150	3,068	0	2,685	5,753	11,772	0	8,572	20,344
- Paddy (Rainfed) 1/ton	0			0	0			0	735			735	0			0	0			0	2,640			2,640	958			958	0			0
- Palawija 2/ ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	358	358	715	0	0	0	0	0	0	0	0	0	0	2,000	2,000
- Rainfed Paddy ton	2,000			2,000	463			463	1,553			1,553	2,488			2,488	0			0	0			0	1,875			1,875	0			0
- Palawija 3/ ton	1,805	0	0	1,805	2,000	0	0	2,000	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143	0	0	143
Total Paddy Production ton	2,000	0	0	2,000	515	0	53	568	3,588	0	1,300	4,888	13,567	0	7,880	21,447	4,144	0	0	4,144	18,720	0	14,070	32,790	5,901	0	2,685	8,585	11,772	0	8,572	20,344
	Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)								Palawija represented by maize (composite)												Palawija represented by maize (composite)			
6. Av. Paddy Yield 6/ t/ha	-	-	-	2.5	-	-	-	2.6	-	-	-	3.1	-	-	-	4.0	-	-	-	4.0	-	-	-	3.6	-	-	-	3.2	-	-	-	4.0
II. With Project																												
1. Land Use	Irri. Paddy Field			1,305 ha	Irri. Paddy Field			900 ha	Irri. Paddy Field			1,241 ha	Irri. Paddy Field			3,457 ha	Irri. Paddy Field			1,036 ha	Irri. Paddy Field			5,076 ha	Irri. Paddy Field			1,900 ha	Irri. Paddy Field			2,983 ha
	Non-irrigable Lan			217 ha	Non-irrigable Lan			300 ha	Non-irrigable Lan			1 ha	Non-irrigable Land			ha	Non-irrigable Land			ha	Non-irrigable Land			ha	Non-irrigable Land			ha	Non-irrigable Lan			17 ha
	Subject Area			*1,522 ha*	*Subject Area*			*1,200 ha*	*Subject Area*			*1,242 ha*	*Subject Area*			*3,457 ha*	*Subject Area*			*1,036 ha*	*Subject Area*			*5,076 ha*	*Subject Area*			*1,900 ha*	*Subject Area*			*3,000 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	1,305		783	2,088	900		540	1,440	1,241		869	2,110	3,457		2,766	6,223	1,036		622	1,658	5,076		4,568	9,644	1,900		1,330	3,230	2,983		2,685	5,668
- Palawija 2/ ha			131	131			90	90			124	124			346	346			207	207			254	254			95	95		298	298	596
Total ha	1,305	0	914	2,219	900	0	630	1,530	1,241	0	993	2,234	3,457	0	3,112	6,569	1,036	0	829	1,865	5,076	0	4,822	9,898	1,900	0	1,425	3,325	2,983	298	2,983	6,264
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100	0	60	160	100	0	60	160	100	0	70	170	100	0	80	180	100	0	60	160	100	0	90	190	100	0	70	170	100	0	90	190
- Palawija 2/ %		0	10	10		0	10	10		0	10	10		0	10	10		0	20	20		0	5	5		0	5	5		10	10	20
Total %	100	0	70	170	100	0	70	170	100	0	80	180	100	0	90	190	100	0	80	180	100	0	95	195	100	0	75	175	100	10	100	210
Overall to Subject Area %	*86*	*0*	*60*	*146*	*75*	*0*	*53*	*128*	*100*	*0*	*80*	*180*	*100*	*0*	*90*	*190*	*100*	*0*	*80*	*180*	*100*	*0*	*95*	*195*	*100*	*0*	*75*	*175*	*99*	*10*	*99*	*209*
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.5		4.5	4.5	4.5		4.5	4.5	5.0		5.0	5.0	5.5		5.0	5.3	5.0		5.0	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0		5.0	5.0
- Palawija 2/ t/ha			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-			5.0	-		5.0	5.0	-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	5,873	0	3,524	9,396	4,050	0	2,430	6,480	6,205	0	4,345	10,550	19,014	0	13,830	32,844	5,180	0	3,110	8,290	25,380	0	22,840	48,220	9,500	0	6,650	16,150	14,915	0	13,425	28,340
- Palawija 2/ ton		0	655	655		0	450	450		0	620	620		0	1,730	1,730		0	1,035	1,035		0	1,270	1,270		0	475	475		1,490	1,490	2,980
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.5	-	-	-	4.5	-	-	-	5.0	-	-	-	5.3	-	-	-	5.0	-	-	-	5.0	-	-	-	5.0	-	-	-	5.0
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																												
1. Land Use	Irri. Paddy Field			1,305 ha	Irri. Paddy Field			885 ha	Irri. Paddy Field			622 ha	Irri. Paddy Field			995 ha	Irri. Paddy Field			0 ha	Irri. Paddy Field			0 ha	Irri. Paddy Field			750 ha	Irri. Paddy Field			40 ha
	Subject Area			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*	*Subject Area*			*0 ha*
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	505	0	783	1,288	700	0	525	1,225	1	0	544	545	0	0	796	796	0	0	622	622	0	0	548	548	0	0	563	563	40	0	542	582
- Others ha		0	131	-591		0	90	-710		0	124	122		0	346	346		-143	64	-79		0	254	254		0	95	95		298	-502	-261
Total ha	-217	0	914	697	-100	0	615	515	-1	0	668	667	0	0	1,142	1,142	0	-143	686	543	0	0	802	802	0	0	658	658	-17	298	40	321
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	100	0	60	160	0	0	-40	-40	47	0	18	65	0	0	0	0	0	0	60	60	21	0	11	32	33	0	3	37	0	0	17	17
- Others %	0	0	10	10	0	0	10	10	0	0	10	10	0	0	10	10	0	-14	6	-8	0	0	5	5	0	0	5	5	0	10	-17	-7
Total %	100	0	70	170	0	0	-30	-30	47	0	28	75	0	0	10	10	0	-14	66	52	21	0	16	37	33	0	8	42	0	10	0	10
4. Paddy Production ton	-	-	-	7,396	-	-	-	5,913	-	-	-	5,663	-	-	-	11,397	-	-	-	4,146	-	-	-	15,430	-	-	-	7,565	-	-	-	7,996
5. Av. Paddy Yield 6/ t/ha	-	-	-	2.0	-	-	-	1.9	-	-	-	1.9	-	-	-	1.3	-	-	-	1.0	-	-	-	1.4	-	-	-	1.8	-	-	-	1.0

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area

5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 6/7

District	Deli Saerdang - continued								Langkat				Inter-district Scheme																			
Irrigation Scheme	41. Rantau Panjang				42. Pekan Kamis				43. Secanggang				44. Paya Lobang				45. Namu Sira-sira Kiri				46. Namu Sira-sira Kanan				47. Bah Korah II				48. Sijambi			
I. Present/Before Project																																
1. Land Use	Irri. Paddy Field 2,309 ha				Irri. Paddy Field 920 ha				Irri. Paddy Field 1,319 ha				Irri. Paddy Field 1,263 ha				Irri. Paddy Field 1,350 ha				Irri. Paddy Field 3,953 ha				Irri. Paddy Field 1,723 ha				Irri. Paddy Field 885 ha			
	Rainfed Paddy Field ha				Rainfed Paddy Field 180 ha				Rainfed Paddy Field ha				Rainfed Paddy Field 295 ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field ha				Rainfed Paddy Field 95 ha			
	Uncultivated Land ha				Uncultivated Land ha				Upland Field 81 ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Uncultivated Land ha				Upland Field 28 ha			
	Subject Area 2,309 ha				*Subject Area 1,100 ha*				*Subject Area 1,400 ha*				*Subject Area 1,558 ha*				*Subject Area 1,350 ha*				*Subject Area 3,953 ha*				*Subject Area 1,723 ha*				*Subject Area 1,008 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha				0	815		815	1,630	1,290			1,290	1,263		884	2,147	1,350		270	1,620	3,953		791	4,744	1,485		1,568	3,053	885		443	1,328
- Paddy (Rainfed) 1/	2,309			2,309	105			105	29			29				0				0				0				0				0
- Palawija 2/ ha				0			92	92				0				0			135	135			395	395	8			8				0
- Rainfed Paddy ha				0	180			180				0	295			295				0				0				0	95			95
- Palawija 3/ ha				0				0	81			81				0				0				0				0	28			28
Total ha	2,309	0	0	2,309	1,100	0	907	2,007	1,400	0	0	1,400	1,558	0	884	2,442	1,350	0	405	1,755	3,953	0	1,186	5,139	1,493	0	1,568	3,061	1,008	0	443	1,451
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	0	0	0	0	89	0	89	177	98	0	0	98	100	0	70	170	100	0	20	120	100	0	20	120	86	0	91	177	100	0	50	150
- Paddy (Rainfed) 1/ %	100	0	0	100	11	0	0	11	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Palawija 2/ %	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	10	10	0	0	10	10	0	0	0	0	0	0	0	0
Irrigated Field 5/ %	0	0	0	0	89	0	99	187	98	0	0	98	100	0	70	170	100	0	30	130	100	0	30	130	87	0	91	178	100	0	50	150
- Rainfed Paddy %					100			100					100			100													100			100
- Palawija 3/ %									100	0	0	100																	100	0	0	100
Overall to Subject Area %	100	0	0	100	100	0	82	182	100	0	0	100	100	0	57	157	100	0	30	130	100	0	30	130	87	0	91	178	100	0	44	144
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha					4.5		4.0	4.3	4.0			4.0	4.0		4.5	4.2	4.5		4.5	4.5	4.5		4.5	4.5	4.5		4.5	4.5	4.0		3.5	3.8
- Paddy (Rainfed) 1/	2.5			2.5	2.5				2.5																							
- Palawija 2/ t/ha				-			2.5	-				-				-			2.5	-			2.5	-	2.5			-				-
- Rainfed Paddy t/ha				-	2.5			-				-	2.5			-				-				-				-	2.5			-
- Palawija 3/ t/ha				-				-	2.5			-				-				-				-				-	2.5			-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	0	0	0	0	3,668	0	3,260	6,928	5,160	0	0	5,160	5,052	0	3,978	9,030	6,075	0	1,215	7,290	17,789	0	3,560	21,348	6,683	0	7,056	13,739	3,540	0	1,551	5,091
- Paddy (Rainfed) 1/ton	5,773			5,773	263			263	73			73	0			0	0			0	0			0	0			0	0			0
- Palawija 2/ ton	0	0	0	0	0	0	230	230	0	0	0	0	0	0	0	0	0	0	338	338	0	0	988	988	20	0	0	20	0	0	0	0
- Rainfed Paddy ton	0			0	450			450	0			0	738			738	0			0	0			0	0			0	238			238
- Palawija 3/ ton	0	0	0	0	0	0	0	0	203	0	0	203	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	0	70
Total Paddy Production ton	5,773	0	0	5,773	4,380	0	3,260	7,640	5,233	0	0	5,233	5,790	0	3,978	9,768	6,075	0	1,215	7,290	17,789	0	3,560	21,348	6,683	0	7,056	13,739	3,778	0	1,551	5,328
					Palawija represented by maize (composite)				Palawija represented by maize (composite)								Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)				Palawija represented by maize (composite)			
6. Av. Paddy Yield 6/ t/ha	-	-	-	2.5	-	-	-	4.0	-	-	-	4.0	-	-	-	4.0	-	-	-	4.5	-	-	-	4.5	-	-	-	4.5	-	-	-	3.7
II. With Project																																
1. Land Use	Irri. Paddy Field 2,309 ha				Irri. Paddy Field 1,100 ha				Irri. Paddy Field 1,376 ha				Irri. Paddy Field 1,558 ha				Irri. Paddy Field 1,350 ha				Irri. Paddy Field 3,953 ha				Irri. Paddy Field 1,723 ha				Irri. Paddy Field 1,000 ha			
	Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Lar 24 ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Land ha				Non-irrigable Lar 8 ha			
	Subject Area 2,309 ha				*Subject Area 1,100 ha*				*Subject Area 1,400 ha*				*Subject Area 1,558 ha*				*Subject Area 1,350 ha*				*Subject Area 3,953 ha*				*Subject Area 1,723 ha*				*Subject Area 1,008 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ha	2,309		1,155	3,464	1,100		880	1,980	1,376		1,238	2,614	1,558		1,558	3,116	1,350		945	2,295	3,953		2,767	6,720	1,723		1,723	3,446	1,000		1,000	2,000
- Palawija 2/ ha			115	115			110	110			138	138		156		156			135	135			198	198		172		172		200		200
Total ha	2,309	0	1,270	3,579	1,100	0	990	2,090	1,376	0	1,376	2,752	1,558	156	1,558	3,272	1,350	0	1,080	2,430	3,953	0	2,965	6,918	1,723	172	1,723	3,618	1,000	200	1,000	2,200
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy %	100	0	50	150	100	0	80	180	100	0	90	190	100	0	100	200	100	0	70	170	100	0	70	170	100	0	100	200	100	0	100	200
- Palawija 2/ %		0	5	5		0	10	10		0	10	10		10	0	10		0	10	10		0	5	5		10	0	10		20	0	20
Total %	100	0	55	155	100	0	90	190	100	0	100	200	100	10	100	210	100	0	80	180	100	0	75	175	100	10	100	210	100	20	100	220
Overall to Subject Area %	*100*	*0*	*55*	*155*	*100*	*0*	*90*	*190*	*98*	*0*	*98*	*197*	*100*	*10*	*100*	*210*	*100*	*0*	*80*	*180*	*100*	*0*	*75*	*175*	*100*	*10*	*100*	*210*	*99*	*20*	*99*	*218*
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy t/ha	4.5		4.5	4.5	5.5		5.0	5.3	5.0		5.0	5.0	5.0		5.0	5.0	5.5		5.5	5.5	5.5		5.5	5.5	5.0		5.5	5.3	5.0		4.5	4.8
- Palawija 2/ t/ha			5.0	-			5.0	-			5.0	-		5.0		-			5.0	-			5.0	-		5.0		-		5.0		-
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Irrigated Paddy ton	10,391	0	5,198	15,588	6,050	0	4,400	10,450	6,880	0	6,190	13,070	7,790	0	7,790	15,580	7,425	0	5,198	12,623	21,742	0	15,219	36,960	8,615	0	9,477	18,092	5,000	0	4,500	9,500
- Palawija 2/ ton		0	575	575		0	550	550		0	690	690		780	0	780		0	675	675		0	990	990		860	0	860		1,000	0	1,000
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.5	-	-	-	5.3	-	-	-	5.0	-	-	-	5.0	-	-	-	5.5	-	-	-	5.5	-	-	-	5.3	-	-	-	4.8
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)			
Increment (With - Present)																																
1. Land Use	Irri. Paddy Field 0 ha				Irri. Paddy Field 180 ha				Irri. Paddy Field 57 ha				Irri. Paddy Field 295 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 0 ha				Irri. Paddy Field 115 ha			
	Subject Area 0 ha				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*				*Subject Area 0 ha*			
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy ha	0	0	1,155	1,155	0	0	65	65	57	0	1,238	1,295	0	0	674	674	0	0	675	675	0	0	1,976	1,976	238	0	155	393	20	0	557	577
- Others ha		0	115	115		0	18	18		0	138	57		156	0	156		0	0	0		0	-197	-197		172	0	164		200	0	172
Total ha	0	0	1,270	1,270	0	0	83	83	-24	0	1,376	1,352	0	156	674	830	0	0	675	675	0	0	1,779	1,779	230	172	155	557	-8	200	557	749
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual
- Paddy %	100	0	50	150	11	0	-9	3	2	0	90	92	0	0	30	30	0	0	50	50	0	0	50	50	14	0	9	23	0	0	50	50
- Others %	0	0	5	5	0	0	0	0	0	0	10	10	0	10	0	10	0	0	0	0	0	0	-5	-5	0	10	0	10	0	20	0	20
Total %	100	0	55	155	11	0	-9	3	2	0	100	102	0	10	30	40	0	0	50	50	0	0	45	45	13	10	9	32	0	20	50	70
4. Paddy Production ton	-	-	-	9,816	-	-	-	2,810	-	-	-	7,838	-	-	-	5,813	-	-	-	5,333	-	-	-	15,612	-	-	-	4,353	-	-	-	4,172
5. Av. Paddy Yield 6/ t/ha	-	-	-	2.0	-	-	-	1.3	-	-	-	1.0	-	-	-	1.0	-	-	-	1.0	-	-	-	1.0	-	-	-	0.8	-	-	-	1.0

1/: Paddy grown under rainfed condition in irrigated field 2/: Palawija in irrigated field 3/: Palawija in upland field 4/: Cropping intensity in each land use category; Irri. Paddy Field, in rainfed field & upland field, respectively and overall to subject area

5/: Irrigation performances --- Cropping intensity of irrigated paddy & palawija in irrigated field; not including paddy grown under rainfed conditions 6/: Overall annual average paddy yield (annual paddy production ÷ annual total cropped area of paddy) 7/: Cropping intensity in irrigated field

Table A-5.3.2 Present Agriculture and Agriculture Plans of the Target Schemes: North Sumatra - 7/7

District	Inter-district Scheme - continued								Overall Province				
Irrigation Scheme	49. Rambung Mera				50. Paya Sordang								
I. Present/Before Project													
1. Land Use	Irri. Paddy Field		944	ha	Irri. Paddy Field		3,979	ha	Irri. Paddy Field		**72,620**	ha	80%
	Rainfed Paddy Field			ha	Rainfed Paddy Field		371	ha	Rainfed Paddy Field		**11,346**	ha	13%
	Uncultivated Land			ha	Uncultivated Land			ha	Non-paddy Field		**6,584**	ha	7%
	Subject Area		*944*	*ha*	*Subject Area*		*4,350*	*ha*	*Subject Area*		***90,550***	*ha*	100%
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy ha	944		786	1,730	3,562		2,862	6,424	62,565	0	42,987	**105,552**	81%
- Paddy (Rainfed) 1/				0				0	7,397	0	0	**7,397**	6%
- Palawija 2/ ha			89	89				0	100	143	3,762	**4,005**	3%
- Rainfed Paddy ha				0	371			371	11,346	0	0	**11,346**	9%
- Palawija 3/ ha				0				0	2,690	0	0	**2,690**	2%
Total ha	944	0	875	1,819	3,933	0	2,862	6,795	84,098	143	46,749	**130,990**	100%
3. Cropping Intensity 4/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy %	100	0	83	183	90	0	72	161	86	0	59	**145**	
- Paddy (Rainfed) 1/ %	0	0	0	0	0	0	0	0	10	0	0	**10**	
- Palawija 2/ %	0	0	9	9	0	0	0	0	0	0	5	**6**	
Irrigated Field 5/ %	100	0	93	193	90	0	72	161	86	0	64	**151**	
- Rainfed Paddy %					100			100	100			**100**	
- Palawija 3/ %									93	0	0	**93**	
Overall to Subject Area %	100	0	93	193	90	0	66	156	93	0	52	**145**	
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy t/ha	4.5		4.5	4.5	4.5		4.5	4.5	4.2		4.1	**4.2**	
- Paddy (Rainfed) 1/									2.5			**2.5**	
- Palawija 2/ t/ha			2.5	-				-				**-**	
- Rainfed Paddy t/ha				-	2.5			-	2.5			**2.5**	
- Palawija 3/ t/ha				-				-				**-**	
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy ton	4,248	0	3,537	7,785	16,029	0	12,879	28,908	262,276	0	176,052	**438,328**	
- Paddy (Rainfed) 1/ton	0			0	0			0	18,493	0	0	**18,493**	
- Palawija 2/ ton	0	0	223	223	0	0	0	0	250	358	9,405	**10,013**	
- Rainfed Paddy ton	0			0	928			928	28,365	0	0	**28,365**	
- Palawija 3/ ton	0	0	0	0	0	0	0	0	6,725	0	0	**6,725**	
Total Paddy Production ton	4,248	0	3,537	7,785	16,957	0	12,879	29,836	309,134	0	176,052	**485,185**	
	Palawija represented by maize (composite)												
6. Av. Paddy Yield 6/ t/ha	-	-	-	4.5	-	-	-	4.4	3.8		4.1	**3.9**	
II. With Project													
1. Land Use	Irri. Paddy Field		944	ha	Irri. Paddy Field		4,350	ha	Irri. Paddy Field		**88,576**	ha	
	Non-irrigable Land			ha	Non-irrigable Land			ha	Non-irrigable Land		**1,974**	ha	
	Subject Area		*944*	*ha*	*Subject Area*		*4,350*	*ha*	*Subject Area*		**90,550**	*ha*	
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	**Annual**	
- Irrigated Paddy ha	944		944	1,888	4,350		3,480	7,830	88,576	0	69,061	**157,637**	94%
- Palawija 2/ ha		188		188			435	435		3,396	6,123	**9,519**	6%
Total ha	944	188	944	2,076	4,350	0	3,915	8,265	88,576	3,396	75,184	**167,156**	100%
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy %	100	0	100	200	100	0	80	180	100	0	78	**178**	
- Palawija 2/ %		20	0	20		0	10	10	0	4	7	**11**	
Total %	100	20	100	220	100	0	90	190	100	4	85	**189**	
Overall to Subject Area %	*100*	*20*	*100*	*220*	*100*	*0*	*90*	*190*	98	4	83	**185**	
4. Crop Yield	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy t/ha	5.5		5.5	5.5	5.5		5.5	5.5	5.1		5.1	**5.1**	
- Palawija 2/ t/ha		5.0		-			5.0	-		5.0	5.0	**5.0**	
5. Crop Production	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual	
- Irrigated Paddy ton	5,192	0	5,192	10,384	23,925	0	19,140	43,065	447,395	0	349,956	**797,351**	
- Palawija 2/ ton		940	0	940		0	2,175	2,175	0	16,980	30,615	**47,595**	
6. Av. Paddy Yield 6/ t/ha	-	-	-	5.5	-	-	-	5.5	-	-	-	**5.1**	
	Palawija represented by maize (hybrid)				Palawija represented by maize (hybrid)								
Increment (With - Present)													
1. Land Use	Irri. Paddy Field		0	ha	Irri. Paddy Field		371	ha	Irri. Paddy Field		**15,956**	ha	
	Subject Area		*0*	*ha*	*Subject Area*		*0*	*ha*	*Subject Area*		***0***	*ha*	
2. Cropped Area	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual					
- Paddy ha	0	0	158	158	417	0	618	1,035	7,268	0	26,074	**33,342**	
- Others ha		188	-89	99		0	435	435		3,253	2,361	**2,824**	
Total ha	0	188	69	257	417	0	1,053	1,470	4,478	3,253	28,435	**36,166**	
3. Cropping Intensity 7/	Wet	Dry I	Dry II	Annual	Wet	Dry I	Dry II	Annual					
- Paddy %	0	0	17	17	10	0	8	19	14	0	19	**33**	
- Others %	0	20	-9	10	0	0	10	10	0	4	2	**5**	
Total %	0	20	7	27	10	0	18	29	14	4	21	**38**	
4. Paddy Production ton	-	-	-	2,599	-	-	-	13,230	-	-	-	**312,166**	
5. Av. Paddy Yield 6/ t/ha	-	-	-	1.0	-	-	-	1.1	-	-	-	**1.2**	

Table A-5.3.3 Determination of Target Cropping Intensity: North Sumatra - 1/2

Irrigation Scheme	Present Cropping Intensity (%) 1/						Planned Cropping Intensity (%) 1/								Refference Data Used for Determination of Target Intensity				
					Annual						Annual		Increment		Past Highest Record of Paddy Cropped Area & Intensity 2/			PSDA 3/	
	Crop	Wet	Dry I	Dry II	%	ha	Crop	Wet	Dry I	Dry II	%	ha	%	ha	Wet	Dry I	Dry II	Wet	Dry
1. Gido Sebua	Paddy	51		51	102	900	Paddy	100		70	170	1,501	68	601	450		450		
Irrigated area	Palawija				0		Palawija			10	10	88	10	88					
883 ---> 883 ha	Total	51	0	51	102	900	Total	100	0	80	180	1,589	78	689	51%		51%		
2. Batang Gadis	Paddy	100		70	170	9,474	Paddy	100		90	190	10,593	20	1,119	5,575		5,575	4,575	4,575
Irrigated area	Palawija				0		Palawija			5	5	279	5	279					
5575 ---> 5575 ha	Total	100	0	70	170	9,474	Total	100	0	95	195	10,872	25	1,398	100%		100%	82%	82%
3. Batang Ilung	Paddy	100		72	172	6,112	Paddy	100		100	200	7,092	28	980	3,546		3,546	3,546	2,566
Irrigated area	Palawija				0		Palawija		5		5	177	5	177					
3546 ---> 3546 ha	Total	100	0	72	172	6,112	Total	100	5	100	205	7,269	33	1,157	100%		100%	100%	72%
4. Blk Sitongkon/N. Suron	Paddy	100		96	196	978	Paddy	100		100	200	1,000	4	22	500		500	622	622
Irrigated area	Palawija				0		Palawija		20		20	100	20	100				area: 712 ha	
500 ---> 500 ha	Total	100	0	96	196	978	Total	100	20	100	220	1,100	24	122	100%		100%	87%	87%
5. Siborna	Paddy	under rainfed condition			0	0	Paddy	100		50	150	1,425	150	1,425	595		595	595	595
Irrigated area	Palawija				0		Palawija			10	10	95	10	95				area: 725 ha	
595 ---> 950 ha	Total	0	0	0	0	0	Total	100	0	60	160	1,520	160	1,520	100%		100%	82%	82%
6. Siaili Tukka	Paddy	100		50	150	383	Paddy	100		50	150	900	0	517	255		158		
Irrigated area	Palawija				0		Palawija			10	10	60	10	60					
255 ---> 600 ha	Total	100	0	50	150	383	Total	100	0	60	160	960	10	577	100%		62%		
7. Badiri Lopian	Paddy	100		30	130	1,169	Paddy	100		70	170	1,528	40	359					
Irrigated area	Palawija				0		Palawija			10	10	90	10	90					
899 ---> 899 ha	Total	100	0	30	130	1,169	Total	100	0	80	180	1,618	50	449					
8. Pandurungan	Paddy	100		50	150	1,554	Paddy	100		70	170	2,268	20	714	1,034		717		
Irrigated area	Palawija				0		Palawija			10	10	133	10	133					
1034 ---> 1334 ha	Total	100	0	50	150	1,554	Total	100	0	80	180	2,401	30	847	100%		69%		
9. Sihiong	Paddy	0		0	0	0	Paddy	100		50	150	933	150	933					
Irrigated area	Palawija				0		Palawija			10	10	62	10	62					
0 ---> 622 ha	Total	0	0	0	0	0	Total	100	0	60	160	995	160	995					
10. Aek Silang	Paddy	100			100	200	Paddy	100		50	150	1,890	50	1,690	700			200	0
Irrigated area	Palawija			10	10	20	Palawija			10	10	126	0	106			20		
200 ---> 1260 ha	Total	100	0	10	110	220	Total	100	0	60	160	2,016	50	1,796				100%	0%
11. Sarulla	Paddy	63		14	77	928	Paddy	100		50	150	2,324	73	1,396	764		1,528	764	0
Irrigated area	Palawija				0		Palawija			10	10	155	10	155				area: 764 ha	
1214 ---> 1549 ha	Total	63	0	14	77	928	Total	100	0	60	160	2,479	83	1,551	63%		126%	100%	0%
12. Parmiahan Hutapaung	Paddy	100			100	200	Paddy	100		50	150	1,455	50	1,255	900		100	200	0
Irrigated area	Palawija			20	20	40	Palawija			10	10	97	-10	57					
200 ---> 970 ha	Total	100	0	20	120	240	Total	100	0	60	160	1,552	40	1,312				100%	0%
13. Sinamo	Paddy	100			100	100	Paddy	100		50	150	1,395	50	1,295	930		100	100	0
Irrigated area	Palawija			10	10	10	Palawija			10	10	93	0	83					
100 ---> 930 ha	Total	100	0	10	110	110	Total	100	0	60	160	1,488	50	1,378				100%	0%
14. Aek Mandos I	Paddy	100			100	999	Paddy	100		50	150	1,562	50	563	999		200	999	0
Irrigated area	Palawija				0		Palawija			10	10	104	10	104					
999 ---> 1041 ha	Total	100	0	0	100	999	Total	100	0	60	160	1,666	60	667	100%		20%	100%	0%
15. Simangatasi II	Paddy	53			53	800	Paddy	100		50	150	2,271	97	1,471	1,514		100	1,514	0
Irrigated area	Palawija				0		Palawija			10	10	151	10	151					
1514 ---> 1514 ha	Total	53	0	0	53	800	Total	100	0	60	160	2,422	107	1,622	100%		7%	100%	0%
16. Bulung Ihit	Paddy	100		50	150	2,033	Paddy	100		70	170	2,304	20	271	1,513		1,513	1,355	1,355
Irrigated area	Palawija				0		Palawija			10	10	136	10	136					
1355 ---> 1355 ha	Total	100	0	50	150	2,033	Total	100	0	80	180	2,440	30	407				100%	100%
17. Perkotaan	Paddy	84		84	168	5,624	Paddy	100		90	190	6,547	22	923	3,446		3,446	3,446	3,339
Irrigated area	Palawija				0		Palawija			5	5	172	5	172				area: 3446 ha	
3339 ---> 3446 ha	Total	84	0	84	168	5,624	Total	100	0	95	195	6,719	27	1,095	100%		100%	100%	97%
18. Sungai Balai	Paddy	100		88	188	2,130	Paddy	100		100	200	2,260	12	130	1,130		1,130	1,130	1,130
Irrigated area	Palawija				0		Palawija		10		10	113	10	113					
1130 ---> 1130 ha	Total	100	0	88	188	2,130	Total	100	10	100	210	2,373	22	243	100%		100%	100%	100%
19. Panca Arga	Paddy	55		43	98	1,786	Paddy	100		60	160	4,000	62	2,214	1,500		786	2,500	1,829
Irrigated area	Palawija				0		Palawija			10	10	250	10	250				area: 2500 ha	
1829 ---> 2500 ha	Total	55	0	43	98	1,786	Total	100	0	70	170	4,250	72	2,464	82%		43%	100%	73%
20. Serbangan	Paddy	90		86	176	3,602	Paddy	100		100	200	4,088	24	486	1,880		1,871	2,044	2,044
Irrigated area	Palawija				0		Palawija		10		10	204	10	204					
2044 ---> 2044 ha	Total	90	0	86	176	3,602	Total	100	10	100	210	4,292	34	690	92%		92%	100%	100%
21. Silau Bonto	Paddy	100		100	200	40	Paddy	100		70	170	1,161	-30	1,121	300		300	1,917	1,200
Irrigated area	Palawija				0		Palawija			10	10	68	10	68				area: 3117 ha	
20 ---> 683 ha	Total	100	0	100	200	40	Total	100	0	80	180	1,229	-20	1,189				62%	38%
22. Sungai Silau	Paddy	under rainfed condition			0	0	Paddy	100		70	170	639	170	639	625			625	1,040
Irrigated area	Palawija			18	18	35	Palawija			10	10	38	-8	3			140	area: 1040 ha	
200 ---> 376 ha	Total		0	18	18	35	Total	100	0	80	180	677	162	642			vegetabl a	60%	100%
23. Padang Mahondang	Paddy	100		41	141	1,024	Paddy	100		50	150	4,357	9	3,333	724		700	2,181	724
Irrigated area	Palawija				0		Palawija			5	5	145	5	145				area: 2905 ha	
724 ---> 2905 ha	Total	100	0	41	141	1,024	Total	100	0	55	155	4,502	14	3,478	100%		97%	75%	25%
24. Simujur	Paddy	100		59	159	1,912	Paddy	100		60	160	3,216	1	1,304	2,010		1,200	1,200	1,200
Irrigated area	Palawija				0		Palawija			10	10	201	10	201					
1200 ---> 2010 ha	Total	100	0	59	159	1,912	Total	100	0	70	170	3,417	11	1,505			100%	100%	100%
25. Purwodadi	Paddy	100		99	199	3,254	Paddy	100		100	200	3,270	1	16	1,635		1,635	1,635	1,635
Irrigated area	Palawija				0		Palawija		20		20	328	20	328					
1635 ---> 1635 ha	Total	100	0	99	199	3,254	Total	100	20	100	220	3,598	21	344	100%		100%	100%	100%
26. Pentara	Paddy	100		50	150	60	Paddy	100		50	150	332	0	272	146		146		
Irrigated area	Palawija			50	50	20	Palawija			10	10	22	-40	2					
40 ---> 221 ha	Total	100	0	100	200	80	Total	100	0	60	160	354	-40	274					

Table A-5.3.3 Determination of Target Cropping Intensity: North Sumatra - 2/2

Irrigation Scheme	Present Cropping Intensity (%) 1/						Planned Cropping Intensity (%) 1/								Refference Data Used for Determination of Target Intensity				
					Annual						Annual		Increment		Past Highest Record of Paddy Cropped Area & Intensity 2/			PSDA 3/	
	Crop	Wet	Dry I	Dry II	%	ha	Crop	Wet	Dry I	Dry II	%	ha	%	ha	Wet	Dry I	Dry II	Wet	Dry
27. Simantin Pane Dame	Paddy				0	0	Paddy	100		50	150	1,050	150	1,050					
Irrigated area	Palawija				0		Palawija			10	10	70	10	70					
0 ---> 700 ha	Total	0	0	0	0	0	Total					1,120	0	1,120					
28. Panambean /Panet T. BK	Paddy	96		99	195	3,355	Paddy	100		100	200	3,444	5	89	1,722		1,722		
Irrigated area	Palawija	0.1		0.4	0.6	10	Palawija		20		20	344	19	334					
1722 ---> 1722 ha	Total	96	0	99	196	3,365	Total	100	20	100	220	3,788	25	423	100%		100%		
29. R. Hombang /T.Mangara	Paddy	99		62	161	3,258	Paddy	100		100	200	4,046	39	788	2,010		1,619		
Irrigated area	Palawija	0.6		29	30	602	Palawija		30		30	607	0.4	5	13		982		
2023 ---> 2023 ha	Total	100	0	91	191	3,860	Total	100	30	100	230	4,653	39	793					
30. Kerasaan	Paddy	70		70	140	5,412	Paddy	100		80	180	7,312	40	1,900	3,229		3,043		
Irrigated area	Palawija	2		22	24	929	Palawija			20	20	812	-4	-117			1,423		
3869 ---> 4062 ha	Total	72	0	92	164	6,341	Total	100	0	100	200	8,124	36	1,783	83%				
31. J.Kolonisasi/Purbolongg	Paddy	100		97	197	1,999	Paddy	100		100	200	2,030	3	31	1,015		1,002		
Irrigated area	Palawija			1	1	14	Palawija		20		20	204	19	190	23		15		
1015 ---> 1015 ha	Total	100	0	98	198	2,013	Total	100	20	100	220	2,234	22	221					
32. Naga Sompah	Paddy	99		48	147	1,492	Paddy	100		100	200	2,030	53	538	1,013		1,012		
Irrigated area	Palawija	1		50	51	520	Palawija		30		30	305	-21	-215	23		1,015		
1015 ---> 1015 ha	Total	100	0	98	198	2,012	Total	100	30	100	230	2,335	32	323					
33. Risma Duma	Paddy				0	0	Paddy	100		60	160	2,088	160	2,088					
Irrigated area	Palawija				0		Palawija			10	10	131	10	131					
0 ---> 1305 ha	Total	0	0	0	0	0	Total	100	0	70	170	2,219	170	2,219					
34. Lae Ordi	Paddy	100		100	200	30	Paddy	100		60	160	1,440	-40	1,410					
Irrigated area	Palawija				0		Palawija			10	10	90	10	90					
15 ---> 900 ha	Total	100	0	100	200	30	Total	100	0	70	170	1,530	-30	1,500					
35. Parit Lompaten	Paddy	53		53	106	650	Paddy	100		70	170	2,110	64	1,460	619		619	619	0
Irrigated area	Palawija				0		Palawija			10	10	124	10	124					
619 ---> 1241 ha	Total	53	0	53	106	650	Total	100	0	80	180	2,234	74	1,584	100%		100%	100%	100%
36. Bandar Sidoras	Paddy	100		80	180	4,432	Paddy	100		80	180	6,223	0	1,791					
Irrigated area	Palawija				0		Palawija			10	10	346	10	346					
2462 ---> 3457 ha	Total	100	0	80	180	4,432	Total	100	0	90	190	6,569	10	2,137					
37. Namu Rambe	Paddy	100			100	1,036	Paddy	100		60	160	1,658	60	622	1,036				
Irrigated area	Palawija		14	14	28	286	Palawija			20	20	207	-8	-79		161	161		
1036 ---> 1036 ha	Total	100	14	14	128	1,322	Total	100	0	80	180	1,865	52	543	100%	16%	16%		
38. Sei Belutu	Paddy	79		79	158	8,040	Paddy	100		90	190	9,644	32	1,604	4,020		4,020		
Irrigated area	Palawija				0		Palawija			5	5	254	5	254					
5076 ---> 5076 ha	Total	79	0	79	158	8,040	Total	100	0	95	195	9,898	37	1,858	79%		79%		
39. Langau	Paddy	67		67	134	1,534	Paddy	100		70	170	3,230	36	1,696	1,150		1,150		
Irrigated area	Palawija				0		Palawija			5	5	95	5	95					
1150 ---> 1900 ha	Total	67	0	67	134	1,534	Total	100	0	75	175	3,325	41	1,791	100%		100%		
40. Medan Krio	Paddy	100		73	173	5,086	Paddy	100		90	190	5,668	17	582					
Irrigated area	Palawija			27	27	800	Palawija		10	10	20	596	-7	-204					
2943 ---> 2983 ha	Total	100	0	100	200	5,886	Total	100	10	100	210	6,264	10	378					
41. Rantau Panjang	Paddy	under rainfed condition			0	0	Paddy	100		50	150	3,464	150	3,464	2,309				
Irrigated area	Palawija				0		Palawija			5	5	115	5	115					
2309 ---> 2309 ha	Total	0	0	0	0	0	Total	100	0	55	155	3,579	155	3,579	100%				
42. Pekan Kamis	Paddy	89		89	178	1,630	Paddy	100		80	180	1,980	2	350	920		900		
Irrigated area	Palawija			10	10	92	Palawija			10	10	110	0	18					
920 ---> 1100 ha	Total	89	0	99	188	1,722	Total	100	0	90	190	2,090	2	368	100%		98%		
43. Secanggang	Paddy	98			98	1,290	Paddy	100		90	190	2,614	92	1,324	1,290		1,150		
Irrigated area	Palawija				0		Palawija			10	10	138	10	138					
1319 ---> 1376 ha	Total	98	0	0	98	1,290	Total	100	0	100	200	2,752	102	1,462	98%		97%		
44. Paya Lobang	Paddy	100		70	170	1,263	Paddy	100		100	200	3,116	30	1,853	1,263		1,263		
Irrigated area	Palawija				0		Palawija		10		10	156	10	156					
1263 ---> 1558 ha	Total	100	0	70	170	1,263	Total	100	10	100	210	3,272	40	2,009	100%		100%		
45 Namu Sira-sira Kiri	Paddy	100		20	120	1,620	Paddy	100		70	170	2,295	50	675	1,350		771		
Irrigated area	Palawija			10	10	135	Palawija			10	10	135	0	0					
1350 ---> 1350 ha	Total	100	0	30	130	1,755	Total	100	0	80	180	2,430	50	675	100%		57%		
46 Namu Sira-sira Kanan	Paddy	100		20	120	4,744	Paddy	100		70	170	6,720	50	1,976	3,953		2,257		
Irrigated area	Palawija			10	10	395	Palawija			5	5	198	-5	-197					
3953 ---> 3953 ha	Total	100	0	30	130	5,139	Total	100	0	75	175	6,918	45	1,779	100%		57%		
47. Bah Korah II	Paddy	86		91	177	3,053	Paddy	100		100	200	3,446	23	393	1,995		1,903	1,255	1,400
Irrigated area	Palawija				0		Palawija		10		10	172	10	172				area: 1430 ha	
1723 ---> 1723 ha	Total	86	0	91	177	3,053	Total	100	10	100	210	3,618	33	565	100%		95%	88%	98%
48. Sijambi	Paddy	100		50	150	1,328	Paddy	100		100	200	2,000	50	672	1,013		1013	988	885
Irrigated area	Palawija				0		Palawija		20		20	200	20	200					
885 ---> 1000 ha	Total	100	0	50	150	1,328	Total	100	20	100	220	2,200	70	872				100%	90%
49. Rambung Mera	Paddy	100		83	183	1,730	Paddy	100		100	200	1,888	17	158	944		940		
Irrigated area	Palawija			9	9	89	Palawija		20		20	188	11	99			344		
944 ---> 944 ha	Total	100	0	92	192	1,819	Total	100	20	100	220	2,076	28	257	100%				
50. Paya Sordang	Paddy	90		72	162	6,424	Paddy	100		80	180	7,830	18	1,406	3,563		3563	3,562	2,862
Irrigated area	Palawija				0		Palawija			10	10	435	10	435				area: 3562 ha	
3979 ---> 4350 ha	Total	90	0	72	162	6,424	Total	100	0	90	190	8,265	28	1,841	100%		100%	100%	80%
Overall	Paddy	86	0	59	145	105,552	Paddy	100		78	178	157,637	33	52,085					
Irrigated area	Palawija	0.1	0.2	5	6	4,005	Palawija		4	7	11	9,519	5	5,514					
72620 ---> 88576 ha	Total	86	0.2	64	150	109,557	Total	100	4	85	189	167,156	39	57,599					

1/: Cropping intensity in irrigated field 2/: Past highest cropped area & intensity of irrigated paddy in a subject irrigation scheme; results of the Inventory Survey by the Study Team (not in the same year or season)
3/: Results of inventory survey by PSDA, North Sumatra (Keandalan Daerah Irigasi Mendukung Masa Tanam 2002)

Table A-5.3.4 Estimated Net Farm Income per Ha under With Project Condition: North Sumatra - 1/2

Irrigation Scheme/ Before Prject Land Use	Crop	With-Project Status							Before Project Net Return per Ha of Farm (Rp. 000)	Incremental Net Return per Ha of Farm (Rp. 000)
		Cropping Intensity & Cropped Area				Net Return per Ha (Rp. million)		Net Return per Ha of Farm (Rp. 000)		
		Wet Season		Dry Season						
		Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Wet Season	Dry Season			
1. Gido Sebua	Irrigated Paddy	100	1.00	70	0.70	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,174	3,040	3,134
2. Batang Gadis	Irrigated Paddy	100	1.00	90	0.90	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	7,622	5,151	2,471
3. Batang Ilung	Irrigated Paddy	100	1.00	100	1.00	4.42	4.42			
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	8,995	6,414	2,581
4. Blk Sitongkon/Napa Suro	Irrigated Paddy	100	1.00	100	1.00	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	8,478	5,939	2,539
5. Siborna	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	1,750	3,734
6. Siaili Tukka	Irrigated Paddy	100	1.00	50	0.50	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,204	4,545	1,659
7. Badiri Lopian	Irrigated Paddy	100	1.00	70	0.70	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,990	3,939	3,051
8. Pandurungan	Irrigated Paddy	100	1.00	70	0.70	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,990	4,545	2,445
9. Sihiong	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Rainfed Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	1,750	3,734
10. Aek Silang	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	2,754	2,730
11. Sarulla	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	2,626	2,858
12. Parmiahan Hutapaung	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	2,938	2,546
13. Sinamo	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Rainfed Field 1 ha	Paddy (rainfed)			10	0.10		3.09	5,484	1,934	3,550
14. Aek Mandos I	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	2,570	2,914
15. Simangatasi II	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,484	2,185	3,299
16. Bulung Ihit	Irrigated Paddy	100	1.00	70	0.70	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,990	4,545	2,445
17. Perkotaan	Irrigated Paddy	100	1.00	90	0.90	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	7,622	5,090	2,531
18. Sungai Balai	Irrigated Paddy	100	1.00	100	1.00	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	8,169	5,696	2,473
19. Panca Arga	Irrigated Paddy	100	1.00	60	0.60	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	5,829	3,306	2,523
20. Serbangan	Irrigated Paddy	100	1.00	100	1.00	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	8,169	5,333	2,836
21. Silau Bonto	Irrigated Paddy	100	1.00	70	0.70	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,174	5,140	1,034
22. Sungai Silau	Irrigated Paddy	100	1.00	70	0.70	3.45	3.45			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,174	2,081	4,093
23. Padang Mahondang	Irrigated Paddy	100	1.00	50	0.50	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	6,050	4,084	1,966
24. Simujur	Irrigated Paddy	100	1.00	60	0.60	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,597	4,818	1,779
25. Purwodadi	Irrigated Paddy	100	1.00	100	1.00	3.93	3.93			
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	8,478	6,030	2,448
26. Pentara	Irrigated Paddy	100	1.00	50	0.50	3.93	3.93			
Irrigated Field 1 ha	Paddy (rainfed)			10	0.10		3.09	6,204	4,545	1,659
27. Simantin Pane Dame	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45			
Upland Field 1 ha	Paddy (rainfed)			10	0.10		3.09	5,484	1,840	3,644
28. Panambean / Panet Tonga	Irrigated Paddy	100	1.00	100	1.00	4.42	4.42			
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	9,458	6,739	2,719

Table A-5.3.4 Estimated Net Farm Income per Ha under With Project Condition: North Sumatra - 2/2

Irrigation Scheme/ Before Prject Land Use	Crop	With-Project Status						Before Project Net Return per Ha of Farm (Rp. 000)	Incremental Net Return per Ha of Farm (Rp. 000)
		Cropping Intensity & Cropped Area				Net Return per Ha (Rp. million)		Net Return per Ha of Farm (Rp. 000)	
		Wet Season		Dry Season					
		Intensity (%)	Cropped Area (ha)	Intensity (%)	Cropped Area (ha)	Wet Season	Dry Season		
29. Raja Hombang / T. Mang	Irrigated Paddy	100	1.00	100	1.00	4.42	3.93		
Irrigated Field 1 ha	Palawija (maize)			30	0.30		3.09	9,277	5,846	3,431
30. Kerasaan	Irrigated Paddy	100	1.00	80	0.80	4.42	4.42		
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	8,574	5,272	3,302
31. J. Kolonisasi/Purbolongg	Irrigated Paddy	100	1.00	100	1.00	4.42	4.42		
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	9,458	6,815	2,643
32. Naga Sompah	Irrigated Paddy	100	1.00	100	1.00	4.42	4.42		
Irrigated Field 1 ha	Paddy (rainfed)			30	0.30		3.09	9,767	5,594	4,173
33. Risma Duma	Irrigated Paddy	100	1.00	60	0.60	3.45	3.45		
Rainfed Field 1 ha	Palawija (maize)			10	0.10		3.09	5,829	1,750	4,079
34. Lae Ordi	Irrigated Paddy	100	1.00	60	0.60	3.45	3.45		
Upland Field 1 ha	Paddy (rainfed)			10	0.10		3.09	5,829	1,472	4,357
35. Parit Lompaten	Irrigated Paddy	100	1.00	70	0.70	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	6,990	4,034	2,956
36. Bandar Sidoras	Irrigated Paddy	100	1.00	80	0.80	4.42	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	7,873	5,874	1,999
37. Namu Rambe	Irrigated Paddy	100	1.00	60	0.60	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	6,906	3,545	3,361
38. Sei Belutu	Irrigated Paddy	100	1.00	90	0.90	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	7,622	4,792	2,830
39. Langau	Irrigated Paddy	100	1.00	70	0.70	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	6,836	4,330	2,506
40. Medan Krio	Irrigated Paddy	100	1.00	90	0.90	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	7,776	5,739	2,037
41. Rantau Panjang	Irrigated Paddy	100	1.00	50	0.50	3.45	3.45		
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	5,330	1,750	3,580
42. Pekan Kamis	Irrigated Paddy	100	1.00	80	0.80	4.42	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	7,873	6,144	1,729
43. Secanggang	Irrigated Paddy	100	1.00	90	0.90	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	7,776	3,004	4,772
44. Paya Lobang	Irrigated Paddy	100	1.00	100	1.00	3.93	3.93		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	8,169	5,445	2,724
45. Namu Sira-sira Kiri	Irrigated Paddy	100	1.00	70	0.70	4.42	4.42		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	7,823	4,324	3,499
46. Namu Sira-sira Kanan	Irrigated Paddy	100	1.00	70	0.70	4.42	4.42		
Irrigated Field 1 ha	Palawija (maize)			5	0.05		3.09	7,669	4,324	3,345
47. Bah Korah II	Irrigated Paddy	100	1.00	100	1.00	3.93	4.42		
Irrigated Field 1 ha	Palawija (maize)			10	0.10		3.09	8,659	6,116	2,543
48. Sijambi	Irrigated Paddy	100	1.00	100	1.00	3.93	3.45		
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	7,998	4,315	3,683
49. Rambung Mera	Irrigated Paddy	100	1.00	100	1.00	4.42	4.42		
Irrigated Field 1 ha	Palawija (maize)			20	0.20		3.09	9,458	6,479	2,979
50. Paya Sordang	Irrigated Paddy	100	1.00	80	0.80	4.42	4.42		
Irrigated Field 1 ha	Paddy (rainfed)			10	0.10		3.09	8,265	5,589	2,676
	Irrigated Field							7,341	4,558	2,783
	Rainfed Field							5,599	1,811	3,788
	Upland Field							5,657	1,656	4,001
Average	Overall							7,170	4,278	2,892

Table A-5.4.1 Institutional Capacity Building Cost : North Sumatra

(Unit : million Rp.)

	District	Irrigation Scheme in Study Area	Subject Area (ha)	Agri. Extension Strengthen	Institutional Capacity Building							Total Cost
					1	2	3	4	5	6	Sub-total	
1	Nias	Gido Sebua	883	154	10	35	9	18	65	18	154	309
2	Mandaling Natal	Batang Gadis	5,575	976	10	223	56	112	464	112	976	1,951
3	Tapanuli Selatan	Batang Ilung	3,546	621	0	142	35	71	302	71	621	1,241
4		Bik Sitonekon / N.S.	500	88	0	0	5	10	63	10	88	176
5		Siboma	950	166	10	0	10	19	108	19	166	332
6	Tapanuli Tengah	Siaili Tukka	600	105	10	0	6	12	65	12	105	210
7		Badiri Lopian	899	157	0	36	9	18	76	18	157	314
8		Pandurungan	1,334	233	0	53	13	27	114	27	234	467
9		Sihiong	779	136	0	0	8	16	97	16	136	272
10	Tapanuli Utara	Aek Silang	1,500	263	10	0	15	30	178	30	263	526
11		Sallura	1,692	296	0	0	17	34	211	34	296	592
12		Parmiahan Hatapung	1,000	175	0	0	10	20	125	20	175	350
13		Sinamo	930	163	0	0	9	19	116	19	163	326
14	Toba Samosir	Aek Mandosi I	1,059	186	0	42	11	21	90	21	185	371
15		Simangatasi II	1,514	265	10	61	15	30	119	30	265	530
16	Labuhan Batu	Bulung Ihit	1,355	237	10	54	14	27	104	27	236	474
17	Asahan	Perkotaan	3,446	603	10	138	34	69	283	69	603	1,206
18		Sungai Balai	1,130	198	0	45	11	23	96	23	198	396
19		Panca Arga	2,500	438	0	100	25	50	213	50	438	876
20		Serbangan	2,044	358	0	82	20	41	175	41	358	716
21		Silau Bonto	967	169	0	0	10	19	121	19	170	339
22		Sungai Silau	452	79	0	18	5	9	38	9	79	158
23		Padang Mahondang	2,905	508	0	116	29	58	247	58	509	1,017
24		Simujur	2,000	352	0	80	20	40	171	40	351	703
25		Purwodari	1,635	286	0	65	16	33	139	33	286	572
26	Simalunggun	Pentara	298	52	0	12	3	6	25	6	52	104
27		Simantin Pane Dame	1,000	175	10	0	10	20	115	20	175	350
28		Panambean / P.T. / B.I	1,722	301	0	69	17	34	146	34	301	602
29		Raja Hombang / T.M	2,023	354	0	81	20	40	172	40	354	708
30		Kerasaan	4,144	725	0	166	41	83	353	83	725	1,450
31		Javacolonisasi / Pur.	1,015	178	0	41	10	20	87	20	179	356
32		Naga Sompah	1,015	178	0	0	10	20	127	20	178	356
33	Dairi	Risma Duma	1,522	266	10	0	15	30	180	30	266	532
34		Lae Ordi	1,200	210	0	0	12	24	150	24	210	420
35	Karo	Parit Lompaten	1,242	217	10	50	12	25	95	25	217	434
36	Deli Serdang	Bandar Sidoras	3,457	605	10	0	35	69	423	69	605	1,210
37		Nam Rambe	1,036	181	0	41	10	21	88	21	181	362
38		Sei Belutu	5,076	888	0	0	51	102	635	102	889	1,777
39		Langau	1,900	333	0	0	19	38	238	38	333	666
40		Medan Krio	3,000	525	0	0	30	60	375	60	525	1,050
41		Rantau Panjang	2,309	404	0	0	23	46	289	46	404	808
42		Pekan Kamis	1,100	193	0	0	11	22	138	22	193	386
43	Langkat	Secanggang	1,400	245	10	56	14	28	109	28	245	490
44	D. Serdang/T. Tinggi	Paya Lombang	1,558	273	10	0	16	31	186	31	274	546
45	Langkat/Binjai	Nam Sira-Sira Kiri	1,350	236	0	54	14	27	114	27	236	472
46	Langkat/Binjai	Nam Sira-Sira Kanan	3,953	692	10	158	40	79	325	79	691	1,383
47	Simalunggun/Siantar	Bah Korah II	1,723	302	10	0	17	34	205	34	301	603
48	Asahan/Tamjun Balai	Sijambi	1,008	177	10	0	10	20	116	20	176	353
49	Siantar/Simalunggun	Rambung Mera	944	165	0	38	9	19	81	19	165	330
50	T. Selatan/M. Natal	Paya Sordang	4,350	761	0	174	44	87	369	87	761	1,522
		Total	90540	15,846	18	2,230	905	1,811	8,919	1,811	15,846	31,692

Renarks: 1; District/municipal government capacity building plan, 2; WUA strengthening plan, 3; WUA federation setting-up plan
4; WUA establishment acceleration plan, 5; On-the-job O&M training, 6; WUA management guidance

Table A-5.5.1 Economic Project Costs of Rehabiliation Plans : North Sumatra

(Unit: million Rp.)

	Irrigation Scheme	Subject Area (ha)	Initial Investment Cost (Economic Price)						Total Initial Investment Cost (Financial Price)	Running Cost	
			Irrigation System Rehabilitation	Institutional Capacity Building	Consulting Service	Admini-stration	Physical Contingency	Total		Incremental O&M Cost	Replacement (every 10 years)
1.	Gido Sebua	883	15,444	278	1,087	368	1,572	18,749	19,538	88	1,254
2.	Batang Gadis	5,575	91,124	1,756	6,437	2,178	9,288	110,783	115,664	558	2,566
3.	Batang Ilung	3,546	64,907	1,117	4,575	1,548	6,602	78,750	82,216	355	1,558
4.	Blk Sitongkon/Napa Suron	500	20,885	158	1,455	492	2,104	25,094	26,151	50	1,254
5.	Siborna	950	33,062	299	2,309	781	3,336	39,789	41,498	95	1,254
6.	Siaili Tukka	600	12,280	189	862	291	1,247	14,869	15,481	60	1,254
7.	Badiri Lopian	899	18,339	283	1,288	436	1,862	22,208	23,149	90	1,254
8.	Pandurungan	1,334	28,502	420	2,002	677	2,892	34,495	35,982	133	1,254
9.	Sihiong	779	19,608	245	1,373	465	1,985	23,677	24,678	78	1,254
10.	Aek Silang	1,500	21,281	473	1,506	510	2,175	25,944	27,062	150	1,254
11.	Sarulla	1,692	15,702	533	1,124	380	1,624	19,363	20,198	169	1,254
12.	Parmiahan Hutapaung	1,000	21,783	315	1,529	517	2,210	26,354	27,478	100	1,254
13.	Sinamo	930	19,016	293	1,336	452	1,931	23,027	24,004	93	1,254
14.	Aek Mandos I	1,059	12,789	334	907	307	1,312	15,650	16,308	106	1,254
15.	Simangatasi II	1,514	17,991	477	1,278	433	1,847	22,025	22,973	151	1,254
16.	Bulung Ihit	1,355	13,685	427	976	330	1,411	16,829	17,546	136	1,254
17.	Perkotaan	3,446	80,979	1,085	5,686	1,924	8,206	97,881	102,180	345	1,558
18.	Sungai Balai	1,130	20,800	356	1,464	495	2,116	25,231	26,309	113	1,254
19.	Panca Arga	2,500	20,179	788	1,453	491	2,097	25,007	26,101	250	1,558
20.	Serbangan	2,044	34,068	644	2,404	813	3,471	41,401	43,199	204	1,558
21.	Silau Bonto	967	25,781	305	1,805	611	2,609	31,111	32,442	97	1,254
22.	Sungai Silau	452	26,238	142	1,825	617	2,638	31,461	32,795	45	1,254
23.	Padang Mahondang	2,905	40,405	915	2,863	969	4,132	49,284	51,448	291	1,558
24.	Simujur	2,010	32,676	633	2,307	780	3,331	39,727	41,452	201	1,558
25.	Purwodadi	1,635	41,625	515	2,918	987	4,214	50,260	52,443	164	1,254
26.	Pentara	298	11,445	94	797	270	1,154	13,759	14,316	30	1,254
27.	Simantin Pane Dame	1,000	13,874	315	981	332	1,419	16,921	17,633	100	1,254
28.	Panambean / Panet Tongah BK	1,722	37,911	542	2,663	901	3,845	45,863	47,857	172	1,254
29.	Raja Hombang / T. Mangaraja	2,023	52,754	637	3,698	1,251	5,339	63,679	66,450	202	1,558
30.	Kerasaan	4,144	102,024	1,305	7,160	2,423	10,333	123,245	128,669	414	1,558
31.	Javacolonisasi/Purbogondo	1,015	25,630	320	1,796	608	2,595	30,948	32,273	102	1,254
32.	Naga Sompah	1,015	29,525	320	2,066	699	2,984	35,594	37,122	102	1,254
33.	Risma Duma	1,522	41,904	479	2,935	993	4,238	50,549	52,743	152	1,254
34.	Lae Ordi	1,200	30,708	378	2,152	728	3,109	37,075	38,672	120	1,254
35.	Parit Lompaten	1,242	45,330	391	3,166	1,071	4,572	54,530	56,890	124	1,254
36.	Bandar Sidoras	3,457	82,100	1,089	5,764	1,950	8,319	99,222	103,580	346	1,558
37.	Namu Rambe	1,036	29,355	326	2,054	695	2,968	35,399	36,919	104	1,254
38.	Sei Belutu	5,076	60,480	1,599	4,302	1,456	6,208	74,044	77,308	508	2,566
39.	Langau	1,900	26,991	599	1,911	647	2,759	32,906	34,338	190	1,254
40.	Medan Krio	3,000	48,398	945	3,419	1,157	4,934	58,853	61,437	300	1,558
41.	Rantau Panjang	2,309	47,486	727	3,340	1,130	4,821	57,504	60,013	231	1,558
42.	Pekan Kamis	1,100	19,254	347	1,356	459	1,960	23,376	24,372	110	1,254
43.	Secanggang	1,400	50,324	441	3,516	1,189	5,077	60,547	63,174	140	1,254
44.	Paya Lobang	1,558	23,292	491	1,647	557	2,378	28,365	29,590	156	1,254
45.	Namu Sira-sira Kiri	1,350	31,556	425	2,214	749	3,198	38,143	39,790	135	1,254
46.	Namu Sira-sira Kanan	3,953	73,059	1,245	5,149	1,742	7,430	88,626	92,533	395	1,558
47.	Bah Korah II	1,723	37,399	543	2,628	889	3,794	45,253	47,220	172	1,254
48.	Sijambi	1,008	35,686	318	2,492	843	3,600	42,940	44,788	101	1,254
49.	Rambung Mera	944	32,870	297	2,296	777	3,317	39,557	41,256	94	1,254
50.	Paya Sordang	4,350	67,255	1,370	4,757	1,609	6,862	81,853	85,474	435	1,558
	Total	**90,550**	**1,805,760**	**28,523**	**127,030**	**42,980**	**183,428**	**2,187,721**	**2,282,713**	**9,055**	**69,276**

Source: JICA Study Team for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-5.5.2 Economic Crop Budget per Ha : North Sumatra

Items	Unit	Unit Price	Paddy														Maize					
			Rainfed Paddy				Irrigated Paddy										Composit		Hybrid			
		(Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)
1. Gross Return																			No-tillage		No-tillage	
Unit Yield	(t/ha)		2.5		3.0		3.5		4.0		4.5		5.0		5.5		2.5		4.0		5.0	
Unit Price	(Rp.000/t)			1,510		1,510		1,510		1,510		1,510		1,510		1,510		1,300		1,300		1,300
Gross Return	(Rp.000)			**3,775**		**4,530**		**5,285**		**6,040**		**6,795**		**7,550**		**8,305**		**3,250**		**5,200**		**6,500**
2. Production cost				**1,983**		**2,212**		**2,418**		**2,586**		**2,803**		**2,959**		**3,100**		**1,840**		**2,662**		**2,980**
2-1. Farm Inputs				*317*		*408*		*507*		*568*		*706*		*785*		*864*		*491*		*981*		*1,122*
Seed 1/	(kg)		30	60	30	60	30	60	30	60	30	90	30	90	30	90	30	120	20	440	20	440
Fertilizers				207		298		372		416		523		603		682		321		414		529
- Urea	(kg)	1.47	100	147	100	147	150	221	150	221	180	265	200	294	225	331	150	221	150	221	200	294
- SP36	(kg)	2.01	30	60	50	101	50	101	50	101	50	101	75	151	75	151	50	101	75	151	75	151
- KCl	(kg)	1.69	0	0	30	51	30	51	30	51	50	85	50	85	75	127		0	25	42	50	85
- ZA	(kg)	1.47	0	0	0	0	0	0	30	44	50	74	50	74	50	74		0		0		0
Agro chemicals				50		50		75		93		93		93		93		50		128		153
- Insecticide (liquid)	(lit)	50	1.0	50	1.0	50	1.5	75	1.5	75	1.5	75	1.5	75	1.5	75	1.0	50	1.0	50	1.5	75
- Insecticide (powder)	(kg)	30																				
- Rodenticide	(kg)	35							0.5	18	0.5	18	0.5	18	0.5	18			0.5	18	0.5	18
- Herbicide	(kg)	30																	2.0	60	2.0	60
2-2. Labour Costs				*1,133*		*1,248*		*1,334*		*1,421*		*1,478*		*1,536*		*1,579*		*1,037*		*1,195*		*1,267*
Contracted Works																						
- Planting/Transplanting 2/	(unit)	x 0.8	1	240	1	240	1	240	1	240	1	240	1	240	1	240						
- Harvesting	(unit)																					
Labour Requirements																						
- Hired Labor	(man-day)	14.4	18	259	26	374	32	461	38	547	42	605	46	662	49	706	10	144	15	216	20	288
- Family Labor	(man-day)	14.4	44	634	44	634	44	634	44	634	44	634	44	634	44	634	62	893	68	979	68	979
Total	(man-day)		62		70		76		82		86		90		93		72		83		88	
2-3. Land Preparation				*380*		*380*		*380*		*380*		*380*		*380*		*380*		*0*		*0*		*0*
- Machinery	(unit)		1	380	1	380	1	380	1	380	1	380	1	380	1	380						
- Draft Animal	(unit)																					
2-4. Field Transportation	(L.S.)	x 0.9	2 %	*59*	2 %	*70*	2 %	*82*	2 %	*94*	2 %	*105*	2 %	*117*	2 %	*129*	2 %	*50*	2 %	*79*	2 %	*99*
2-5. Shelling Cost		56/t																*175*		*280*		*350*
2-6. Misceraneous Expenses	(L.S.)		5 %	*94*	5 %	*105*	5 %	*115*	5 %	*123*	5 %	*133*	5 %	*141*	5 %	*148*	5 %	*88*	5 %	*127*	5 %	*142*
				2.5		3.0		3.5		4.0		4.5		5.0		5.5		2.5		4.0		5.0
3. Net Return	Rp.000			**1,792**		**2,318**		**2,867**		**3,454**		**3,992**		**4,591**		**5,205**		**1,410**		**2,538**		**3,520**
	%			***47***		***51***		***54***		***57***		***59***		***61***		***63***		**43**		**49**		**54**
	Rounded	%		***1,790***		***2,320***		***2,870***		***3,450***		***3,990***		***4,590***		***5,200***		***1,410***		***2,540***		***3,520***

1/: Seed price: Paddy --- yield level < 4.5 Rp. 2,000; yield level ≧4.5 Rp. 3,000 Maize --- composite Rp. 4,000/kg; hybrid Rp. 22,000/ka

2/: Contract work for transplanting assumed --- Rp. 360,000/ha at financial price

Table A-5.5.3 Estimated Project Benefits of Rehabilitation Plans : North Sumatra

(Unit: million Rp.)

Irrigation Scheme	Project Benefit			Gross Return per Ha of Subject Area		
	Before Project	With Project	Project Benefits	Before Project	With Project	Incremental Gross Return per Ha
	Net Return	Net Return	Incremental Net Return	Gross Return per Ha	Gross Return per Ha	
1. Gido Sebua	2,863	6,299	3,436	5,569	10,492	4,923
2. Batang Gadis	32,685	49,604	16,919	8,837	12,626	3,789
3. Batang Ilung	26,514	37,501	10,987	10,733	14,575	3,842
4. Blk Sitongkon/N. Suron	3,374	4,942	1,568	10,171	14,100	3,929
5. Siborna	1,701	6,020	4,319	3,250	9,325	6,075
6. Siaili Tukka	1,939	4,342	2,403	5,188	10,300	5,112
7. Badiri Lopian	4,033	7,330	3,297	6,762	11,598	4,836
8. Pandurungan	5,898	10,878	4,980	6,788	11,599	4,811
9. Sihiong	456	3,941	3,485	1,064	7,444	6,380
10. Aek Silang	1,497	7,985	6,488	1,727	7,833	6,106
11. Sarulla	3,469	9,818	6,349	3,360	8,539	5,179
12. Parmiahan Hutapaung	1,883	6,147	4,264	3,295	9,045	5,750
13. Sinamo	1,787	5,893	4,106	3,419	9,325	5,906
14. Aek Mandos I	2,867	6,598	3,731	4,292	9,169	4,877
15. Simangatasi II	3,574	9,593	6,019	3,937	9,324	5,387
16. Bulung Ihit	7,014	11,054	4,040	7,802	11,604	3,802
17. Perkotaan	19,594	30,656	11,062	8,588	12,624	4,036
18. Sungai Balai	7,349	10,771	3,422	9,802	13,550	3,748
19. Panca Arga	7,811	16,840	9,029	5,201	9,910	4,709
20. Serbangan	12,427	19,482	7,055	9,164	13,549	4,385
21. Silau Bonto	115	4,872	4,757	0	7,410	7,410
22. Sungai Silau	407	2,683	2,276	1,651	8,733	7,082
23. Padang Mahondang	7,263	20,509	13,246	4,206	10,023	5,817
24. Simujur	8,046	15,469	7,423	6,256	10,950	4,694
25. Purwodadi	11,226	16,164	4,938	10,349	14,103	3,754
26. Pentara	235	1,601	1,366	1,232	7,648	6,416
27. Simantin Pane Dame	1,410	4,436	3,026	2,750	6,528	3,778
28. Panambean/Panet T. BK	13,401	19,120	5,719	11,414	15,399	3,985
29. R. Hombang /T. Manga.	13,173	21,942	8,769	9,838	15,300	5,462
30. Kerasaan	22,904	40,881	17,977	8,257	13,694	5,437
31. Javacolonisasi/Purbog.	7,996	11,274	3,278	11,559	15,405	3,846
32. Naga Sompah	6,145	11,010	4,865	9,366	15,303	5,937
33. Risma Duma	2,450	8,792	6,342	3,013	8,499	5,486
34. Lae Ordi	1,545	6,062	4,517	2,448	7,433	4,985
35. Parit Lompaten	3,883	10,121	6,238	5,120	11,592	6,472
36. Bandar Sidoras	18,401	31,890	13,489	8,065	12,901	4,836
37. Namu Rambe	3,977	8,339	4,362	5,959	11,501	5,542
38. Sei Belutu	27,297	45,160	17,863	8,398	12,625	4,227
39. Langau	6,876	15,160	8,284	5,874	11,325	5,451
40. Medan Krio	18,755	28,114	9,359	9,601	13,373	3,772
41. Rantau Panjang	4,133	14,226	10,093	3,250	9,050	5,800
42. Pekan Kamis	6,703	10,146	3,443	9,259	12,900	3,641
43. Secanggang	4,617	12,484	7,867	5,018	12,679	7,661
44. Paya Lobang	8,413	14,852	6,439	8,150	13,551	5,401
45. Namu Sira-sira Kiri	6,654	12,409	5,755	7,295	12,705	5,410
46. Namu Sira-sira Kanan	19,486	35,641	16,155	7,295	12,430	5,135
47. Bah Korah II	12,193	17,474	5,281	10,378	14,199	3,821
48. Sijambi	4,534	9,284	4,750	6,948	13,343	6,395
49. Rambung Mera	7,028	10,479	3,451	10,980	15,395	4,415
50. Paya Sordang	26,296	42,247	15,951	8,916	13,420	4,504
Total	**1,192,832**	**1,112,773**	**344,238**	**Avg.**	**7,169**	**12,026**	**4,857**

Source: JICA Study Team for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-5.5.4 Results of Economic Evaluation of Rehabiliation Plans: North Sumatra

Irrigation Scheme	Subject Area (ha)	EIRR (%)	B/C [1/]	B - C [1/] (Rp. million)
1. Gido Sebua	883	14.5%	1.41	7,199
2. Batang Gadis	5,575	11.7%	1.15	15,766
3. Batang Ilung	3,546	11.2%	1.10	7,338
4. Blk Sitongkon/Napa Suron	500	3.1%	0.50	-11,520
5. Siborna	950	8.3%	0.86	-5,032
6. Siaili Tukka	600	12.5%	1.21	3,005
7. Badiri Lopian	899	11.8%	1.15	3,176
8. Pandurungan	1,334	11.5%	1.13	4,051
9. Sihiong	779	11.0%	1.09	2,025
10. Aek Silang	1,500	18.2%	1.79	20,079
11. Sarulla	1,692	23.0%	2.31	25,235
12. Parmiahan Hutapaung	1,000	12.7%	1.23	5,807
13. Sinamo	930	13.9%	1.34	7,536
14. Aek Mandos I	1,059	18.4%	1.78	11,848
15. Simangatasi II	1,514	21.1%	2.06	22,532
16. Bulung Ihit	1,355	18.5%	1.77	12,812
17. Perkotaan	3,446	8.8%	0.90	-8,727
18. Sungai Balai	1,130	10.6%	1.05	1,246
19. Panca Arga	2,500	26.2%	2.57	40,099
20. Serbangan	2,044	13.6%	1.33	12,589
21. Silau Bonto	967	11.7%	1.15	4,391
22. Sungai Silau	452	4.5%	0.58	-11,948
23. Padang Mahondang	2,905	19.4%	1.92	44,403
24. Simujur	2,010	14.0%	1.37	14,037
25. Purwodadi	1,635	7.3%	0.78	-9,940
26. Pentara	298	7.0%	0.76	-3,057
27. Simantin Pane Dame	1,000	13.1%	1.27	4,526
28. Panambean / Panet Tongah BK	1,722	9.9%	0.99	-527
29. Raja Hombang / T. Mangaraja	2,023	11.1%	1.10	5,733
30. Kerasaan	4,144	11.4%	1.13	14,145
31. Javacolonisasi/Purbogondo	1,015	8.0%	0.84	-4,655
32. Naga Sompah	1,015	11.0%	1.09	2,850
33. Risma Duma	1,522	9.4%	0.95	-2,564
34. Lae Ordi	1,200	9.0%	0.92	-2,877
35. Parit Lompaten	1,242	8.9%	0.91	-4,408
36. Bandar Sidoras	3,457	10.9%	1.08	6,903
37. Namu Rambe	1,036	9.8%	0.98	-666
38. Sei Belutu	5,076	17.9%	1.78	54,735
39. Langau	1,900	19.5%	1.90	28,486
40. Medan Krio	3,000	12.2%	1.20	10,813
41. Rantau Panjang	2,309	13.6%	1.34	17,798
42. Pekan Kamis	1,100	11.5%	1.13	2,862
43. Secanggang	1,400	10.5%	1.05	2,616
44. Paya Lobang	1,558	17.8%	1.73	19,766
45. Namu Sira-sira Kiri	1,350	12.2%	1.19	6,785
46. Namu Sira-sira Kanan	3,953	14.1%	1.39	31,711
47. Bah Korah II	1,723	9.1%	0.92	-3,183
48. Sijambi	1,008	8.6%	0.89	-4,462
49. Rambung Mera	944	6.2%	0.70	-10,803
50. Paya Sordang	4,350	14.9%	1.46	35,435

1/: At discount rate of 10%

Source: JICA Study Team for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Table A-6.2.1 Prioritization for Rehabilitation by Weighted Scoring Method

Issue for Evaluation	Full Score	Evaluation Index	Weight	Weighted Score	Situation for High Priority
1 Issue of Irrigation System	**50.0**				
1.1 Rate of Utilization of Irrigation Potential (=present irrigation paddy area / irrigated paddy area with project x 100)	10.0	(1) Less than 50 % (2) 50 - 69 % (3) 70 - 100 %	1.0 0.8 0.5	10.0 8.0 5.0	Severe problem on irrigation program achievement.
1.2 Urgency of Rehabilitation	25.0				Severe problem on irrigation facilities
1.2.1 Function of Water Resources Facility	10.0	(1) Serious condition for operation (Evaluation: D) (2) Not functioning well (Evaluation: C) (3) Partially deteriorated (Evaluation: B) (4) Functioning well (Evaluation: A)	1.0 0.8 0.6 0.4	10.0 8.0 6.0 4.0	
1.2.2 Function of Main Canal System	7.0	(1) Serious condition for operation (Evaluation: D) (2) Not functioning well (Evaluation: C) (3) Partially deteriorated (Evaluation: B) (4) Functioning well (Evaluation: A)	1.0 0.8 0.6 0.4	7.0 5.6 4.2 2.8	
1.2.3 Function of Secondary Canal System	5.0	(1) Serious condition for operation (Evaluation: D) (2) Not functioning well (Evaluation: C) (3) Partially deteriorated (Evaluation: B) (4) Functioning well (Evaluation: A)	1.0 0.8 0.6 0.4	5.0 4.0 3.0 2.0	
1.2.4 Function of On-farm System	3.0	(1) Serious condition for operation (Evaluation: D) (2) Not functioning well (Evaluation: C) (3) Partially deteriorated (Evaluation: B) (4) Functioning well (Evaluation: A)	1.0 0.8 0.6 0.4	3.0 2.4 1.8 1.2	
1.3 Sustainability of Irrigation System	15.0				Severe problem on sustainability
1.3.1 Age of the Facility	7.5	(1) More than 50 years (2) 30 - 49 years (3) 15 - 29 years (4) Less than 15 years	1.0 0.8 0.6 0.4	7.5 6.0 4.5 3.0	
1.3.2 Technical Level	7.5	(1) Non-technical level (2) Semi-technical level (3) Technical level	1.0 0.8 0.5	7.5 6.0 3.8	
2 Issue of Agricultural Productivity	**20.0**				
2.1 Current Cropping Intensity of Paddy (=annual cropped area of paddy / subject area x 100)	10.0	(1) Less than 100 % (2) 100 - 149 % (3) 150 - 199 % (4) More than 200 %	1.0 0.8 0.6 0.4	10.0 8.0 6.0 4.0	Severe problem on agriculture (low productivity)
2.2 Current Unit Yield of Paddy (=weighted average unit yield of irrigated & rainfed paddy in the scheme)	10.0	(1) Less than 60 % of planned target yield (2) 60 - 79 % of planned target yield (3) 80 - 100 % of planned target yield	1.0 0.8 0.5	10.0 8.0 5.0	Severe problem on agriculture (low productivity)
3 Issue of Society	**15.0**				Severe social problem
3.1 Contribution to Regional Economy (Current Number of Beneficiaries)	7.5	(1) Less than 30 % of with project beneficiaries (2) 30 - 59 % of with project beneficiaries (3) 60 - 89 % of with project beneficiaries (4) More than 90 % of with project beneficiaries	1.0 0.8 0.6 0.4	7.5 6.0 4.5 3.0	
3.2 Provision of Social Infrastructure (Current ratio of Inspcetion Road Provision)	7.5	(1) Less than 40 % of total canal length of main & secondary canal (2) 40 - 59 % of total canal length of main & secondary canal (3) 60 - 79 % of total canal length of main & secondary canal (4) 80 - 100 % of total canal length of main & secondary canal	1.0 0.8 0.6 0.4	7.5 6.0 4.5 3.0	
4 Issue of Economic and Financial Impact	**15.0**				High economic and financial impact
4.1 Feasibility (EIRR)	7.5	(1) More than 20 % (2) 15 - 19 % (3) 10 - 14 % (4) Less than 10 %	1.0 0.8 0.6 0.4	7.5 6.0 4.5 3.0	
4.2 Rate of Increase of Gross Agricultural Retern per ha (=planned annual gross retern per ha / current anuual gross retern per ha x 100)	7.5	(1) More than 200 % (2) 150 - 199 % (3) Less than 150 %	1.0 0.8 0.6	7.5 6.0 4.5	
TOTAL	**100.0**				

Table A-6.2.2 Priority Ranking for Rehabilitation : North Sumatra

	Irrigation Scheme	Utilization of Irrigation Potential	Function of Water Resources Facility	Function of Main Canal	Function of Secondary Canal	Function of On-farm	Factor of Deterioration by Year of Construction	Technical Level	Current Cropping Intentsity	Current Unit Yield of Paddy	Contibution to Regional Economy	Provision of social infrastructure	EIRR	Rate of Increase of Gross Agricultural Return	Total Score	Ranking	Classified Group
1	Gido Sebua	Group VI (Subject area is less than 1,000 ha)															Group VI
2	Batang Gadis	(3)	(3)	(3)	(2)	(2)	(4)	(3)	(3)	(3)	(4)	(4)	(3)	(3)	54.4	17	Group III
3	Batang Ilung	(3)	(3)	(2)	(2)	(2)	(4)	(3)	(3)	(3)	(4)	(2)	(3)	(3)	58.8	15	Group III
4	Blk Sitongkon/Napa Suron	Group VI (Subject area is less than 1,000 ha)															Group VI
5	Siborna	Group VI (Subject area is less than 1,000 ha)															Group VI
6	Siaili Tukka	Group VI (Subject area is less than 1,000 ha)															Group VI
7	Badiri Lopian	Group VI (Subject area is less than 1,000 ha)															Group VI
8	Pandurungan	(3)	(1)	(1)	(1)	(2)	(3)	(3)	(2)	(2)	(3)	(1)	(3)	(2)	76.2	2	Group I
9	Sihiong	Group VI (Subject area is less than 1,000 ha)															Group VI
10	Aek Silang	Group V (Acceralation of WUAs establishment)															Group V
11	Sarulla	Group V (Acceralation of WUAs establishment)															Group V
12	Parmiahan Hutapaung	Group V (Acceralation of WUAs establishment)															Group V
13	Sinamo	Group VI (Subject area is less than 1,000 ha)															Group VI
14	Aek Mandos I	(3)	(2)	(3)	(1)	(1)	(4)	(2)	(1)	(2)	(4)	(2)	(2)	(1)	74.7	4	Group I
15	Simangatasi II	(3)	(2)	(2)	(2)	(2)	(4)	(3)	(2)	(2)	(4)	(1)	(1)	(1)	73.3	5	Group I
16	Bulung Ihit	(3)	(3)	(1)	(1)	(2)	(4)	(3)	(3)	(3)	(4)	(4)	(2)	(3)	59.7	14	Group III
17	Perkotaan	(3)	(3)	(2)	(2)	(3)	(4)	(3)	(3)	(3)	(4)	(4)	(4)	(3)	53.7	18	Group III
18	Sungai Balai	(3)	(2)	(1)	(1)	(2)	(4)	(2)	(3)	(3)	(4)	(1)	(3)	(3)	66.9	6	Group I
19	Panca Arga	Group IV (Reformulation of development plan)															Group IV
20	Serbangan	Group IV (Reformulation of development plan)															Group IV
21	Silau Bonto	Group V (Acceralation of WUAs establishment)															Group V
22	Sungai Silau	Group IV (Reformulation of development plan)															Group IV
23	Padang Mahondang	(1)	(1)	(1)	(1)	(1)	(3)	(2)	(2)	(1)	(1)	(4)	(2)	(1)	87.5	1	Group I
24	Simujur	(2)	(1)	(1)	(1)	(1)	(3)	(2)	(2)	(2)	(4)	(4)	(3)	(2)	76.0	3	Group I
25	Purwodadi	(3)	(2)	(1)	(1)	(2)	(4)	(3)	(3)	(3)	(1)	(4)	(4)	(3)	63.2	9	Group II
26	Pentara	Group VI (Subject area is less than 1,000 ha)															Group VI
27	Simantin Pane Dame	Group V (Acceralation of WUAs establishment)															Group V
28	Panambean / Panet Tongah BK	(3)	(3)	(2)	(1)	(2)	(4)	(3)	(3)	(3)	(4)	(1)	(4)	(3)	59.8	12	Group II
29	Raja Hombang / T. Mangaraja	(3)	(3)	(2)	(1)	(1)	(4)	(3)	(3)	(3)	(4)	(1)	(3)	(2)	63.4	8	Group II
30	Kerasaan	(3)	(2)	(2)	(1)	(1)	(3)	(3)	(2)	(3)	(4)	(4)	(3)	(2)	64.4	7	Group II
31	Javacolonisasi/Purbogondo	(3)	(3)	(2)	(1)	(2)	(4)	(3)	(3)	(3)	(4)	(3)	(4)	(3)	56.8	16	Group III
32	Naga Sompah	Group VI (High rehabilitation cost)															Group VI
33	Risma Duma	Group VI (Less facility was provided)															Group VI
34	Lae Ordi	Group V (Acceralation of WUAs establishment)															Group V
35	Parit Lompaten	Group VI (High rehabilitation cost)															Group VI
36	Bandar Sidoras	Group V (Acceralation of WUAs establishment)															Group V
37	Namu Rambe	Group VI (High rehabilitation cost)															Group VI
38	Sei Belutu	Group V (Acceralation of WUAs establishment)															Group V
39	Langau	Group V (Acceralation of WUAs establishment)															Group V
40	Medan Krio	Group V (Acceralation of WUAs establishment)															Group V
41	Rantau Panjang	Group VI (Less facility was provided)															Group VI
42	Pekan Kamis	Group V (Acceralation of WUAs establishment)															Group V
43	Secanggang	Group VI (High rehabilitation cost)															Group VI
44	Paya Lombang	Group V (Acceralation of WUAs establishment)															Group V
45	Namu Sira-sira Kiri	(3)	(3)	(2)	(2)	(1)	(3)	(3)	(2)	(3)	(4)	(4)	(3)	(2)	61.4	10	Group II
46	Namu Sira-sira Kanan	(3)	(3)	(2)	(2)	(2)	(3)	(3)	(2)	(3)	(4)	(4)	(3)	(2)	60.8	11	Group II
47	Bah Korah II	Group V (Acceralation of WUAs establishment)															Gourp V
48	Sijambi	Group V (Acceralation of WUAs establishment)															Group V
49	Rambung Mera	Group VI (Subject area is less than 1,000 ha)															Group VI
50	Paya Sordang	(3)	(3)	(2)	(1)	(2)	(4)	(3)	(3)	(3)	(3)	(4)	(3)	(2)	59.8	12	Group II
	Average														64.8		
	Itemized Total	(1)	1	3	6	12	6	0	0	1	1	2	5	1	3	Group I :	6	
		(2)	1	5	10	6	11	0	4	7	4	0	2	3	7	Group II :	7	
		(3)	16	10	2	0	1	6	14	10	13	2	1	10	8	Group III :	5	
		(4)	0	0	0	0	0	12	0	0	0	14	10	4	0	Group IV :	3	
																Group V :	14	
																Group VI :	15	

Source: JICA Study Team for the Study on Comprehensive Recovery Program of Irrigation Agriculture

Group I: First priority group (Ranking 1 - 6)

Group II: Second priority group (Ranking 7 - 12)

Group III: Third priority group (Ranking 13 - 18)

Group IV: Reformulation of water resources development plan

Group V: Acceralation of WUAs establishment

Group VI: Development by other category or method

Table A-7.3.1 Breakdown of Area, Cost, Construction Package for Recovery Program on Action Plan : North Sumatra

Priority Group	Scheme No.	Irrigation Scheme	District	Subject Area (ha)	Const. Cost (Bil. Rp.)	Nos. of Contract.		Const. Period (Year)
						F/S	Construction	
I	PI-1	Pandurungan	Tapanuli Tengah	1,334	30	1	1	2
	PI-2	Aek Mandos I	Toba Samosir	1,059	13	1	1	2
	PI-3	Simangatasi II	Toba Samosir	1,514	19	1	1	2
	PI-4	Sungai Balai	Asahan	1,130	22	1	1	2
	PI-5	Padang Mahondang	Asahan	2,905	42	1	2	2
	PI-6	Simujur	Asahan	2,010	34	1	1	2
	Total I			9,952	160	6	7	
II	PII-1	Purwodadi	Asahan	1,635	43	1	1	2
	PII-2	Panambean / Panet Tongah BK	Simalungun	1,722	39	1	1	2
	PII-3	Raja Hombang / T. Mangaraja	Simalungun	2,023	55	1	1	2
	PII-4	Kerasaan	Simalungun	4,144	106	1	2	2
	PII-5	Namu Sira-sira Kiri	Langkat/Binjai	1,350	33	1	1	2
	PII-6	Namu Sira-sira Kanan	Langkat/Binjai	3,953	76	1	2	2
	PII-7	Paya Sordang	Tapanuli Sel/Mandailing Natal	4,350	70	1	2	2
	Total II			19,177	422	7	10	
III	PIII-1	Batang Gadis	Mandaling Natal	5,575	95	1	2	2
	PIII-2	Batang Ilung	Tapanuli Selatan	3,546	68	1	1	2
	PIII-3	Bulung Ihit	Labuhan Batu	1,355	14	1	1	2
	PIII-4	Perkotaan	Asahan	3,446	84	1	2	2
	PIII-5	Javacolonisasi/Purbogondo	Simalungun	1,015	27	1	1	2
	Total III			14,937	288	5	7	
IV	PIV-1	Panca Arga	Asahan	2,500	73	1	N.A	
	PIV-2	Serbangan	Asahan	2,044	78	1	N.A	
	PIV-3	Sungai Silau	Asahan	452	20	1	N.A	
	Total IV			4,996	171	3		
V	PV-1	Aek Silang	Tapanuli Utara	1,500	22	1	N.A	
	PV-2	Sarulla	Tapanuli Utara	1,692	16	1	N.A	
	PV-3	Parmiahan Hutapaung	Tapanuli Utara	1,000	23	1	N.A	
	PV-4	Silau Bonto	Asahan	967	42	1	N.A	
	PV-5	Simantin Pane Dame	Simalungun	1,000	14	1	N.A	
	PV-6	Lae Ordi	Dairi	1,200	32	1	N.A	
	PV-7	Bandar Sidoras	Deli Serdang	3,457	85	1	N.A	
	PV-8	Sei Belutu	Deli Serdang	5,076	63	1	N.A	
	PV-9	Langau	Deli Serdang	1,900	28	1	N.A	
	PV-10	Medan Krio	Deli Serdang	3,000	50	1	N.A	
	PV-11	Pekan Kamis	Deli Serdang	1,100	20	1	N.A	
	PV-12	Paya Lombang	Deli Serdan/Tebing Tinggi	1,558	24	1	N.A	
	PII-6	Bah Korah II	Simalungun/Siantar	1,723	39	1	N.A	
	PV-13	Sijambi	Asahan/Tanjung Balai	1,008	38	1	N.A	
	Total V			26,181	496	14		
VI	PVI-1	Gido Sebua	Nias	883	16	1	NA	
	PVI-2	Blk Sitongkon/Napa Suron	Tapanuli Selatan	500	22	1	NA	
	PVI-3	Siborna	Tapanuli Selatan	950	34	1	NA	
	PVI-4	Siaili Tukka	Tapanuli Tengah	600	13	1	NA	
	PVI-5	Badiri Lopian	Tapanuli Tengah	899	19	1	NA	
	PVI-6	Sihiong	Tapanuli Tengah	779	20	1	NA	
	PVI-7	Sinamo	Tapanuli Utara	930	20	1	NA	
	PVI-8	Pentara	Simalungun	298	12	1	NA	
	PVI-9	Naga Sompah	Simalungun	1,015	30	1	NA	
	PVI-10	Risma Duma	Dairi	1,522	44	1	NA	
	PVI-11	Parit Lompaten	Karo	1,242	47	1	NA	
	PVI-12	Namu Rambe	Deli Serdang	1,036	31	1	NA	
	PVI-13	Rantau Panjang	Deli Serdang	2,309	49	1	NA	
	PVI-14	Secanggang	Langkat	1,400	52	1	NA	
	PVI-15	Rambung Mera	P. Siantar/Simalungun	944	34	1	NA	
	Total VI			15,307	443	15		
	Grond Total			90,550	1,980			

Figures

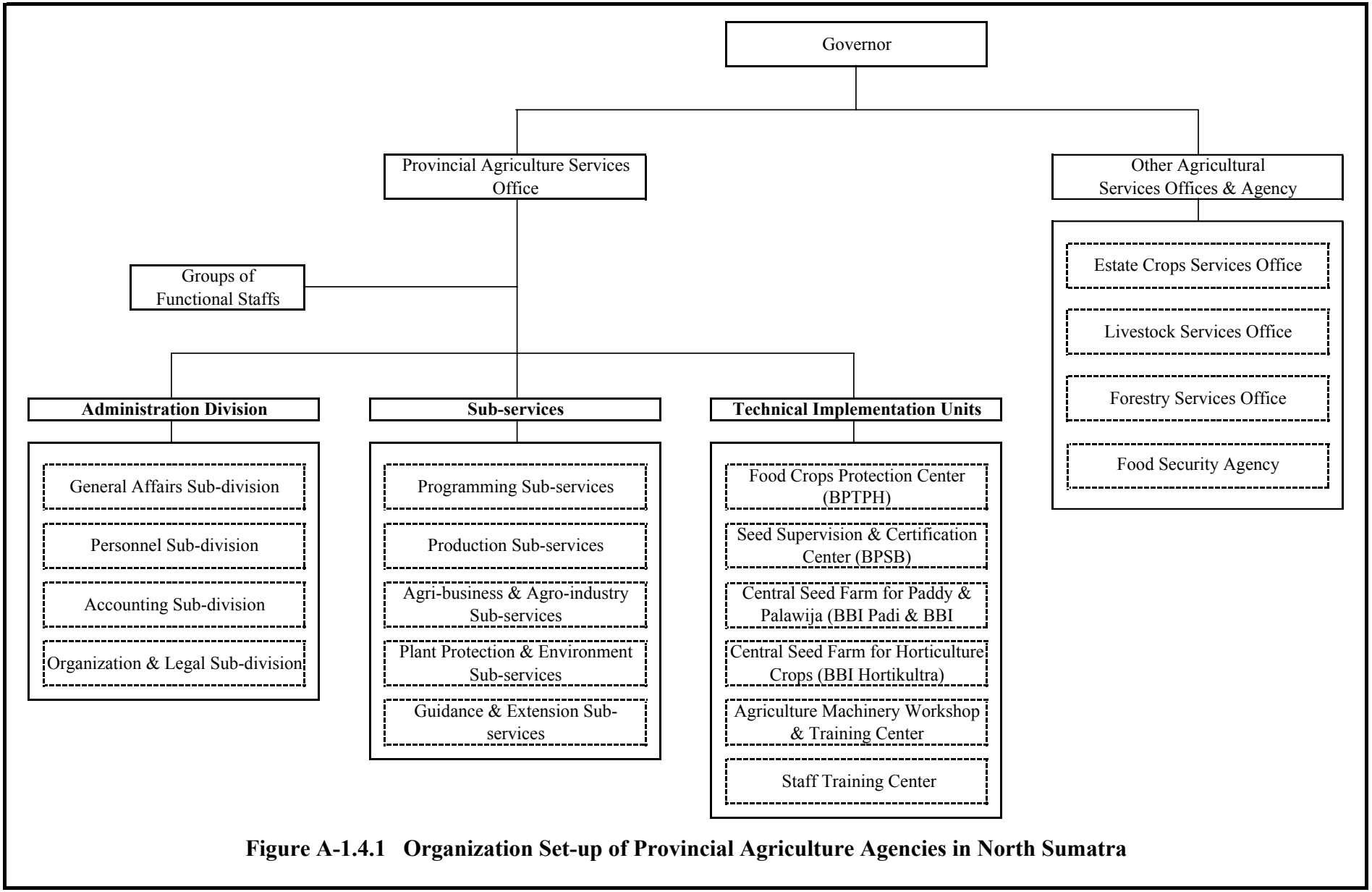
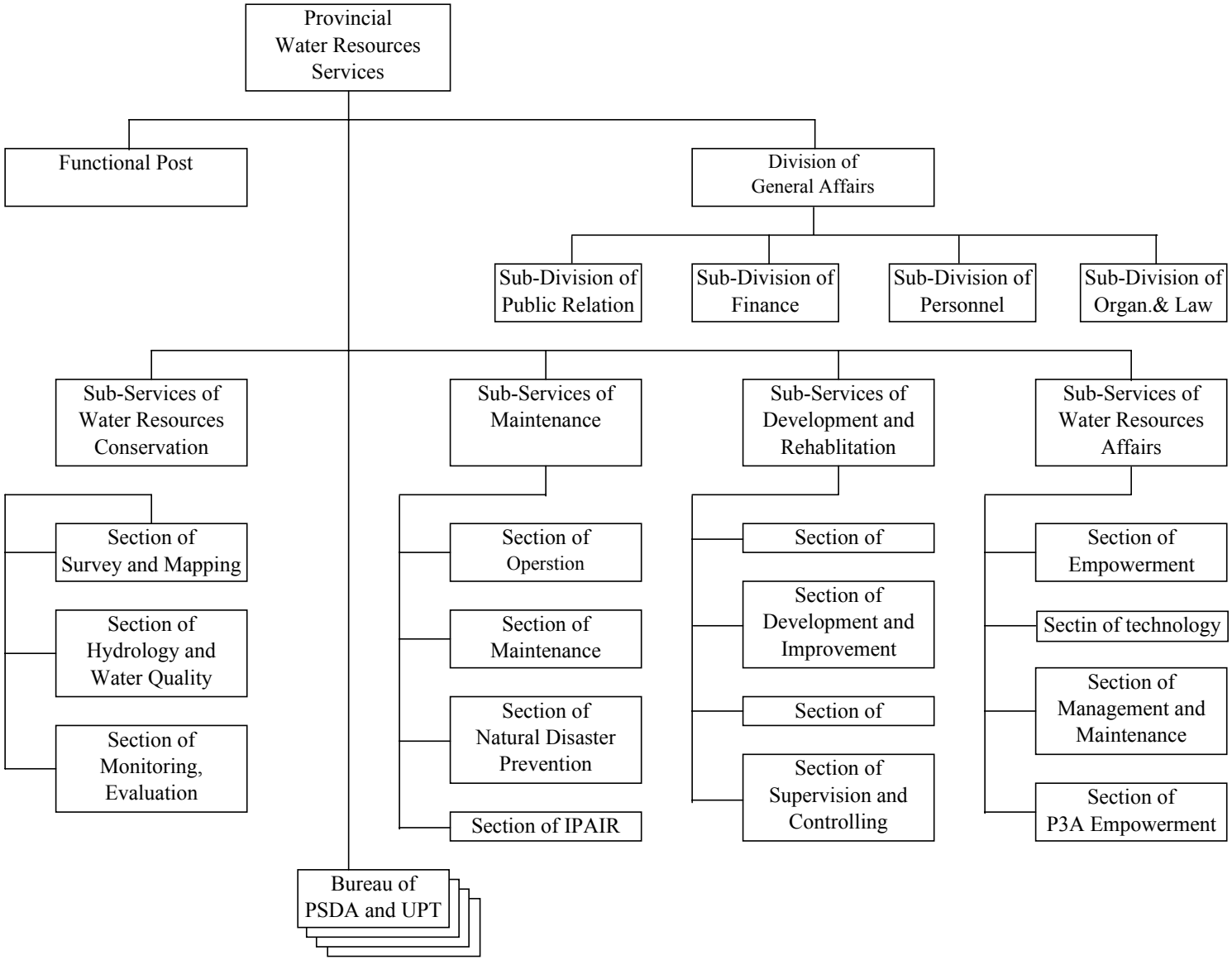


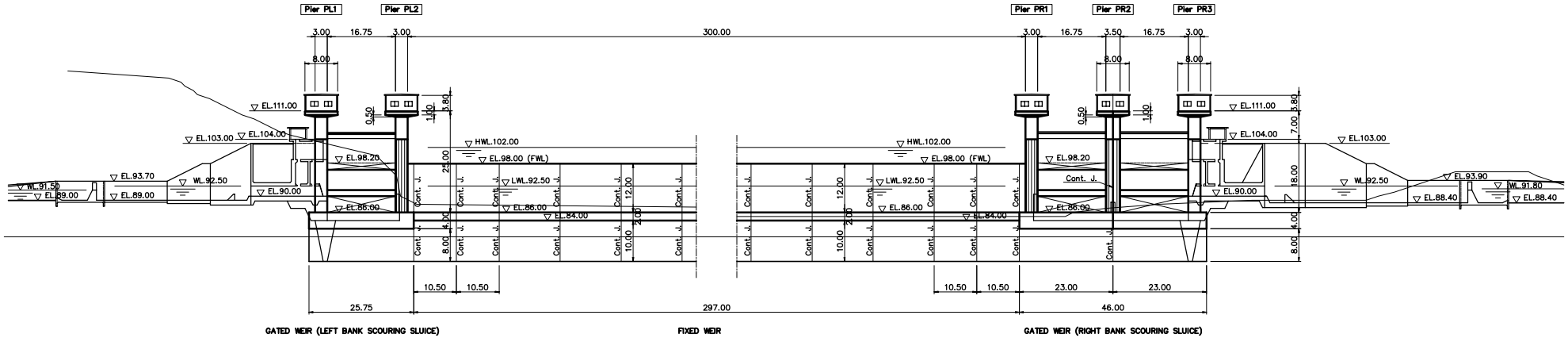
Figure A-1.4.1 Organization Set-up of Provincial Agriculture Agencies in North Sumatra



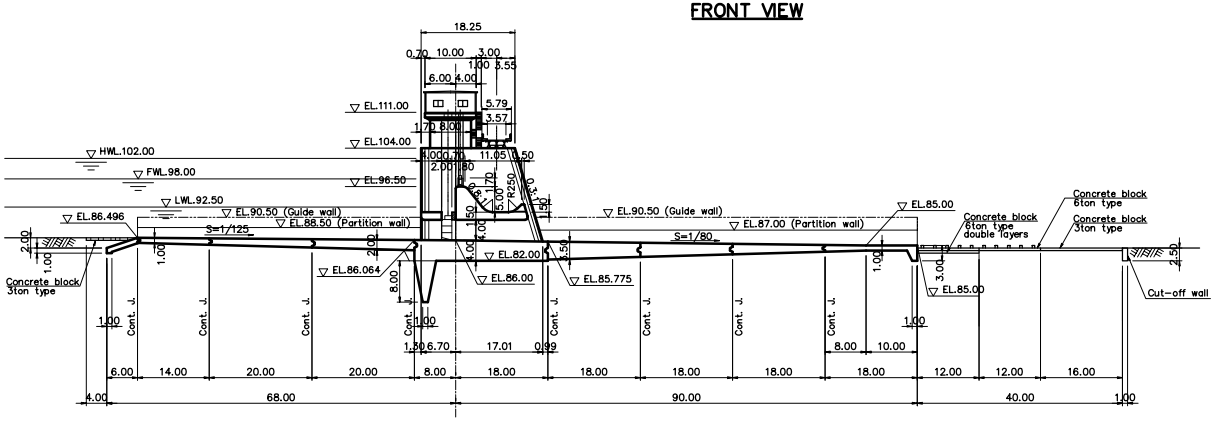
Remarks
PSDA: Water Resources Management
UPT: River Basin management Uhit
IPAIR: Irrigation service fee
P3A: Water Users' Association

Figure A-1.5.1 Organization Chart of Provincial Water Resources Services : North Sumatra

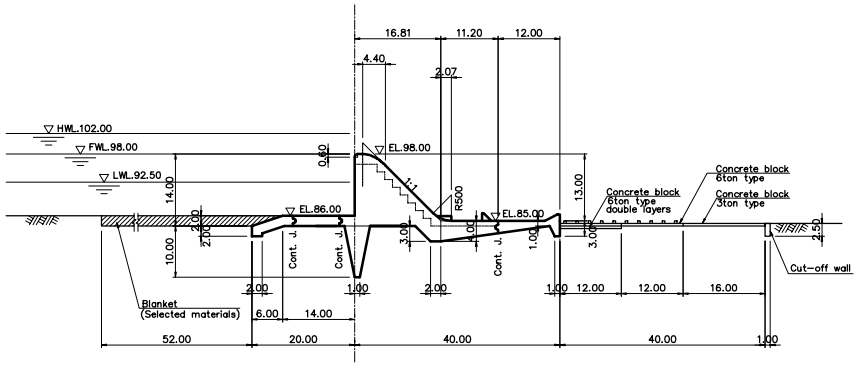
PLATE NO.



FRONT VIEW



SECTION OF RIGHT BANK SCOURING SLUICE



SECTION OF FIXED WEIR

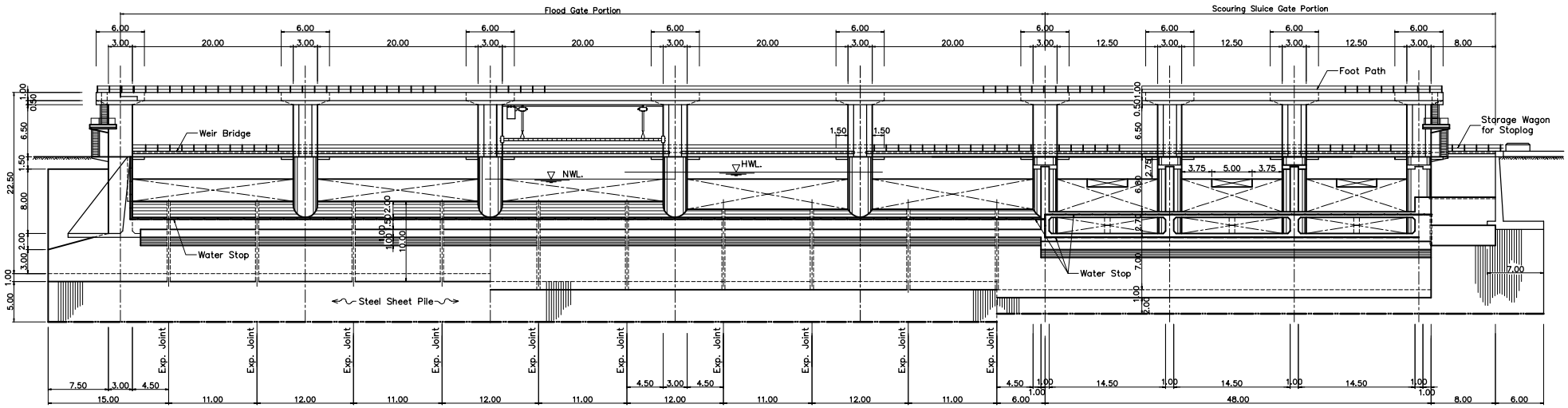
Note:
All dimensions are in meters unless specified.

SCALE 0 25.00m 50.00m

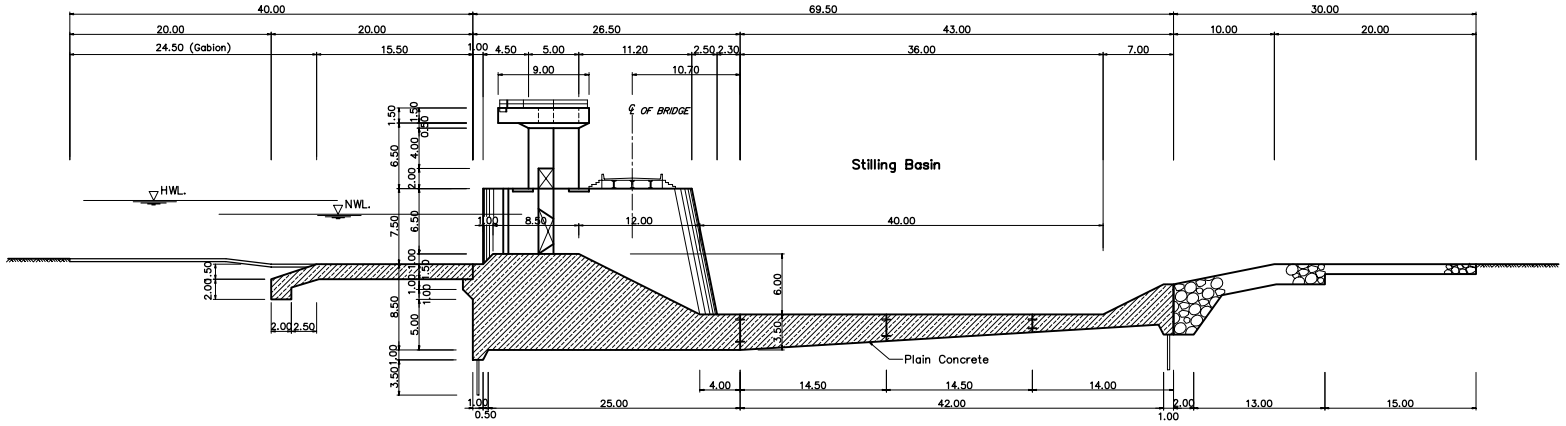
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (1/16) TYPICAL DRAWING HEADWORKS (Fixed Weir Type)
Japan International Cooperation Agency	

AF - 3

PLATE NO.



FRONT VIEW



SECTION

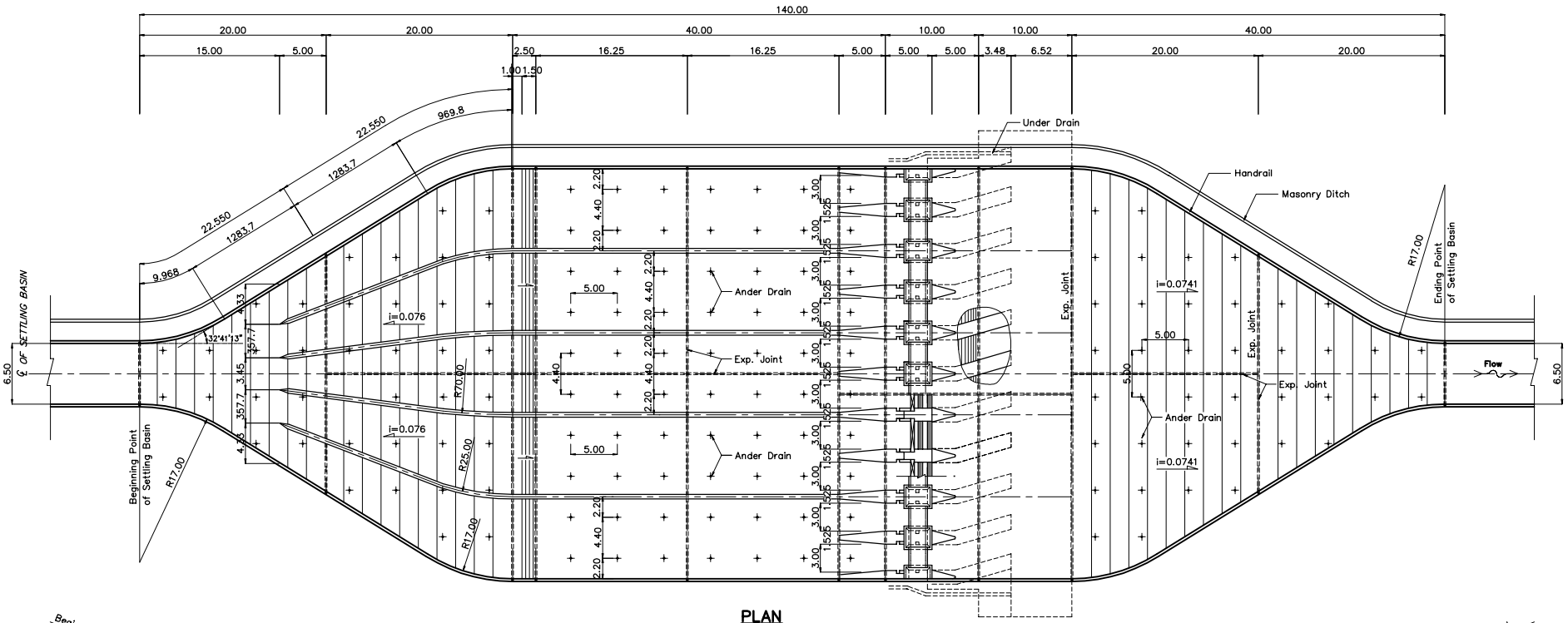
SCALE 0 12.50m 25.00m

Note:
All dimensions are in meters unless specified.

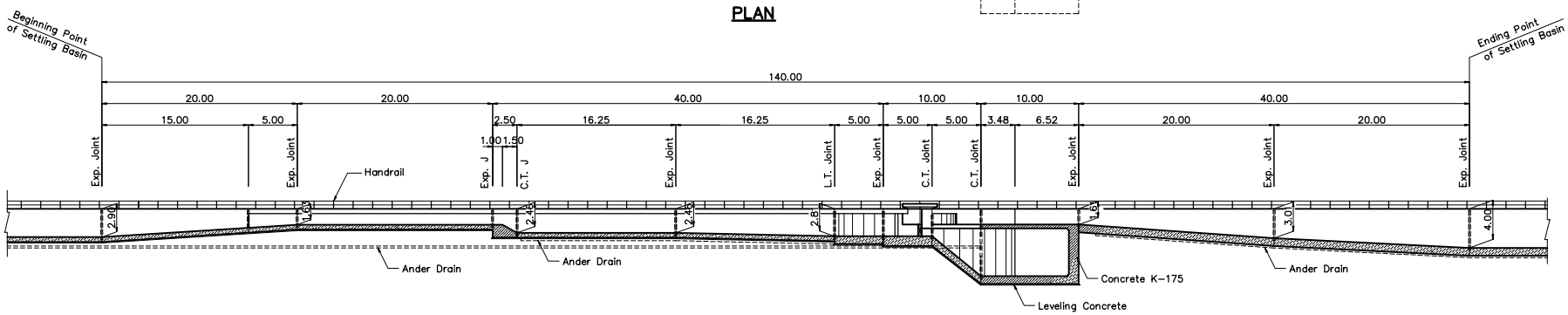
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (2/16) TYPICAL DRAWING HEADWORKS (Movable Weir Type)
Japan International Cooperation Agency	

AF - 4

PLATE NO.



PLAN



PROFILE OF SETTLING BASIN

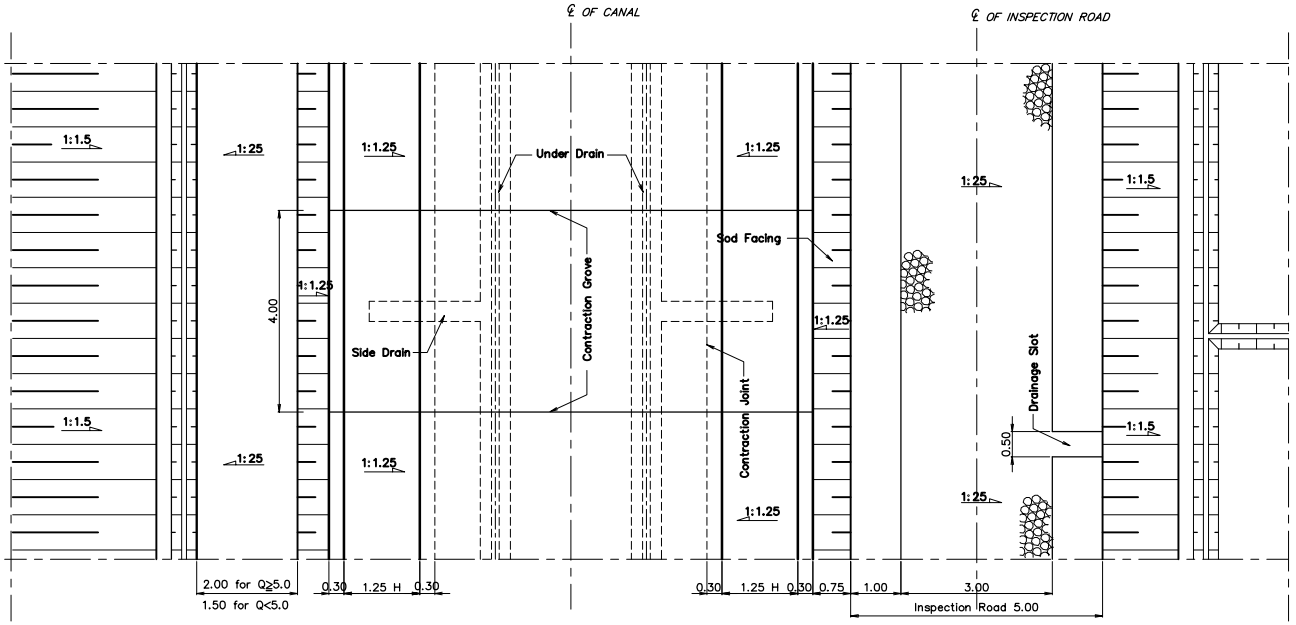
Note:
All dimensions are in meters unless specified.

SCALE 0 1.25m 25.00m

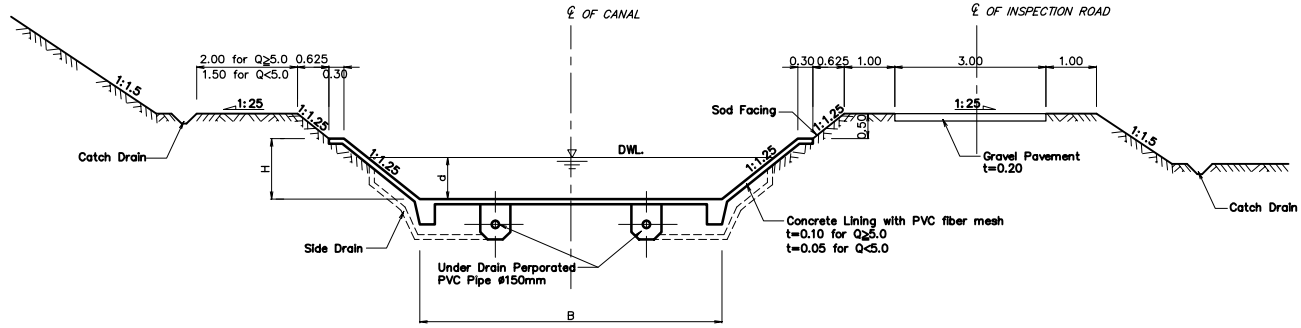
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (3/16) TYPICAL DRAWING SETTLING BASIN
Japan International Cooperation Agency	

AF - 5

PLATE NO.



PLAN



SECTION

DIMENSION TABLE

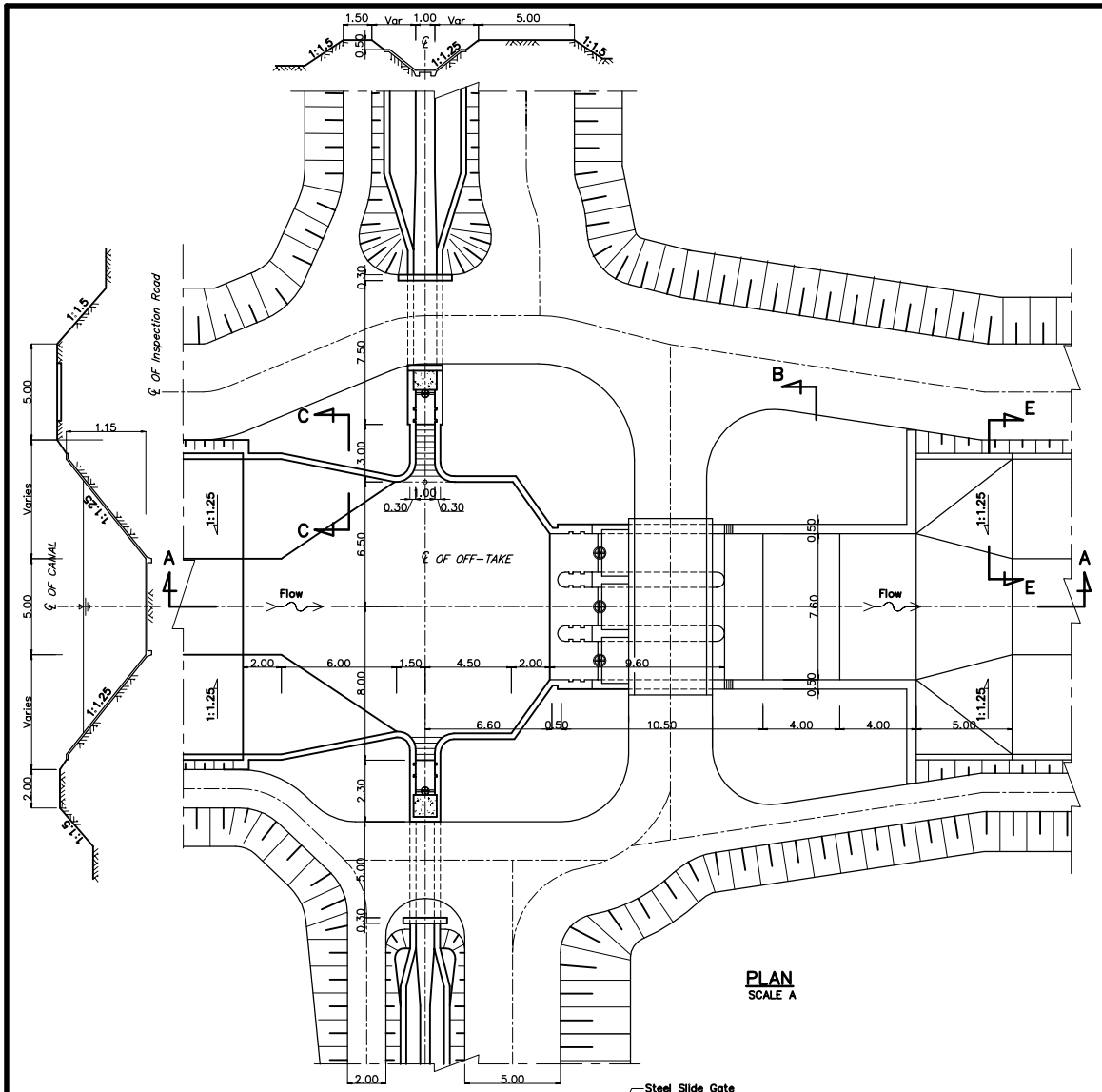
DESIGN DISCHARGE Q (m^3/s)	B (m)	H (m)	d (m)
0.0–0.5	1.00	1.50	0.90
0.5–1.0	1.00	1.75	1.15
10.–1.5	1.00	1.95	1.35
1.5–2.0	1.00	2.15	1.55
2.0–4.0	1.00	2.35	1.75
4.0–6.0	1.50	2.55	1.95
6.0–8.0	2.00	2.95	2.20
8.0–10.0	2.50	3.05	3.30
10.0–15.0	3.00	3.35	2.60
15.0–20.0	3.50	3.65	2.90
20.0–25.0	4.00	3.85	3.10
25.0–30.0	4.50	4.05	3.30
30.0–35.0	5.00	4.15	3.40

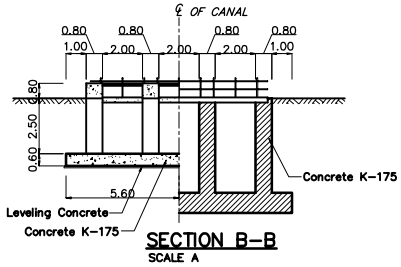
Note:
All dimensions are in meters unless specified.

SCALE 0 2.50m 5.00m

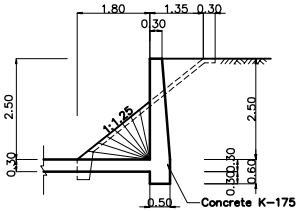
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (4/16) TYPICAL CROSS SECTION OF IRRIGATION CANAL
Japan International Cooperation Agency	

PLATE NO.

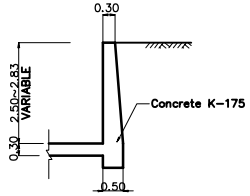




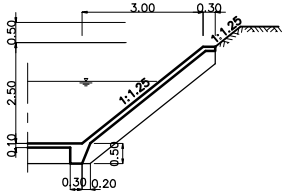
SECTION B-B
SCALE A



SECTION C-C
SCALE B



SECTION D-D
SCALE B



SECTION E-E
SCALE B

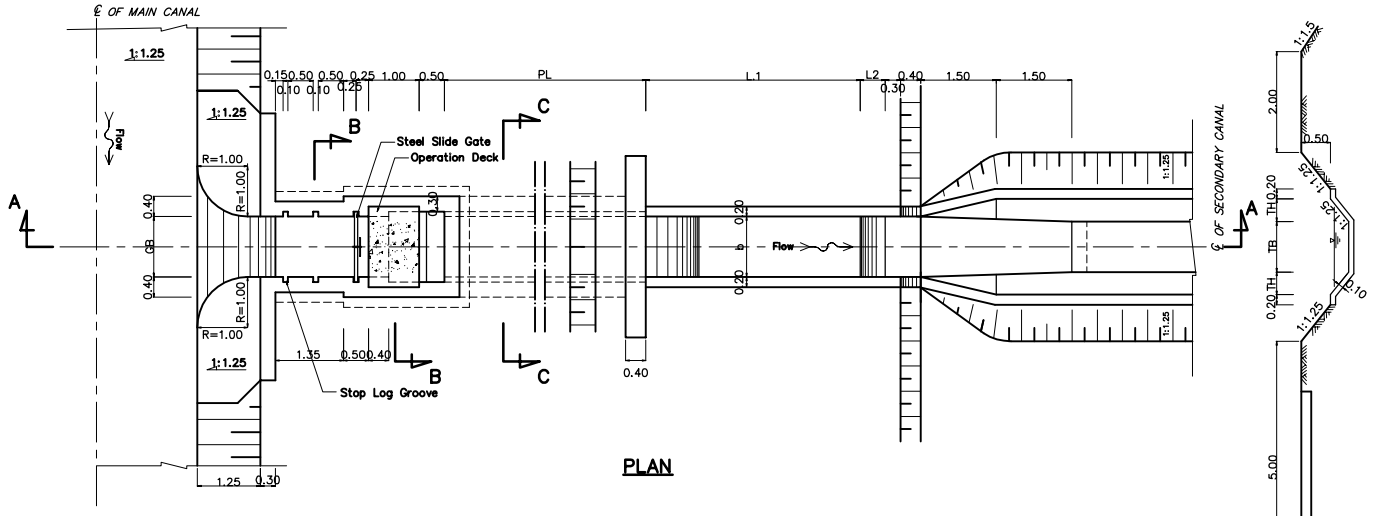
Note:
All dimensions are in meters unless specified.

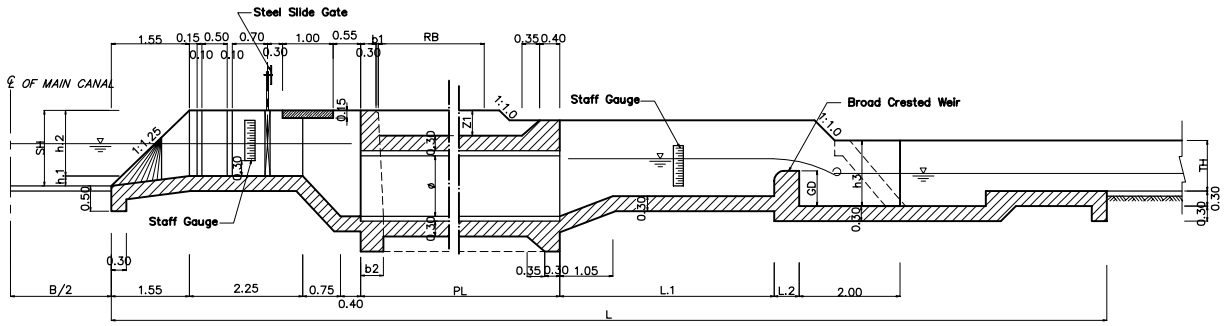
SCALE A 0 6.25m 12.50m

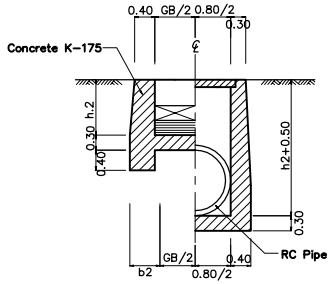
SCALE B 0 3.125m 6.25m

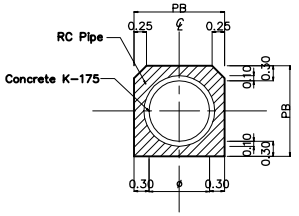
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (5/16) TYPICAL DRAWING DIVISION STRUCTURE
Japan International Cooperation Agency	

PLATE NO.









Note:

1. All dimensions are in meters unless specified.
1. Structure Shall be Reinforced Concrete

SCALE 0 2.50 m 5.00 m

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (6/16) TYPICAL DRAWING TURNOUT
Japan International Cooperation Agency	

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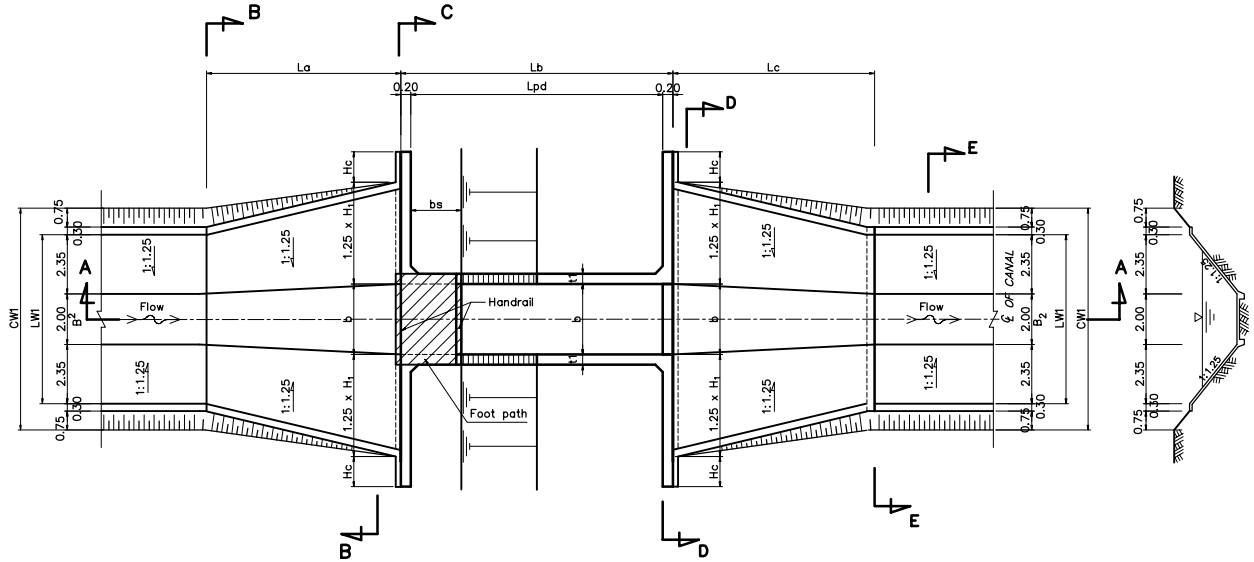
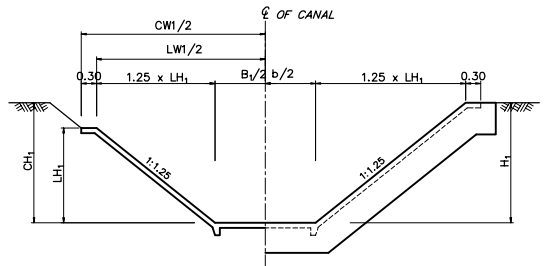
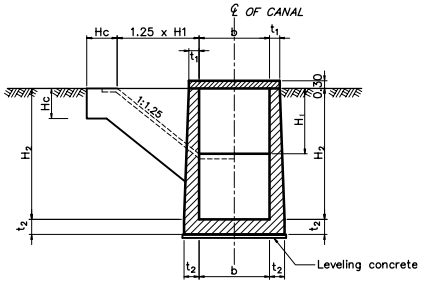
PLATE NO.



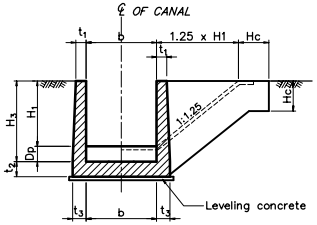
PLAN
SCALE A



SECTION B–B
SCALE B



SECTION C–C
SCALE B



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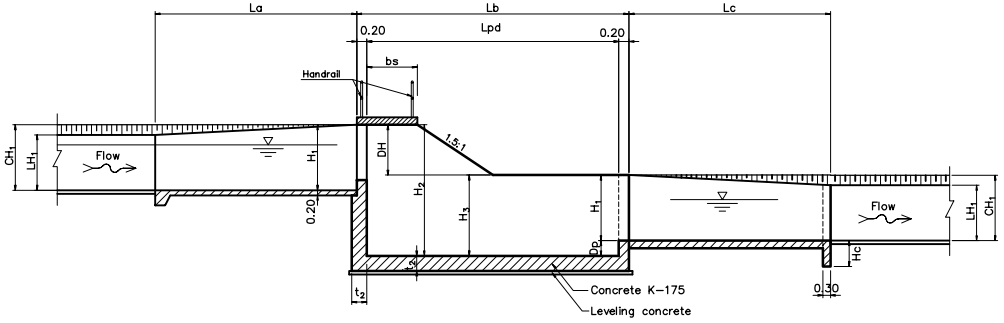
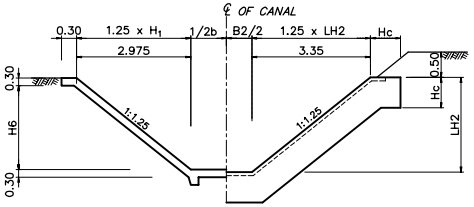
SCALE B



SECTION A–A
SCALE B



SECTION E–E
SCALE B

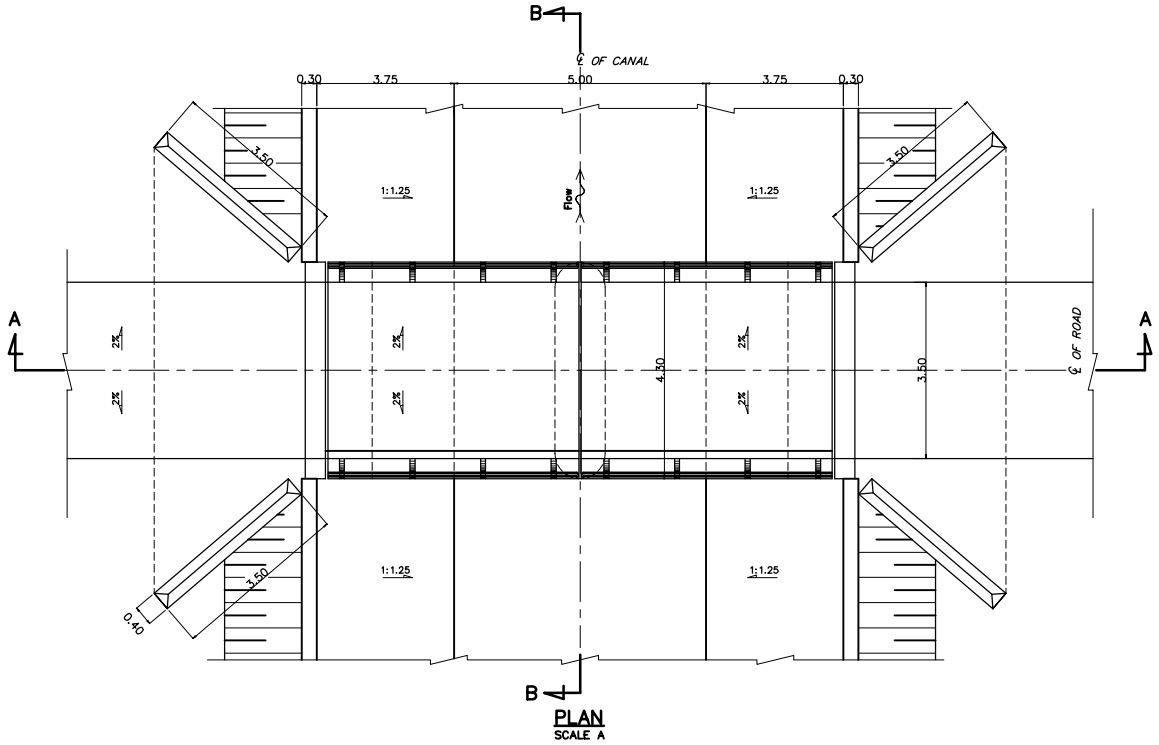
SCALE A 0 5.00 m 10.00 m
SCALE B 0 2.50 m 5.00 m

Note:
All dimensions are in meters unless specified.

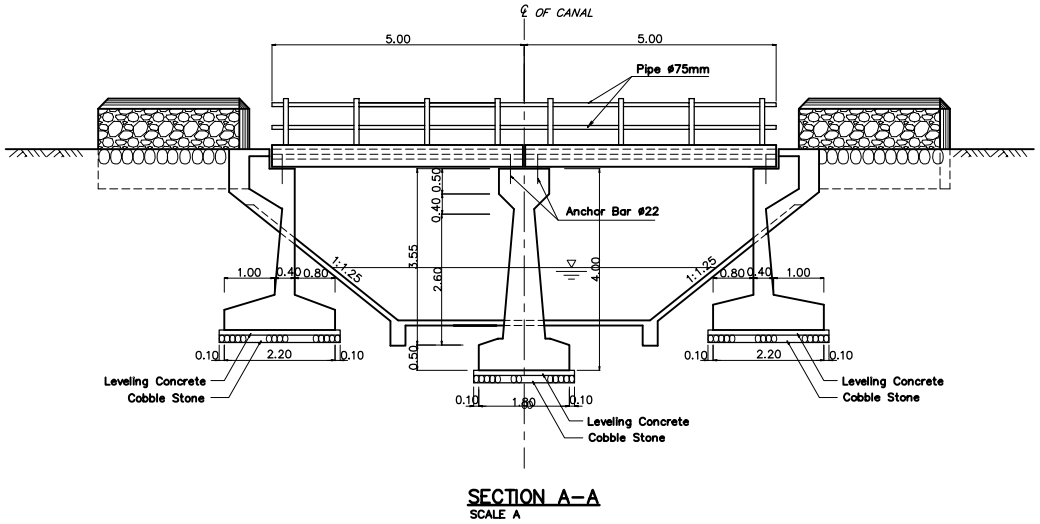
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (7/16) TYPICAL DRAWING DROP
Japan International Cooperation Agency	

AF - 9

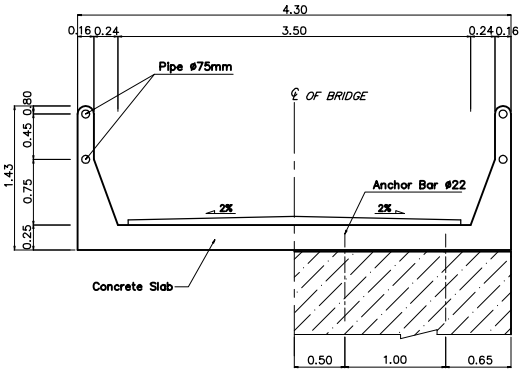
PLATE NO.



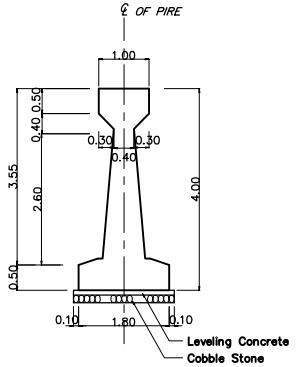
PLAN
SCALE A



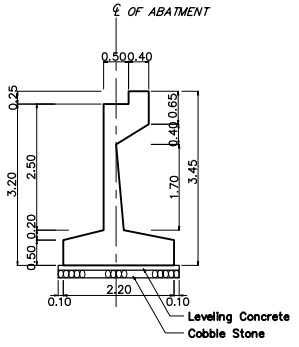
SECTION A–A
SCALE A



SECTION B–B
SCALE B



PIER
SCALE A



ABATMENT
SCALE A

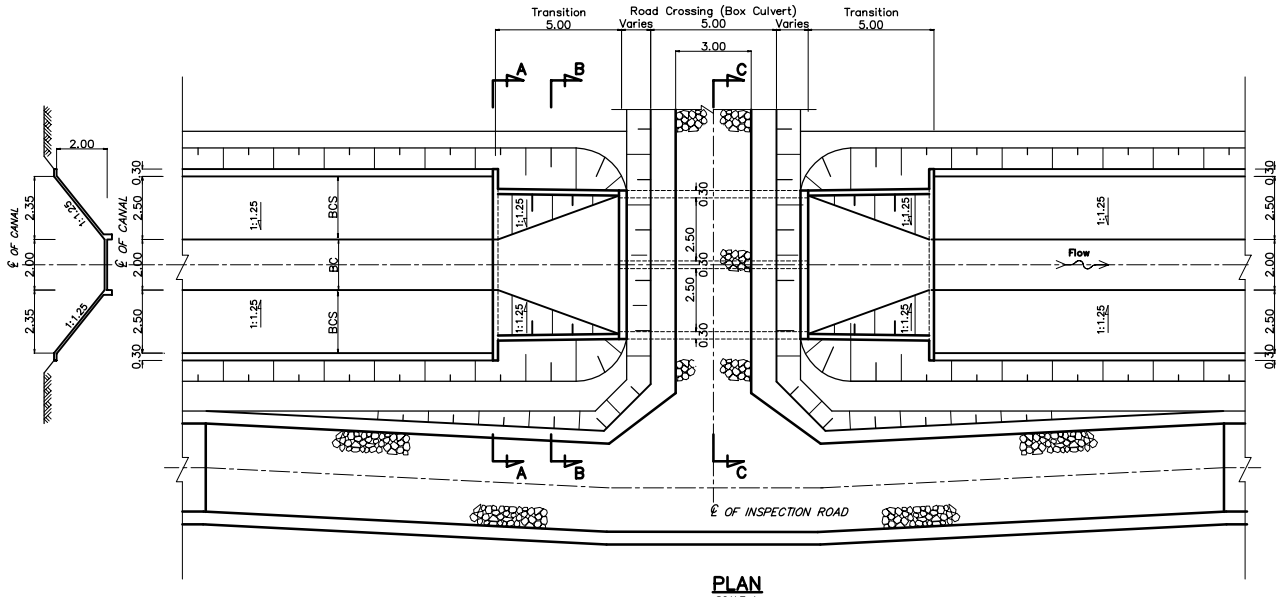
Note:
All dimensions are in meters unless specified.

SCALE A 0 2.50 m 5.00 m

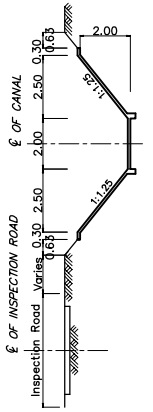
SCALE B 0 1.25 m 2.50 m

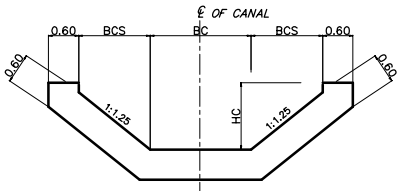
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (8/16) TYPICAL DRAWING SLAB BRIDGE
Japan International Cooperation Agency	

PLATE NO.

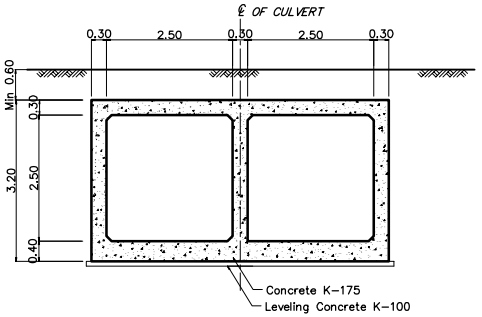


PLAN
SCALE A

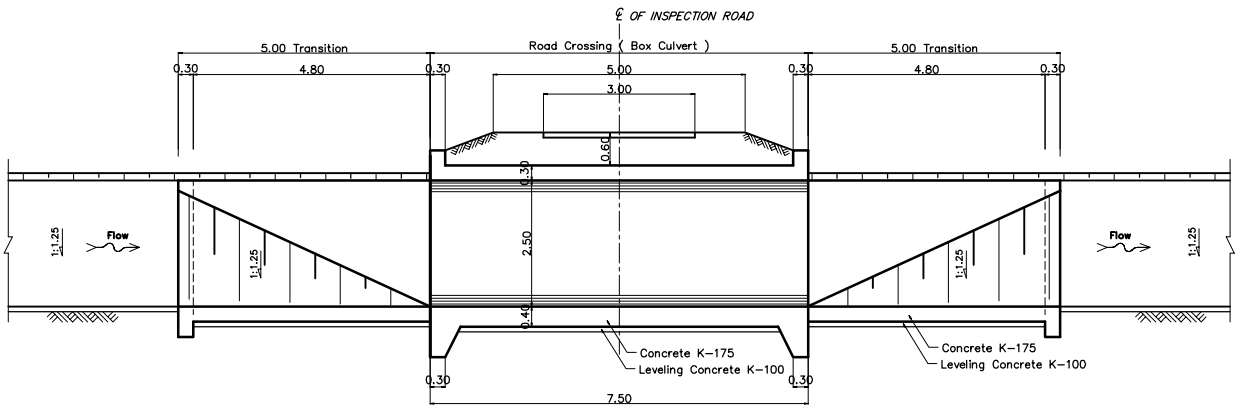




SECTION A – A
SCALE B



SECTION C – C
SCALE B



PROFILE
SCALE B

Note:
All dimensions are in meters unless specified.

SCALE A 0 5.00m 10.00m

SCALE B 0 2.50m 5.00m

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figuer 5.2.1 (9/16) TYPICAL DRAWING ROAD CROSSING (BOX CULVERT TYPE)
Japan International Cooperation Agency	

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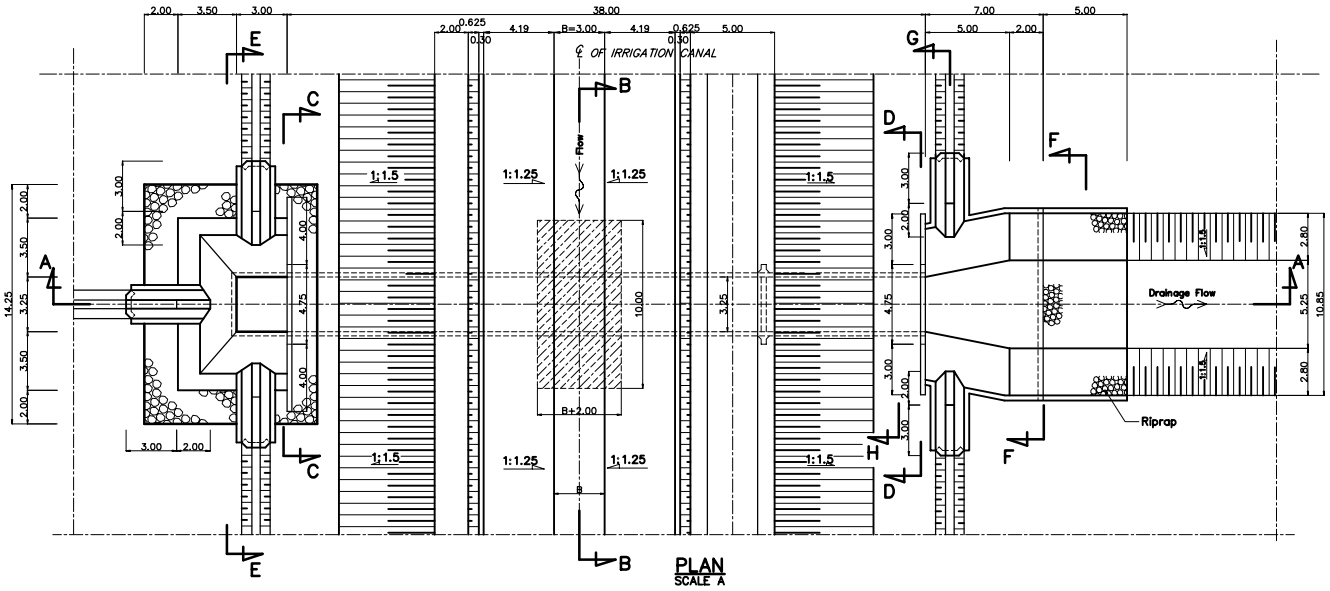
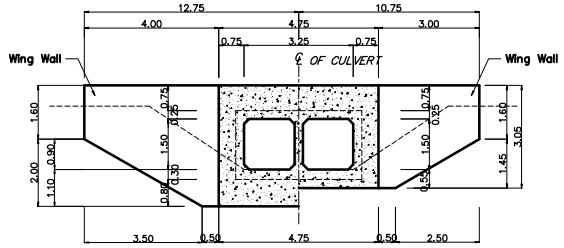
PLATE NO.

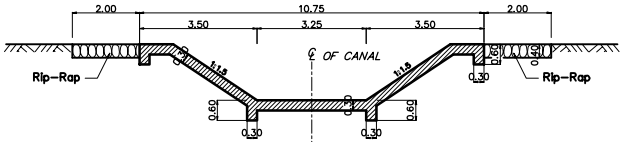


PLAN
SCALE A

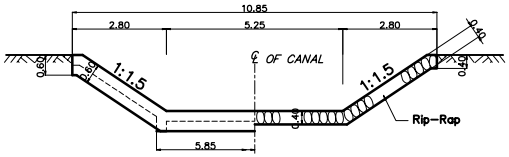


SECTION C–C
SCALE B

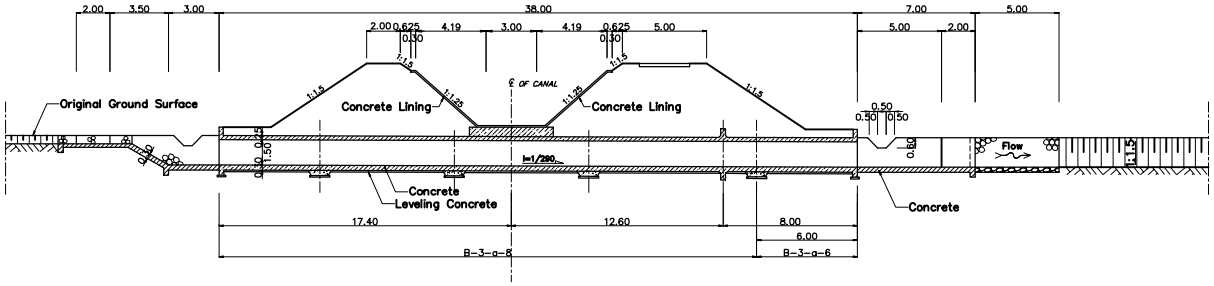
SECTION D–D
SCALE B



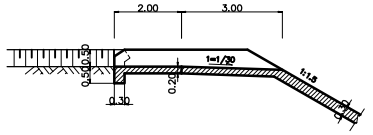
SECTION E–E
SCALE B



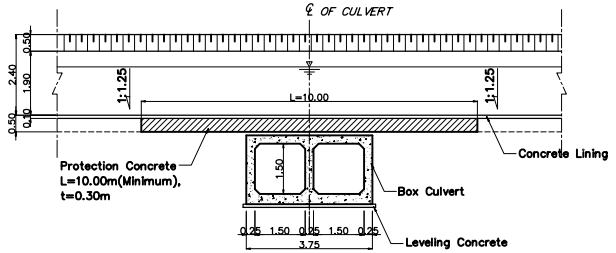
SECTION F–F
SCALE B



SECTION A–A
SCALE A



SECTION G–G
SCALE B



SECTION B–B
SCALE B

Note:
All dimensions are in meters unless specified.

SCALE A 0 7.50m 15.00m

SCALE B 0 3.75m 7.50m

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (10/16) TYPICAL DRAWING DRAINAGE CROSSING
Japan International Cooperation Agency	

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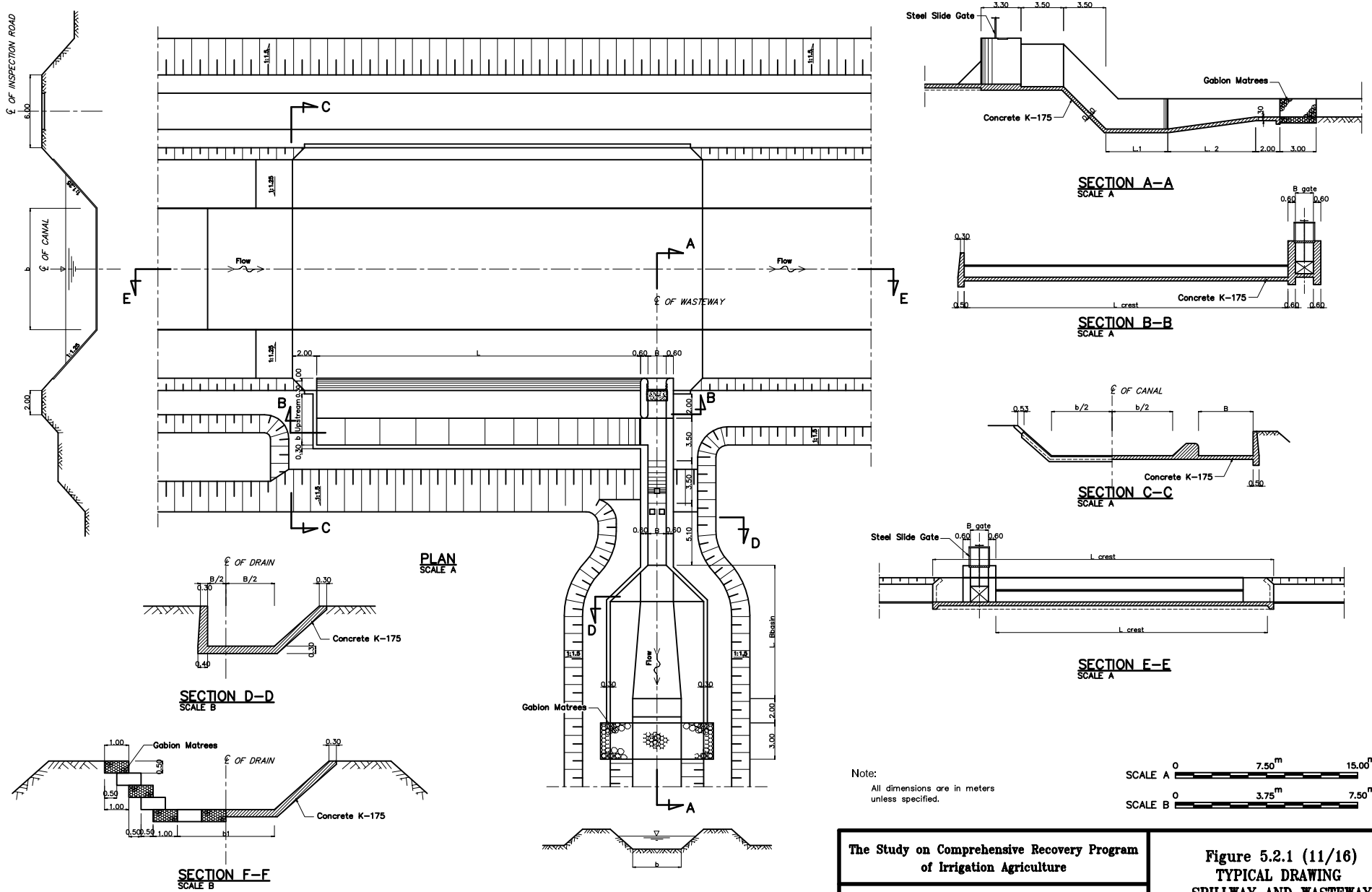
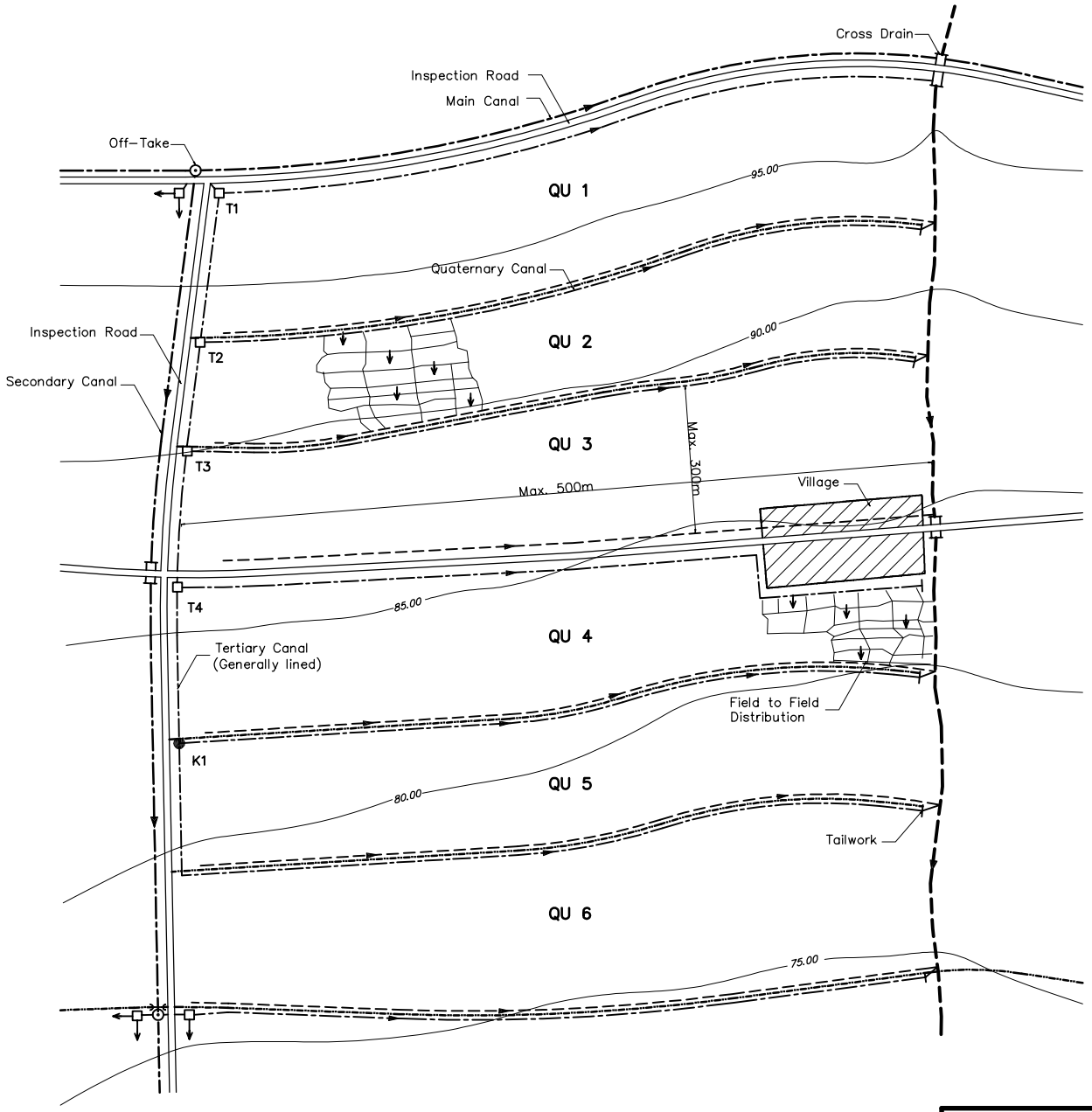
PLATE NO.



The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (11/16) TYPICAL DRAWING SPILLWAY AND WASTEWAY
Japan International Cooperation Agency	

PLATE NO.



General Criteria for Tertiary Unit Development
1, Size of Tertiary Unit 50–100 ha
2, Size of Quaternary Unit 8–15 ha
3, Length of Tertiary Canal <1500 m
4, Length of Quaternary Canal <500 m
5, Distance between Quaternary Canal and Drainage Canal <300 m

LEGEND

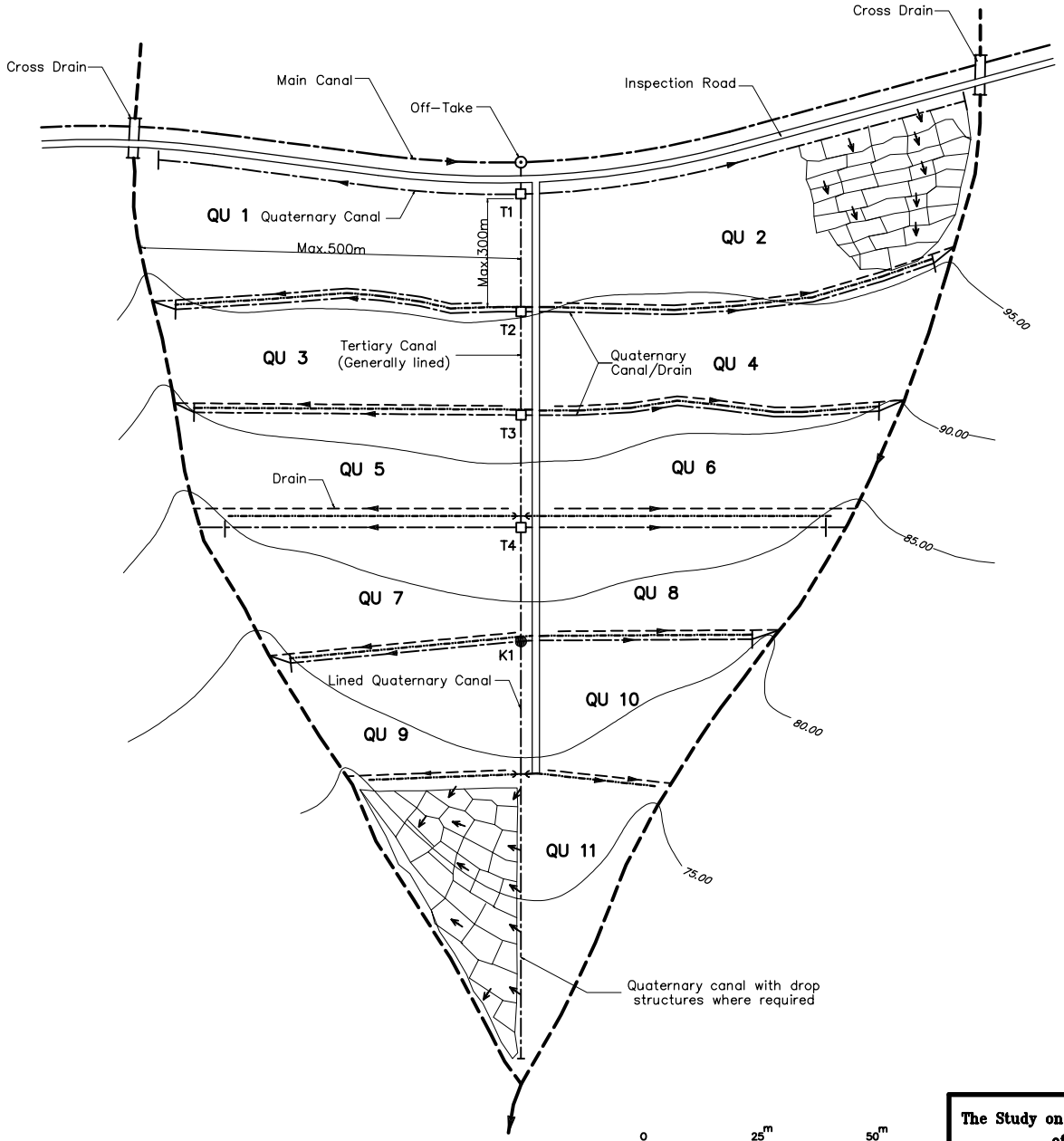
- 5m Contour line
- Inspection Road
- Village
- Paddy Fileld
- Culvert
- Off–Take
- Tertiary Division Box
- Quarternary Division Box
- Canal with Farm Road
- Drain
- Farm Road
- Flow
- Bridge

SCALE 0 25m 50m

The Study on Comprehensive Recovery Program of Irrigation Agriculture

Japan International Cooperation Agency

Figure 5.2.1 (12/16)
TYPICAL LAYOUT OF TERTIARY UNIT SLOPE LESS THAN 5%

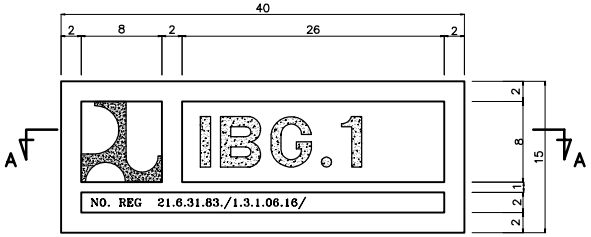


General Criteria for Tertiary Unit Development
1, Size of Tertiary Unit 50–100 ha
2, Size of Quaternary Unit 8–15 ha
3, Length of Tertiary Canal <1500 m
4, Length of Quaternary Canal <500 m
5, Distance between Quaternary Canal and Drainage Canal <300 m

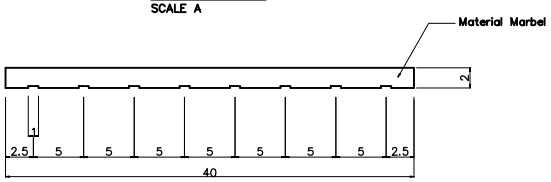
LEGEND

- 5m Contour line
- Inspection Road
- Village
- Paddy Fileld
- Culvert
- Off–Take
- Tertiary Division Box
- Quarternary Division Box
- Canal with Farm Road
- Drain
- Farm Road
- Flow
- Bridge

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figuer 5.2.1 (13/16) TYPICAL LAYOUT OF TERTIARY UNIT SLOPE MORE THAN 5%
Japan International Cooperation Agency	

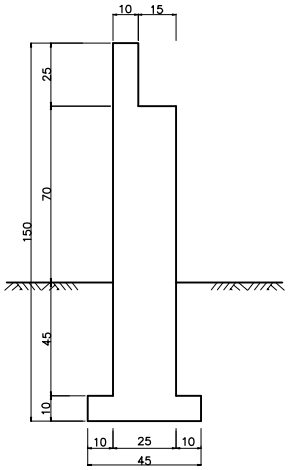


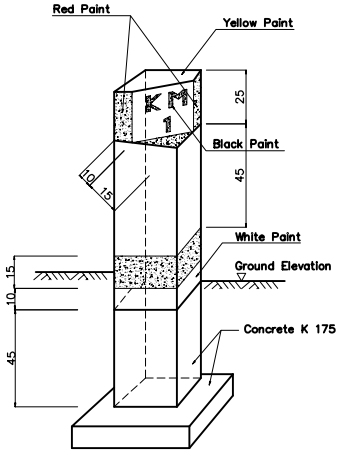
FRONT VIEW
SCALE A



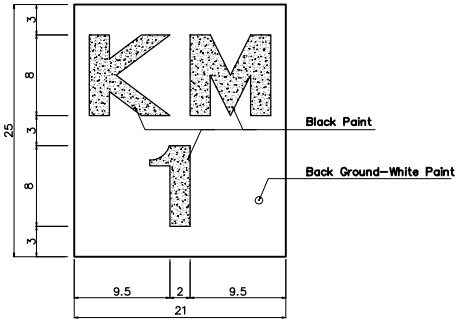
SECTION A–A
SCALE A

NAME PLATE OF STRUCTURE



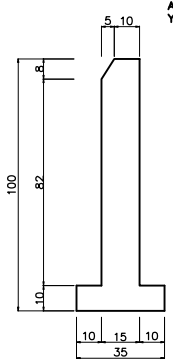


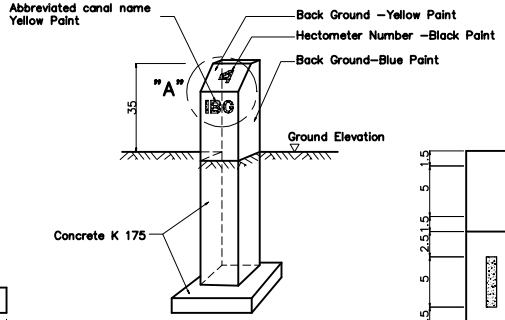
PERSPECTIVE
SCALE B



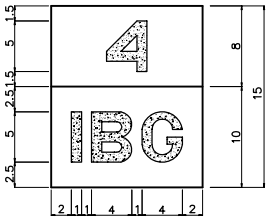
LETTERING DETAIL
SCALE A

KILOMETER POST





PERSPECTIVE
SCALE B



DETAIL "A"
SCALE A

HECTOMETER POST

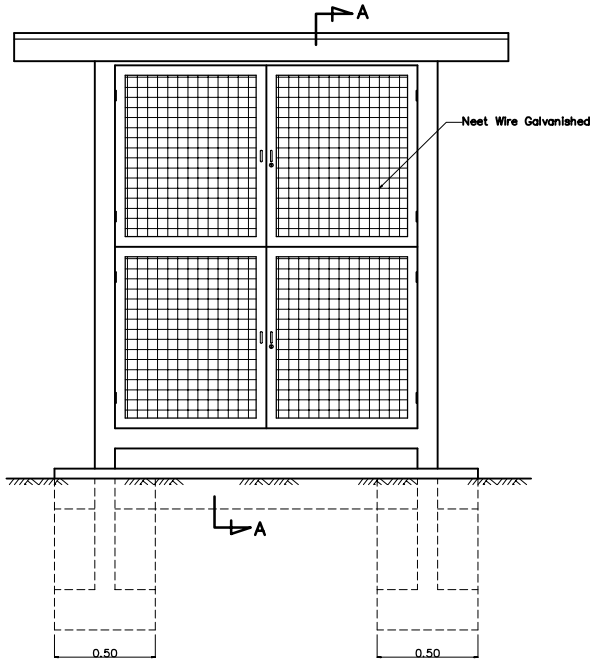
Note:
All dimensions are in centimeters unless specified.

SCALE A 0 12.50 cm 25.00 cm

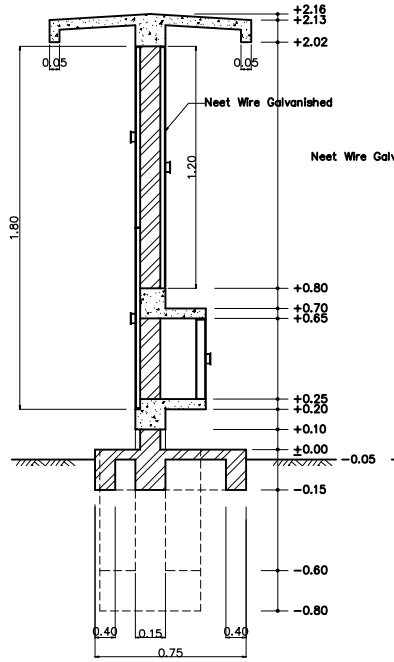
SCALE B 0 10.00 cm 20.00 cm

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (14/16) TYPICAL DRAWING NAME PLATE OF STRUCTURE, KILOMETER & HECTOMETER POST
Japan International Cooperation Agency	

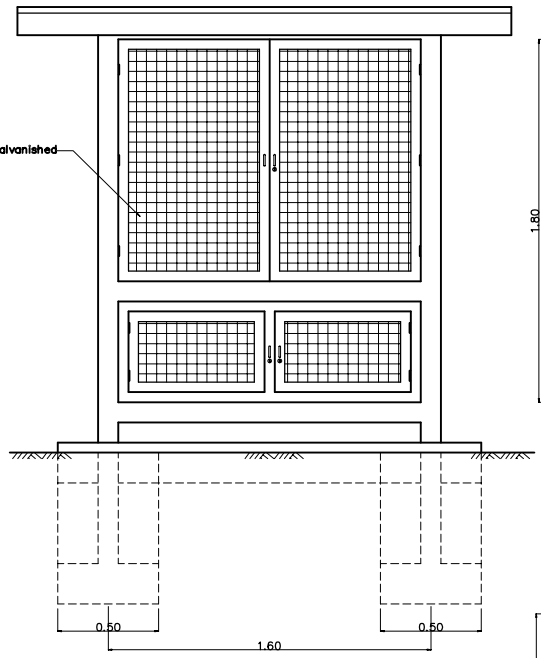
PLATE NO.



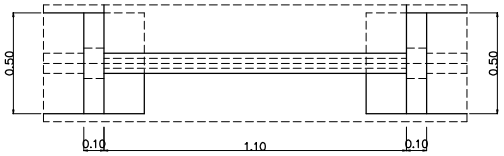
FRONT VIEW



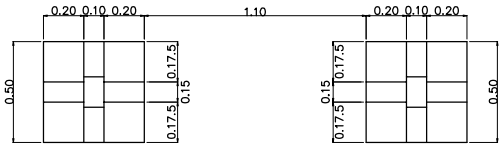
SECTION A–A



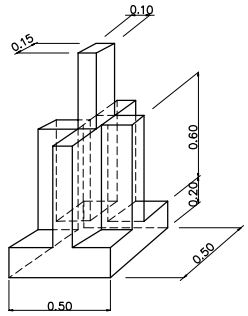
REAR VIEW



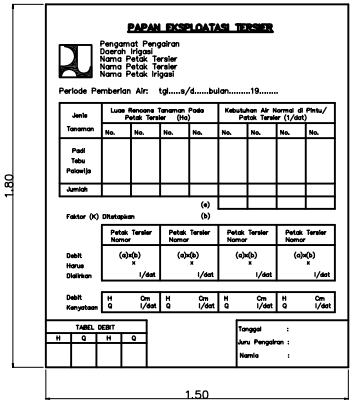
PLAN

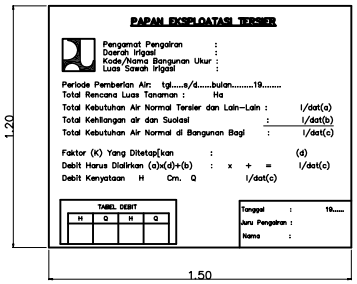


FOUNDATION



FOUNDATION DETAIL





Note:
All dimensions are in centimeters unless specified.

SCALE 0 0.625 m 1.25 m

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (15/16) TYPICAL DRAWING DISPLAY BOARD
Japan International Cooperation Agency	

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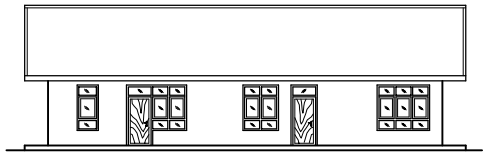
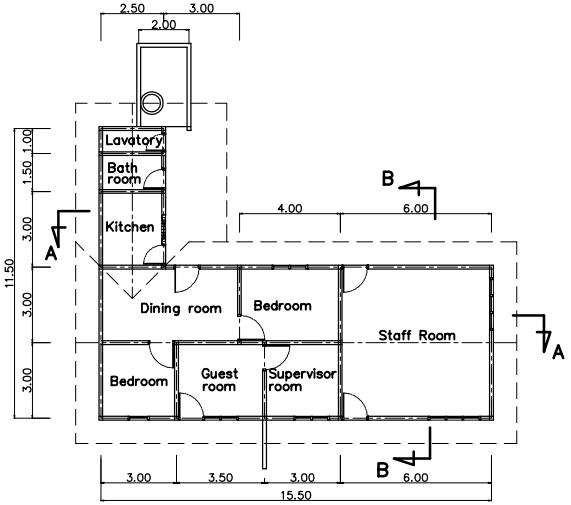
PLATE NO.

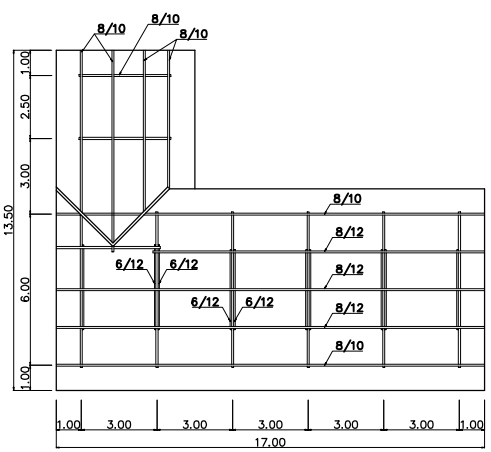


FRONT VIEW

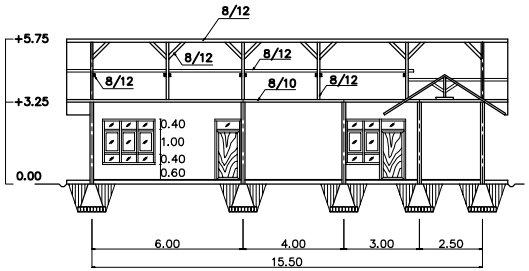
RIGHT SIDE VIEW



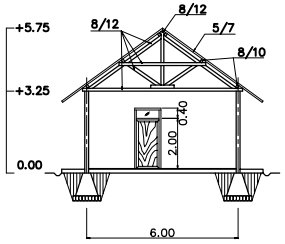
PLAN



ROOF PLAN

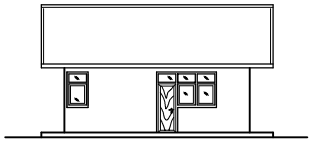


SECTION A–A

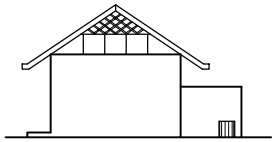


SECTION B–B

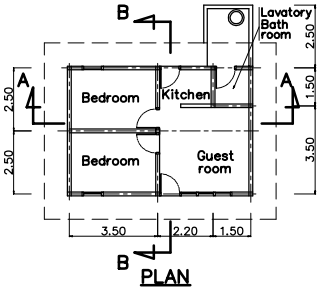
OPERATION OFFICE A= 120m²



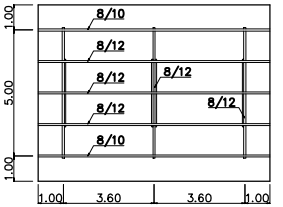
FRONT VIEW



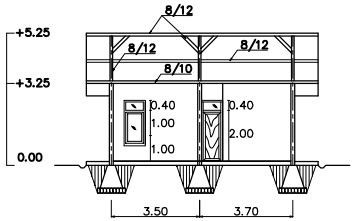
RIGHT SIDE VIEW



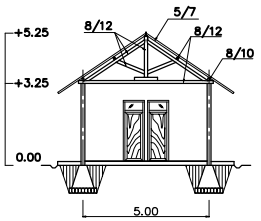
PLAN



ROOF PLAN



SECTION A–A



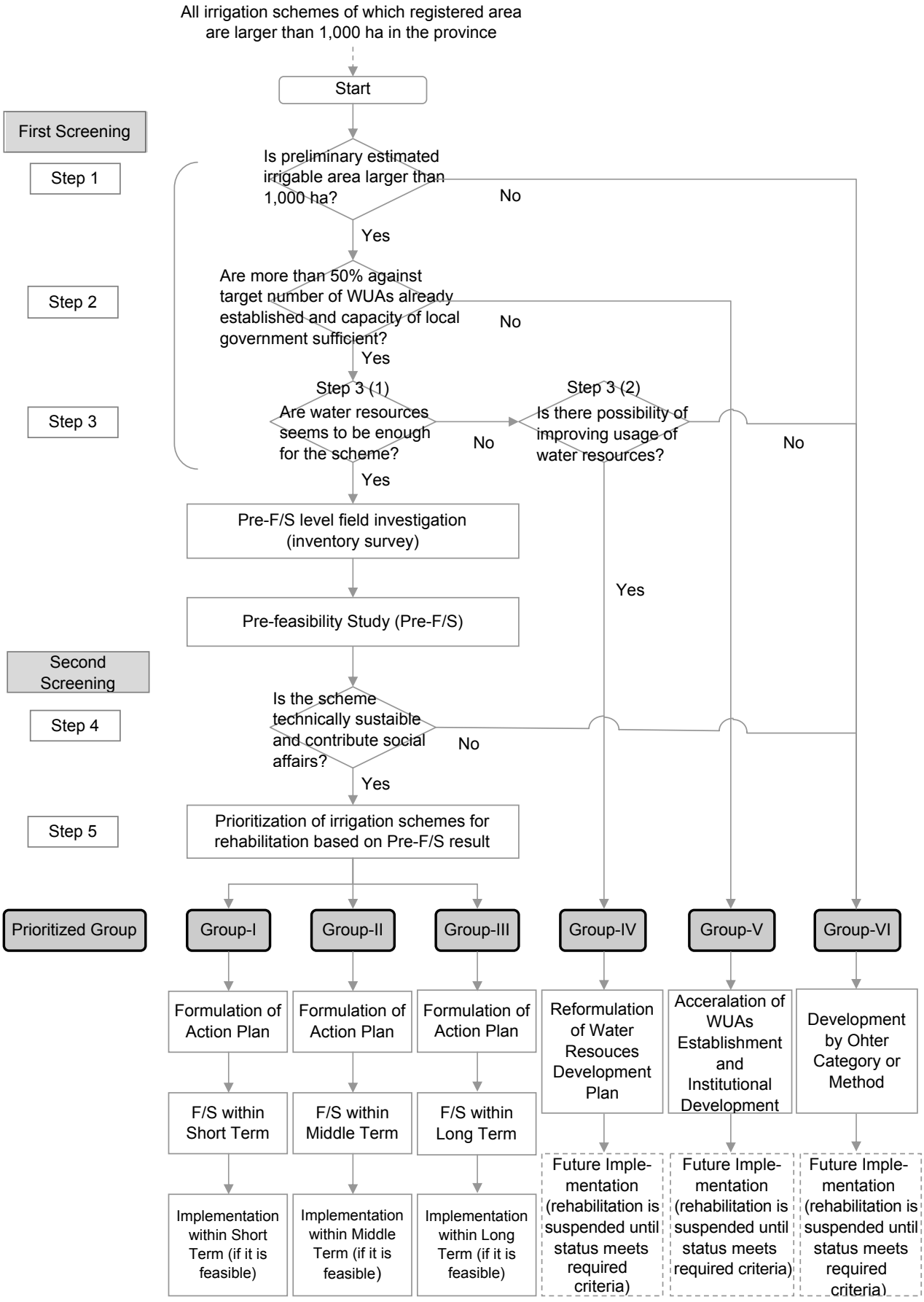
SECTION B–B

GATE KEEPER HOUSE A=36m²

Note:
All dimensions are in meters unless specified.

SCALE 0 5.00m 10.00m

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure 5.2.1 (16/16) TYPICAL DRAWING OPERATION OFFICE AND GATE KEEPER HOUSE
Japan International Cooperation Agency	



The Study on Comprehensive Recovery Program of Irrigation Agriculture

Japan International Cooperation Agency

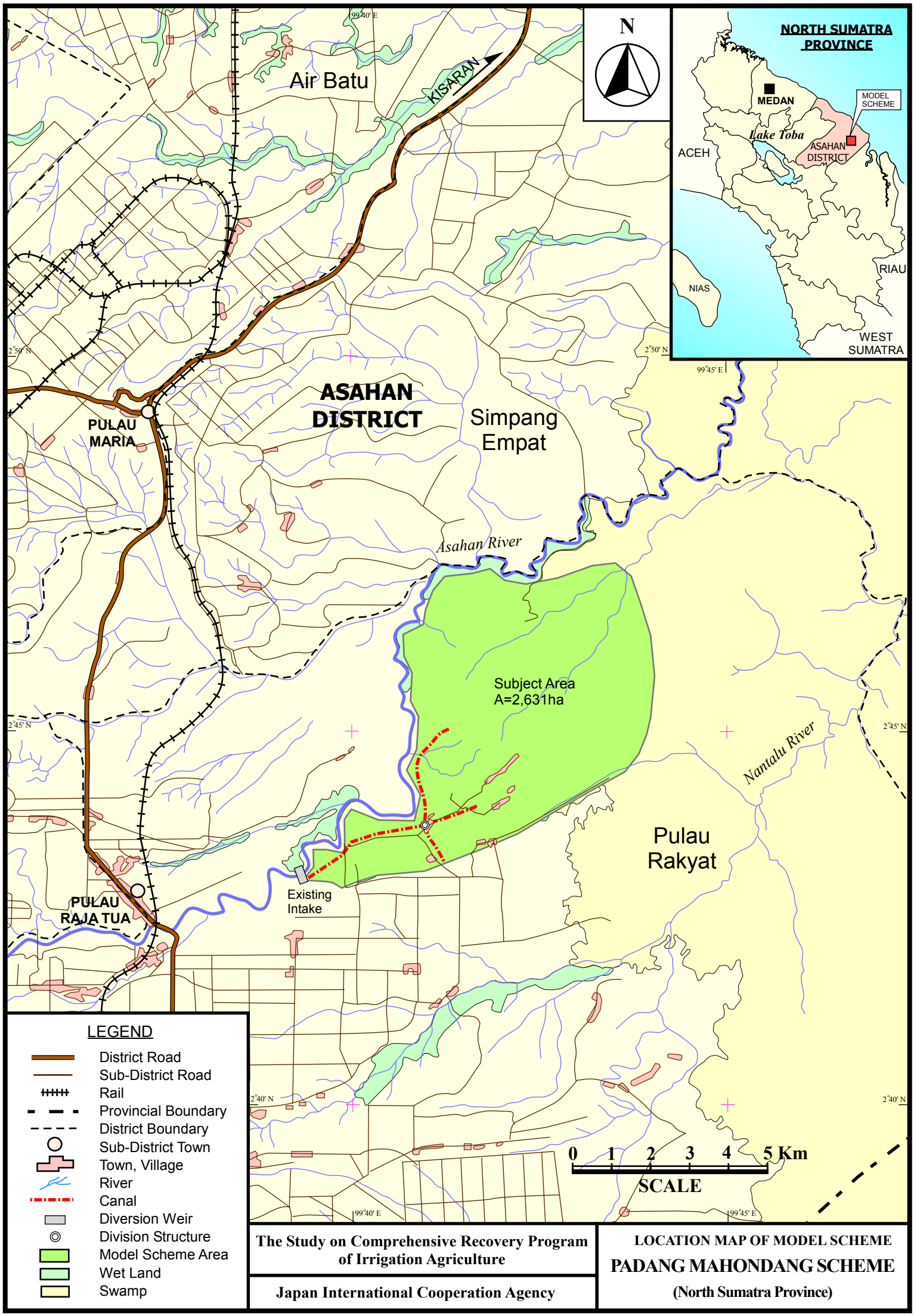
Figure A-6.1.1
Flow of Rehabilitation of Irrigation Schemes

Figure A-7.3.1 Action Plan of Recovery Program of Irrigation Agriculture : North Sumatra

Priority Group	Phase	Work Description		Pre-F/S		Year from commencement of Midterm Phase														
				1st	2nd	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th
-	**Initiation**	Pre-Feasibility	- Preparation of Master List																	
			- Pre-F/S level Field Investigation																	
			- Second Screening by Water Resources Availability																	
			- Formulation of Pre-F/S level Development Plan																	
			- Prioritization																	
			- Preparation of Action Plan																	
I.	**Midterm**	Feasibility Study	- Procurement of Consultant													**Group I**				
			- Preparation of F/S													Number of scheme: 6				
			- Financial Arrangement													Irrigation Area: 9,952 ha				
																Construction Lot: 7				
	Final	Implementation	- Procurement of Consultant																	
			- Detailed Design																	
			- Tender																	
			- Construction																	
			- Guidance, training etc.																	
II.	**Midterm**	Feasibility Study	- Procurement of Consultant																	
			- Preparation of F/S													**Group II**				
			- Financial Arrangement													Number of scheme: 7				
																Irrigation Area: 19,177 ha				
	Final	Implementation	- Procurement of Consultant													Construction Lot: 10				
			- Detailed Design																	
			- Tender																	
			- Construction																	
			- Guidance, training etc.																	
III.	**Midterm**	Feasibility Study	- Procurement of Consultant													**Group III**				
			- Preparation of F/S													Number of scheme: 5				
			- Financial Arrangement													Irrigation Area: 14,937 ha				
																Construction Lot: 7				
	Final	Implementation	- Procurement of Consultant																	
			- Detailed Design																	
			- Tender																	
			- Construction																	
			- Guidance, training etc.																	
IV.	**Midterm**	Review and Preparation of Development Plan													Group IV					
												(Continue to future step)			Number of scheme: 3					
															Irrigation Area: 4,996 ha					
V.	**Midterm**	Institutional Capacity Building											**Group V**							
										(Continue to future step)			Number of scheme: 14							
													Irrigation Area: 26,181 ha							
VI.	**Midterm**	Review and Preparation of Development Plan												**Group VI**						
											(Continue to future step)			Number of scheme: 15						
														Irrigation Area: 15,307 ha						

PART II

FEASIBILITY STUDY FOR SELECTED MODEL SCHEME



The Study on Comprehensive Recovery Program of Irrigation Agriculture

Japan International Cooperation Agency

LOCATION MAP OF MODEL SCHEME

PADANG MAHONDANG SCHEME

(North Sumatra Province)

CHAPTER 1 PRESENT CONDITION

1.1 Natural Conditions

(1) Location

The project area lies in the central part of North Sumatra province about 160 km southeast from Medan, the capital city of the province. Administratively, the project area is within the jurisdiction of one Kecamatan (Pulo Rakyat) of Asahan district.

(2) Climate and Hydrology

The project area lies in the tropical monsoon zone. The annual average temperature is about 26°C with very little seasonal variation throughout a year. The temperature varies from a maximum of 32 ^{o}C to a minimum of 22 ^{o}C. The climate conditions of the area are shown in Table B-1.1.1.

The area is affected by the northeast monsoon from the China Sea in September through December and southwest monsoon from the Indian Ocean in March through May. The main wet season begins in the coastal area facing the Strait of Malacca with heaviest rain in October and it reaches the coast of the Indian Ocean after one to one and a half months. In the secondary rainy season, however, due to the existence of a mountain range over 2,000 m high to the west of the area, the influence of the monsoon is weakened and hence the area receives considerable rainfall even in the dry season. There are no severe dry months.

The annual rainfall is about 2,000 mm in the project area and about 2,000 to 3,500 mm to the west towards the mountains. In general the water resources in the area are ample. The relative humidity is high at 88% on average ranging between 90% in the highest month and 87% in the lowest.

(3) River System and River Runoff

The major river in the project area is the Asahan River. The catchment area of the Asahan River at Pulau Raja site is: 4,608 km^2 and annual mean discharge is estimated at 150 m^3/s. The Asahan River originates from Lake Toba regulating the water level at about El. 905 m and runs about 150 km, into the Strait of Malacca after joining the Silau River at Tanjung Balai.

(4) Topography and geology

The topography of the project area is mostly wide and flat alluvial plain lower than El. 20 m including lower swampy areas.

The area at the elevation of 10 m to 15 m has terrace deposits mainly composed of sand and silt forming belts, projected low ridges and isolated islands. Alluvial plain deposit, including that in the vast swampy area, mostly consists of fine silt to clayey soils inter bedded by thin soil layers and organic soil layers.

1.2 Socio-economy

Administratively, the Scheme is located in Pulau Rakyat Sub-district (the project sub-district), one of 17 sub-districts of Asahan District. The beneficiary area of the Scheme extends into 2 villages (the project *desas*: Padang Mahondang and Ofa Padang Mahondang). The administrative area of the project sub-district is 251.0 km^2 and that of the project *desas* is 91.3 km^2.

The population of the project sub-district was 30,631 and in the project *desas* was 8,088 in 2002. Number of households and the average family size in the sub-district are 6,834 and 4.5 persons, respectively. The same in the *desas* are respectively 2,324 and 3.5. There were no transmigrant households in the *desas*. The rural population of the sub-district accounts for 90% of the total.

Major socio-economic features of the sub-district and *desas* are presented in the following table.

Socio-economic Features of Project Sub-district & Desas

Indicators	Project Sub-district	Project *Desas*
Area (km^2)	251.0	91.3
No. of *Desas*	11	2
Population	30,631	8,088
No. of Households	6,834	2,324
Average Family Size	4.5	3.5
Population (Age group: 15 – 64)	18,927	-
Population (Age group: ≧=/>65)	1,931	-
Labor Force per Family	2.9	-
Origin of Residents	Local residents (≒100%)	Local residents (≒100%)

Source: Kabupaten Asahan Dalam Angka & Kecamatan Pulau Rakyat Dalam Angka, 2002

The agriculture sector is the main economic activity both in the sub-district and the *desas*. The primary sub-sector in the sub-district is estate crop production and the main commodity is oil palm followed by rubber. The primary sub-sector in the *desas* is food crops production and the main commodity is paddy. The production of the estate crops is carried out mostly by the estate, PT. Perkebunan Nusantara, which operates a large oil palm processing factory in the sub-district. While, the production of estate crops, rubber and oil palm, is also carried out by small holders in both the sub-district and the *desas*. The secondary agriculture sub-sector in the

sub-district is food crop production. The main crop is paddy and production of other crops is rather limited.

Other agricultural activities in the sub-district include the livestock sub-sector, though its scale is limited to the said two sub-sectors.

1.3 Present Irrigation and Drainage Condition

(1) General

The history of irrigation in the project area is relatively short. In former times the main focus for agricultural development was placed on tree crop plantations such as oil palm, rubber and coconuts. Paddy schemes in the area have been developed only in the last 20 years by Kimpraswil (former DPU), North Sumatra province and district public service office of Asahan District.

Irrigation schemes in the area are of the gravity irrigation type diverting irrigation water from the Asahan River through the free intake facility located about 2 km downstream of the national highway.

The irrigation scheme is found to be very poor since the end of 1990's due to poor function of the existing free intake facility, especially in the dry season. In the dry season, the water level of the Asahan River becomes lower than the required intake water level, so that irrigable area becomes very small.

(2) Inventory of the Existing System

Field investigation of the existing irrigation facilities was carried out by the JICA Team prior to the formulating the rehabilitation plan in September and October 2003.

The survey results indicate that the existing irrigation scheme in the project area is broadly divided into two areas according to the present agricultural condition. The land with an area of 700 ha is utilized as irrigated paddy field with semi-technical level in the wet season and the other land with an area of about 2,200 ha is rainfed paddy.

The Location map of project area is shown in Figure B-1.3.1.

(3) Present Conditions and Problems

Inventory of the major existing irrigation and drainage facilities in the project area was drawn up for the preparation of the development plan of the pre-feasibility level. Based on the inventory, structural conditions of all the existing facilities were assessed according to the criteria that categorize the conditions of the existing facilities into four classes on the basis of the degree of deterioration. According to

the results of the inventory, all facilities were classified into D (to be replaced and/or reconstructed) and summarized as follows:

(a) Malfunctioning of the free intake
(b) Absolute shortage of canal length
(c) Inadequate provision and deterioration of irrigation facilities
(d) Poor drainage conditions
(e) Lack of water management activities

(4) Rural Infrastructure

There are no inspection roads along the canals. The village roads in the project area are unpaved earth surface of only 3-4 m wide and are very poorly maintained and hence impassable in the wet season.

(5) Operation and Maintenance

The existing scheme was constructed by PWRS North Sumatra and maintained by its branch office at Kisaran. However, no proper operation and maintenance have been practiced since the end of 1990's after Asahan District Government took over management activities of irrigation schemes.

Following are photographs of the existing condition of the scheme.

1. Upstream View of Asahan River at Intake Site

2. Inlet Channel of Intake from Asahan River (No removal of sediment and eroded earth)

3. Condition of Intake (Free Intake System) (No O&M for a long time)

4. Condition of Main Canal at 2 km Point (Out of Services)

5. Condition of Terminal Facility (Out of Services)

6. Village Road and Paddy Field

1.4 Agriculture

The basic agriculture features of the Scheme are presented in summarized form in Table B-1.4.1 and discussed in the following sections.

1.4.1 Agro-demography

The agro-demographic features of the project sub-district are estimated based on the results of the Agriculture Census, 1993 (district & sub-district), 2003 (*Desa* Padang Mahondang) carried out by BPS[1] and information provided by BPP as presented in Table B-1.4.1 and summarized in the following table.

[1] Based on "*Sensus Pertanian 1993, Hasil Pendaftaran Rumatangga, Kantor Statistik Kabupaten Asahan" & "Tentative results of Agriculture Census 2003, BPS Asahan"*

Agro-demographic Features of Project Sub-district

Agro-demographic Indicators	Project Sub-district *1	Padang Mahondang *2
Proportion of Farm Households to Total Households	51 %	93 %
Proportion of Farm Households Having Activity in		
- Food Crops Farming	31 %	76 %
- Horticulture Crops Farming	5 %	8 %
- Estate Crops Production	74 %	33 %
- Livestock	96 %	18 %

Note *1: Results of the Census on the rural areas of the sub-district
*2: Tentative results of Agriculture Census, 2003, BPS Asahan

On the basis of the tables, the number of farm households of the project sub-district and *desas* in 2002 is estimated at some 3,490 accounting for 51% of the total 6,834 households and some 2,160 accounting for 93 % of the total 2,324households, respectively. Primary farming activity of the farm households in the sub-district is estate crops production followed by food crops production. Farm households having activity in estate crops production represent some 74% of the total farm households. While, in the project *desas* a similar percentage of the households are involved in food crop production.

The current land holding status in the project sub-district and *desa* were estimated based on the number of farm households and the present agricultural land use as shown in Table B-1.4.1. On the basis of the tables, the land holding status of the project *desas* could be assumed as follows;

Estimated Land Holding Status in Project Desas

Indicators	*Project Desas*
Average Farm Land Holding Size/Farm Household	2.47 ha
Average Holding Size of Paddy Field/Farm Household	1.22 ha
Distribution of Farm Household by Holding Size	
- < 0.5 ha	35 %
- ≧ 0.5 ha	65 %

1.4.2 Land Use

According to the JICA study report[2], the land use of the Scheme in 1990 was estimated as: irrigated paddy field 1,100 ha, rainfed paddy field 1,400 ha and others 830 ha. While, from the information provided by the irrigation services office (Balai PSDA Bah Bolon-Asahan) and the statistic data on cropped areas of the Asahan District Agriculture Services Office, the present land use statuses are estimated as: irrigated paddy field 724 ha, rainfed paddy field currently in use 436

[2] *Master Plan Study on Lower Asahan River Basin Development, JICA, 1990*

ha, others 2,071 ha and 3,231 ha in total. The oil palm planted land is roughly estimated at some 600 ha.

The present land use of the Scheme has been estimated on the basis of the said information as the availability of reliable information on the same is limited. The present status assumed is shown in Table B-1.4.1 and in the following table.

Present Land Use of Padang Mahondang Scheme

Irrigated Paddy Field	Rainfed Paddy Field			Tree Crop Land (Oil Palm)	Total
	Currently Used	Long Fallow Land			
		Bush	Light Forest		
724 ha	436 ha	736 ha	735 ha	600 ha	3,231 ha
22.4 %	13.5 %	22.8 %	22.7 %	18.6 %	100 %

As shown in the table, the vegetation covers of the long fallow land are assumed to be bush (50%) and light forest (50%).

The deterioration of the irrigation scheme could be attributed to the decrease of irrigation water intake caused by the draw-down of the river. The existence of the large long fallow lands is due mainly to the low productivity in rainfed paddy fields due to poor drainability of the fields and partly to the shortage of labor forces.

1.4.3 Cropping Schedule and Pattern

The prevailing cropping schedules and patterns in the Scheme are identified as shown below and in Table B-1.4.1.

Cropping Schedules

- Paddy (planting ~ harvest): Wet Season: Nov. - Feb. ~ Feb. - Apr.
  Dry Season: May - July ~ Aug. - Oct.
- Palawija: Cultivation both in wet and dry season (area limited)

Cropping Pattern

- Irrigated Paddy Field: wet - dry season: paddy -paddy/ palawija/ fallow
- Rainfed Paddy Field: wet - dry season: paddy/ palawija/ fallow - fallow (cropped area limited)

1.4.4 Cropped Area and Cropping Intensity

The irrigation performances in irrigated paddy fields expressed by cropped area and cropping intensity and the cropped area and cropping intensity in rainfed paddy fields are estimated based on the information provided by the District Water Resources Office, the statistical data of the District Agriculture Services Office and on the past records on cropped areas shown in Table B-1.4.2. The results are shown in Table B-1.4.1 and summarized below.

Cropped Area and Cropping Intensity in Padang Mahondang Scheme (2,631 ha)

Cropped Area	Irrigated Paddy	Rainfed Paddy	Palawija	Total	C.I
Wet Season	350 ha	810 ha	53 ha	1,213 ha	46%
Dry Season	163 ha	-	62 ha	225 ha	9%
Annual	513 ha	810 ha	115 ha	1,438 ha	55%

Note: C.I: Cropping intensity to 2,631 ha

As shown in the tables, the overall cropped area and cropping intensity of paddy in the Scheme is respectively estimated as low as: wet season 1,160 ha, dry season 163 ha, annual 1,323 ha and wet season 44%, dry season 6%, annual 50%. The irrigation performance in the irrigated fields expressed by cropping intensity is 131% in total; paddy 123% and palawija 9%. The annual cropped area of palawija is around 115 ha and the cropping intensity total is 4%. The overall cropping intensity in the Scheme stands at 55%.

1.4.5 Crop Yield and Production

The present yield levels of paddy and palawija in the Scheme are estimated on the bases of the findings of the Phase I Study (estimation of irrigated paddy yield), the field observation and information provided by PPLs deployed in the Scheme and representatives of farmers organizations as follows;

Current Crop Yields in Padang Mahondang Scheme

Crops	Wet Season	Dry Season
Irrigated Paddy	4.0 t/ha	4.0 t/ha
Rainfed Paddy *1	2.5 t/ha	-
Rainfed Paddy	2.0 t/ha	-
Palawija (maize composite)	3.0 t/ha	3.0 t/ha

Note *1: Paddy in irrigated fields grown under rainfed conditions

On the bases of the estimated yields and the cropped areas, the crop productions at present are estimated as shown in Table B-1.4.1 and summarized below.

Present Crop Production in Padang Mahondang Scheme

Crops	Wet Season	Dry Season	Annual
Paddy	3,207 t	652 t	3,859 t
Palawija (maize composite)	159 t	186 t	345 t

1.4.6 Farming Practices and Crop Budget

The current prevailing farming practices for paddy are as shown in Table B-1.4.3 and summarized below.

Farming Practices

Variety	Improved variety: IR 64 & Ciherang (115 days)
Nursery	Seeding rate: 30 kg/ha; period 20 ~ 25 days
Land Preparation	By machinery (hand tractor)
Planting	Manual transplanting (regular/random)
Fertilization	NPK applied (irrigated field); volume depending
Harvesting	Manual; threshing by power/pedal thresher

Current crop budgets of major crops (irrigated & rainfed paddy and palawija) in the Scheme are studied based on the data collected through the Inventory Survey and crop budget analyses made by the District Agriculture Services Office, Asahan as shown in Table B-1.4.3 and summarized in the following table.

Financial Net Return per Ha

Commodity	Yield (t/ha)	Gross Return (Rp.000)	Production Cost (Rp.000)	Net Return (Rp.000)
Irrigated Paddy *1	4.0	5,200	2,170	3,030
Rainfed Paddy *2	2.5	3,250	1,500	1,750
Rainfed Paddy *3	2.0	2,600	1,390	1,210
Maize (composite)	3.0	3,300	1,050	2,250

Note *1: Wet & dry season paddy
*2: Paddy grown under rainfed condition in irrigation command area
*3: Paddy grown in rainfed paddy field

1.4.7 Marketing

The prevailing marketing practices of paddy in the Scheme is "selling paddy just after harvest at field" followed by "selling paddy after drying". The prevailing marketing channel of paddy is "selling paddy to collector/middleman" followed by "selling paddy to rice mill". The marketing practice of palawija is "selling to collector/ middleman" followed by "selling at local market".

1.4.8 Farm Economy

The primary objective of the farm economic analysis under the present Study is to examine capacity-to-pay or possible contribution of O&M costs by beneficiary farmers after the project. Further, the limited accessibility to reliable sources on farm household income and expenditures prevent examining farm economic conditions. Accordingly, the present farm economic analysis has been made on 1 ha of irrigated paddy field or rainfed paddy field by estimating net farm income from the field. The results of the farm economic analyses thus made are presented as follows:

Estimated Net Farm Income from 1 ha of Paddy Field

Land Use Category	Net Farm Income (Rp. 000)	Cropping Pattern Assumed
Irrigated Paddy Field	4,840	Paddy (1ha) - paddy (0.47ha)/palawija (0.17ha)
Rainfed Paddy Field *1	1,750	Paddy (1ha) - fallow
Rainfed Paddy Field	1,320	Paddy (0.89ha) - palawija (0.11ha)

Note *1: Paddy field in irrigation command area, but being under rainfed condition

1.4.9 Agricultural Support Institutions, Farmers' Organizations and Extension

(1) Agricultural Support Institutions and Farmer Organizations

The main governmental agricultural support institutions providing technical and institutional support in and around the Scheme include the Rural Extension Services Center (BPP), District Agriculture Services Office, District Food Security & Agriculture Extension Office, seed farm and the Seed Supervision & Certification Branch Office at district level as shown in Table B-1.4.1. The organizational set-ups of the District Offices are illustrated in Figure B-1.4.1. The district institutions are placed under the jurisdiction of the district governor, although the technical guidance and support linkages with the central and provincial agencies are still maintained. BPPs and Field Extension Workers (PPLs) are placed under the District Food Security & Agriculture Extension Office of Asahan District Government.

A number of farmers' organizations involved in agricultural activities are formed in the project sub-district and *desas*. Among these, the major ones are the Farmers' Group (*Kelompok Tani*/KT) and Water Users' Association (P3A). The number of KTs formed in the project sub-district and their development status assessed by district agricultural agencies are shown in Table B-1.4.1. In the project sub-district, 48 KTs with a total membership of about 1,950 have been formed. Of 48 KT, 13% are classified as primary level (*pemula*), 52% as secondary level (*lanjut*), 33% are middle level (*madya*) and 2% is advance level (*maju*).

There are 2 KUDs, 2 KOPTAN, 1 UPJA and 1 BRI Village Unit in the project sub-district, though the KUDs has no activity at present. General problems encountered by KUD are reported to be: i) cooperative funds still limited, ii) management capability still poor and iii) awareness of members on cooperative activities, member's rights & responsibilities and cooperative principles are still limited.

(2) Agricultural Extension

One of the main features of the decentralization policy in the agriculture sector is the devolution of agricultural extension activities to the district government.

Therefore, the functions of the provincial extension agencies have faded away and their current main functions are to provide technical guidance and support to district agencies. The arrangements for institutions for the agricultural extension services are not uniform among districts.

The extension services to farmers in Indonesia are basically provided by PPLs of district agricultural agencies, who are to guide and serve farmers through farmers' groups in their working area. PPLs are deployed by sub-district basis to BPPs.

The number of PPLs assigned to BPP in the project sub-district is 5 of which 2 PPLs are deployed in and around the Scheme. However, the BPP office in the sub-district has not been established and activities of PPLs are constrained, as well, due to limitations of transportation, extension materials & equipment and operation funds. The weaknesses or problems involved in the current extension services are:

- Limitation of funds for implementation of extension activities, insufficient number of extension staff and; limited capabilities of extension staffs especially on post-harvest and marketing issues, and
- Coordination & collaboration of extension agencies and agriculture services offices yet to be established to introduce holistic approaches for extension.

1.4.10 Agricultural Facilities and Machinery

The numbers of agricultural facilities and machinery including rice mills, tractors, water pumps, threshers, paddy dryers etc. possessed in the project sub-district are shown in Table B-1.4.1. There will be a shortage in the availability of hand tractors when land preparation works of all the paddy fields in the Scheme are to be carried out by machinery, which will result in prolonging the planting season of paddy in the area. The capacity of rice mills in and around the Scheme is sufficient to meet milling requirements in the areas as such requirement is mostly for family consumption and most of the paddy is marketed without husking.

1.4.11 Agricultural Development Constraints

The major agricultural development constraints identified in the Scheme include;

- Shortage of irrigation water supply both in wet and dry season,
- Poor land drainability, especially in rainfed paddy fields,
- Existence of a large extent of long unused fallow lands ,
- Land use conversion to oil palm and decrease of food crop farmers; may have resulted in labor shortages and lands that have long laid fallow,
- Recommended farming practices not yet fully adopted due to various reasons,

- Rat infestation, especially in rainfed paddy fields located close to fallow lands,
- Limited activities of KTs and other farmer organizations,
- Insufficient extension services; lack of facilities and equipment (BPP), insufficient capability of extension staff especially in post-harvest & marketing aspects, limitation of operational funds & transportation and limited coverage of extension services and activities of PPLs, and
- Low intensity of farm roads.

1.5 Institution

(1) District Government Authorities

The Asahan District Government, under the control of Regent (*Bupati*), is composed of one secretariat, 24 internal units and 17 external units, having 10,372 civil servants as a whole. These civil servants consist of one first rank officer, 10 second rank, 87 third rank and 329 fourth rank officers as management staff and 9,945 rank-and-file staff. The educational background of civil servants is that the majority (55%) has graduated from senior secondary school followed by diploma graduates (22%) and university graduates (11%).

Revenue and expenditure condition of Asahan District Government for the last three years from 2000 to 2002 is as summarized below.

Revenue and Expenditure

Fiscal Year	Revenue (Million Rp.)	Expenditure (Million Rp.)
2000	119,214	149,189
2001	275,103	307,505
2002	329,108	329,285

Development expenditure as one component of the above expenditure was Rp.52,082 million in 2000, Rp.96,744 million in 2001 and Rp.98,310 million in 2002. The genuine revenues of Asahan District Government amounted to Rp.14,300 million in 2002. Actual receipts and expenditures of Asahan District Government in 1999/00 and 2000 are shown in Table B-1.5.1.

(2) Water Resources and Irrigation Sector Authority

In Asahan District, water resources and irrigation sector administration is under the jurisdiction of the Settlement and Regional Infrastructure Services (*Dinas*

KIMPRASWIL). This organization is composed of five Sub-Services, one Division and five branch offices as shown in Figure B-1.5.1.

In Water Resources Sub-Services (*Sub Dinas*), there are four sections and one bureau to handle administration activities with 75 staff in total. This Sub-Services unit is responsible for management of 22 public irrigation schemes including the Padang Mahondang irrigation scheme. Among 22 irrigation schemes, there are nine technical irrigation schemes commanding 13,627 ha, 12 semi-technical irrigation schemes covering 11,991 ha and 1simple irrigation scheme of 3,231 ha. Budget utilized by water resources and irrigation sector amounted to Rp.988 million in 1999/00 and Rp.428 million in 2000. The share in the development expenditure is 3.9% in 1999/00 and 1.7% in 2000.

The Asahan Water Resources Sub-Services office is closely coordinated with Bah Bolon – Asahan Water Resources and River Basin Management Unit (*Balai* PSDA/UPT) which is a branch office of PWRS North Sumatra covering Simalungun and Asahan Districts as well as Pematang Siantar and Tanjung Balai Municipalities, especially concerning water resources development planning aspect. In accordance with the framework of water resources development policy as shown in Figure B-1.5.2, any proposal of water resources sector development from Asahan District Government is to be reviewed by *Balai* PSDA/UPT Bolon – Asahan. Based on review result, recommendations for implementation are to be fed back to the district government.

(3) Water Users' Association

For Padang Mahondang irrigation scheme, provincial and district governments set up the target to establish two WUA in the registered area of 3,231 ha. One of the target WUA was established in May 1993 and approved by *Bupati* in June 1993. Since then, however, its performance has been dormant due to non-functional irrigation system so that there remain only 26 members at present in WUA Padang Mahondang. Of course no representative and board member of director is available. The monitoring and evaluation record on WUA performance made by *Balai* PSDA/UPT Bolon – Asahan reveals that WUA Padang Mahondang is recognized as "Not yet developed".

The followings are major items pointed out by face-to-face interview respondents consisting of eight WUA member farmers and two non-members based on the rapid rural appraisal method:

- This scheme was initially developed on the facility-oriented basis without paying any attention to beneficiary farmer's needs resulting in that very limited number of farmers were interested in irrigation water since the

beginning;

- WUA was also established according to top-down direction;
- No irrigation water is distributed for the dry season cropping because irrigation system does not function totally from intake to tertiary block;
- During the wet season, irrigation water supply is not a critical issue as paddy can grow depending on rainfall;
- Even though WUA membership fee is stipulated at 25 kg of dry paddy per 1 ha for one crop season in the article of WUA, nobody wants to follow this rule because no merit can be expected from participation to WUA due to no guarantee of irrigation water supply;
- Operation and maintenance works at the tertiary level are voluntarily carried out by a limited number of farmers in a part of the irrigation area; and
- To reactivate WUA and encourage non-member farmers to participate in or establish WUA, function recovery of irrigation system is prerequisite in this area and further betterment of drainage condition is preferable.

(4) Federation of WUA

In response to administrative instruction by Ministry of Home Affairs, *Bupati* of Asahan District Government has promoted to organize the existing WUA into a federation in the respective irrigation schemes. In the service area of *Balai* PSDA/UPT Bolon -Asahan, a total of 13 WUA Federation (FWUA) was established and approved by *Bupati* as of January 2001. Although this promotion backed up by the World Bank is in line with PKPI based on Government Regulation No.77/2001 on Irrigation, action actually taken is obviously depending on top-down system. Therefore, the article of FWUA is signed by the chief of village (*Kupara Desa*), not the representative of member WUA. In some cases, no consultation was obtained from representatives of member WUA.

CHAPTER 2 BASIC CONDITIONS IN FORMULATING REHABILITATION PLAN

2.1 Irrigation

2.1.1 Rehabilitation Plan for Irrigation Facilities

(1) Purposes of Rehabilitation

The rehabilitation plan will be based on the field investigation results and the discussions made with the officials of the provincial government concerned and the project management office as follows:

1) To provide an intake structure to draw stable irrigation water throughout the year,
2) To prevent inflow of sediment into the canal from the river,
3) To improve and introduce a technical irrigation network system,
4) To extend the irrigation command area with irrigation facilities,
5) To design diversion/turnout structures by providing water measurement devices for the introduction of an appropriate water management technology,
6) To provide such infrastructures as inspection roads and farm roads for O/M of irrigation facilities and future mechanized farming, and
7) To provide project facilities such as a site operation houses ($50m^2$), vehicles, motor cycles, and office equipment for the project office.

(2) Criteria applied for Facilities Design

Design of facilities to be rehabilitated is based on the "Irrigation Design Standards" (from KP-01 to 13) prepared by the Ministry of Settlement and Regional Infrastructure (former Ministry of Public Works) in December 1986. In evaluating rehabilitation of irrigation facilities, the "Technical Guideline for Rehabilitation and Upgrading, Irrigation Networks" prepared in August 1999 is basically applied.

2.1.2 Assessment of Inventory Survey Results

(1) Number of Facilities

According to the survey results, there are 1 free intake (diversion weir) and 4 irrigation canals with a total length of 14 km, consisting of 1 main canal and 3 secondary canals. The number of related structures on the irrigation canals is 25 in total, consisting of 8 on the main canal and 17 on the secondary canals. The inspection roads are partially provided; however, they are almost un-trafficable along both the main and secondary canals.

Features of Irrigation Facilities

Facility	Number	Length (km)	No. of Structures
Intake	1	Free intake from Asahan River	1
Main Canal	1	3.575	8
Secondary Canal	3	9.225	17

The main and secondary canals are unlined. The structures on the irrigation canals are made of stone masonry except bridges that are of concrete construction.

(2) Structural Conditions of Facilities

On the basis of the results of the investigation, the conditions of the structures have been assessed and classified, by the state of rehabilitation into the following four categories:

A: Functioning well, no rehabilitation is needed.
B: Partially damaged/deteriorated, minor rehabilitation is needed.
C: Not functioning well, large scale rehabilitation is needed.
D: Seriously damaged, replacement or reconstruction is needed.

As a result of evaluation, conditions of all the structures are classified into category D, because of poor construction and/or deteriorated due to no operation for a long time since the end of the 1990s.

(3) Irrigation and Drainage Condition

The land use condition in the project areas, based on rough surveys and interviews with the *Balai* and farmers are as follows:

(a) Soil conditions at eastern lower part are found to be unsuitable for paddy cultivation, and
(b) Lower part land less than El. 5 m is swampy, poorly drained and inundating during the rainy season.

(4) Maximum Irrigable Area

Based on the existing irrigation map prepared by the *Balai* PSDA/UPT Bolon -Asahan and the discussions with PWRS and the *Balai* regarding the area for irrigation, the maximum irrigable area is determined to be 2,631 ha in case that the water source availability is sufficient. Through the water balance study mentioned in Chapter 3, the irrigable area of 2,631 ha is verified and determined as the subject area.

2.2 Agriculture

The basic concepts applied for the formulation of the agriculture plans for the present Study are as enumerated below.

1) Formulation of agriculture plans placing emphasis on paddy production envisaging contribution to the food security in Indonesia and to introduce a double cropping of paddy as a basic cropping pattern to the greatest possible extent; to which the general consensus of the beneficiaries in the current irrigated fields have been obtained at the public consultation meetings of preliminary nature held during the Phase II Study,
2) Tree crop planted land is excluded from the target area of the present rehabilitation plan (Farmers intension to be assessed in detail in further studies to follow),
3) Irrigation agriculture performances and experiences in the advanced schemes among the target schemes of the Phase I Study in the province are to be fully taken into consideration in the formulation of the agricultural plan,
4) The plan envisages improvement of crop productivity and realization of increase of cropping intensity through the efficient use of irrigation water,
5) The current agricultural status, including crop selection, cropping schedule, cropping pattern and cropping intensity in the Scheme and also the past records shown in Table B-1.4.2 should be dully assessed and taken into planning so that the formulated plans will be sustainable for beneficiaries intentions and capabilities, and
6) Major constraints for the attainment of the agriculture development targets are to be dully addressed to the greatest possible extent in the agriculture extension services strengthening.

2.3 Institutional Strengthening Concept and Target

The current situation of WUA's performance in the scheme can be described as "Not developed yet". The main reason is the existing physical condition of the irrigation system under which no sustainable irrigation water supply can be guaranteed to farmers according to their requirements. Therefore, full recovery of the irrigation system's function is a precondition to encourage farmers to activate the existing WUA as well as to accelerate establishment of new WUA and participate in these new WUA in non-WUA tertiary blocks. In this regard, the basic concept for promoting WUA establishment in Padang Mahondang irrigation area is to raise farmers' awareness to the necessity of WUA establishment as well as the role, function and activities of WUA in parallel with implementation of irrigation system rehabilitation works.

Another concept for institutional strengthening is to enable officials of the Asahan District Government to understand and practice the new irrigation management policy and also to improve the capacity of organization units involved in the irrigation management and those staff capabilities in line with the new irrigation management policy.

The target of institutional strengthening is to establish WUA in the service area of each tertiary system of the scheme when its function is fully recovered.

CHAPTER 3 DEVELOPMENT PLAN

3.1 Determination of Irrigation Area

(1) Data and Information used for the Formulation of the Rehabilitation Plan

Data and information used for the formulation of the rehabilitation plan are as follows:

1) General topographic map
   National Geographic Bureau (Scale: 1/50,000, 1981)
   Peta Luasan Daerah Irrigashi Dan Rawa Caban Dinas P.U. Pengairan Asahan (Scale: 1/250,000)
2) Meteorological and hydrological data
   Meteorological records at the Medan meteorological station
   Discharge record of the Asahan River at the Pulau Raja site
3) Design references
   Master Plan Study on Lower Asahan River Basin Development (JICA, 1990)
   Design Report on Lower Asahan River Flood Control Project (DGWRD, 1990)
   Inventory Survey Report of the Existing Facilities (JICA Team, 2003)

(2) Project Area

The registered area of the scheme is 3,231ha. The target area had been almost entirely developed as paddy field in the past, except for oil palm planted land. The area of oil palm land is estimated at approximately 600 ha. Taking into account the said conditions, the target area for the present development plan is determined to be 2,631 ha by excluding oil palm planted land from the project area as stated in Chapter 2 and as shown below.

Project Area

Registration Area	3,231 ha
Tree Crop Land (oil palm)	600 ha
Project Area	2,631 ha

(3) Assessment of Water Demands in the Field

The irrigation water requirements have been estimated based on a planning guideline prepared by MOSRI. Consumptive use of water has been estimated on the basis of the modified Penman method proposed by FAO. A percolation rate of 2

mm/day is applied. The water requirement of land preparation for paddy is assumed to be 250 mm. The overall irrigation efficiency is assumed to be 60%.

On the conditions and assumptions stated in (2) and above, the unit diversion irrigation water requirement for paddy is estimated at 1.16 liters/sec/ha (in May and November), and details are shown in Table B-3.1.1 to B-3.1.3.

(4) Confirmation of Available Water from the Asahan River

Based on the calculation results stated above, the intake discharge is estimated at Q = 3.157 m^3/s for the maximum irrigation area of 2,631 ha. The average runoff of the Asahan River is 112 m^3/s, and probable runoff expected 4 out of 5 years is estimated at 70 m^3/s, water demand for the project area will be satisfied by the river runoff.

3.2 Proposed Project Works

3.2.1 Conditions of Existing Facilities

(1) Free Intake

The existing free intake is not functioning and hence it is completely out of service due to the following conditions/reasons:

(a) The river water level of the Asahan River during the dry season is lower than the required intake water level and no irrigation water can be drawn off the river.
(b) Due to the large fluctuation in river water level and lack of facilities such as trash racks, and poor design of location of the intake, the approach channel of intake has been closed with sand and debris.
(c) Due to poor maintenance of the approach channel of the intake, large quantities of sediments have been piled and hence the water inflow to the intake has been stopped.

(2) Irrigation Canal and Related Structures

Existing irrigation canal is unlined earth canal 1-2 m wide. Due to poor maintenance, many sediments and trees/grasses are found inside of the canal. As a result, canal flow is blocked off. In addition, collapse of canal slopes are found along the entire length. Related structures, such as division structure, off-take structure, drainage culvert, and bridge have been damaged or are out of order.

(3) Inspection Road

Conditions of inspection roads and other related facilities are very poor and almost impassable through the year.

(4) Possibility of Rehabilitation of Existing Facilities

As the existing conditions of the irrigation facilities could be described as almost out of order as stated above, large-scale rehabilitation or replacement will be required. The design capacity of existing structures is determined to be sufficient to irrigate 700 to 1,000 ha. Therefore, the rehabilitation and/or upgrading of the existing facilities seem to be hardly possible. Therefore, it is proposed to newly design the system with a development area of 2,631 ha as shown in DRAWINGS attached at the end of this report.

Prior to the design of irrigation facilities, the following considerations are made:

(a) Location of intake should be relocated upstream from the existing site.
(b) Type of diversion structure shall be of free intake type and diversion weir type (fixed or barrage type) shall not be considered because of high construction costs and the effect of back water on the upstream.
(c) Several countermeasures for the prevention of sediment inflow to the intake and stable intake water throughout the year should be considered for the selection of the intake site and the design purpose.
(d) Canals and related structures are to be designed for irrigation with an area of 2,631 ha.
(e) Technical level of facilities is to be raised to technical irrigation. (Existing grade is semi-technical or simple level)
(f) Drainage canals in the northeastern area should be provided with an appropriate capacity.

3.2.2 Irrigation Diagram

Prior to the design of irrigation facilities, the irrigation diagram was prepared for the irrigation command area of 2,631 ha. The proposed irrigation diagram is shown in DRAWINGS attached at the end of this report.

3.2.3 Design of Irrigation Facilities

(1) Diversion Structure

To determine the type of diversion structure, the following countermeasures are considered, taking into account the conditions of the existing structure:

(a) To prevent inflow of bed load from the river
(b) To keep water intake stable throughout the year
(c) Required intake level at intake site is set at El. 13.0 m

The site selection is based on the available topographic map and the profile of the Asahan River that was prepared in 1990 during the detail design of the Asahan

flood control project. The bottom elevation of the existing free intake is to be set at El. 11.50 m as a result of the survey by the JICA Team.

The gradient of the Asahan River is estimated at 1/3,000 and the river bed elevation at the existing intake point is about El. 9 m. It seems to be very difficult to draw water off the river without intake of much bed level and the river bed elevation is only 2.5 m.

To avoid such design failure, the following design considerations are made:

(a) To select the location of the proposed intake for drawing water off the river during low level period, the river bed elevation is to be El. 10 m, which is situated about 3 km upstream from the existing intake.
(b) To avoid inflow of bed load directly into the canal, a sand trap pond is to be provided in front of the intake gate. A gap of 1 m between the sand trap pond and the intake bed level is required.
(c) To avoid inflow of bed load during medium to high water level, the width of the intake should be as great as possible.
(d) In addition to the above design considerations, a settling basin after the intake is considered.

Drawing of intake is shown in DRAWINGS attached at the end of this report.

(2) Irrigation Canal and Related Structures

Based on the proposed irrigation network, design of irrigation canals and related structures are made. Summary of canal and related structure are as follows.

Summary of Irrigation Canal and Related Structures (New construction)

Canal	Number	Length (km)	Related Structure (nos.)
Main	1	9.0	12
Secondary	4	13.0	Not designed

The list of irrigation canals and the related structures on the main canal are shown in Table B-3.2.1 and the hydraulic dimension of the main canal is shown in Table B-3.2.2.

Reference drawings of intake and canals are shown in DRAWINGS attached at end of this report.

(3) Drainage Canals and Facilities

Design of drainage canals and facilities has been made at a preliminary level and applied to the cost estimate.

(4) Work Quantities

The work quantities have been calculated based on the development plan. Work quantities for each structural item have been calculated as shown in Table B-3.2.3. Regarding the calculation of work quantities of the secondary canals, estimate of work quantities has been made in proportion to the area of the secondary system.

3.3 Agriculture

3.3.1 Land Use Plan

In the agricultural land use plan, the conversion of the current rainfed fields into irrigated fields and the development of the entire project area into irrigated paddy fields (2,440 ha) are planned as shown in Table B-3.3.1 and as follows;

Land Use Plan

Land Use Category	Present (ha)	With Project (ha)	Increment (ha)
Irrigated Paddy Field	724	2,440	1,716
Rainfed Paddy Field	1,907	-	- 1,907
- Currently Used	*436*	-	*- 436*
- Long Fallow Land	*1,471*	-	*- 1,471*
Right-of-ways *1	-	191	191
Project Area	2,631	2,631	0

Note *1: Right-of-ways assumed to be 10% of rainfed paddy field

3.3.2 Planned Cropping Pattern and Schedule

Under the present Study, the selection of crops to be introduced in the planned cropping pattern in the Scheme has been made basically observing the currently prevailing cropping pattern and cropped area in the area and the past records on the same, which represents farmers intention and capabilities to a certain extent. Based on such approach, the crop selection has been made as follows:

(a) Paddy has been selected as a main crop in the planned cropping pattern as stated in the development concepts (Chapter 2) and as farmers' preferences for a crop and the volume of market demands. However, the introduction of double cropping of paddy is limited to 50% on the basis of the past cropping records in the Scheme and considering the availability of labor force[3].

(b) Maize is selected as a representative palawija to be introduced in the planned cropping pattern since it is the most common palawija currently cropped in and around the Scheme. Further, from the demand/supply

[3] Sufficient number of labor forces are available in the project *desas*, but part of them are worked as estate labor. Possibility to count them as labor forces for irrigation farming in the Scheme is to be confirmed.

condition and profitability of crops, hybrid maize appears to be the most promising crop among palawija. Similarly, maize is the most promising palawija in terms of national economy. The palawija area has been set at 10% of the paddy field in the dry season.

The planned cropping pattern and schedule have been formulated on the basis of: i) current cropping pattern & schedule in the Scheme and ii) recommended cropping schedules of the District Agriculture Office, iii) climatic conditions and iv) water balance study as shown in Figure B-3.3.1 and summarized below.

Planned Cropping Pattern & Schedule

Season	Pattern (Crop & Intensity)	Schedule
Wet Season	Paddy (100%)	Mid. Oct. - end Nov. ~ early Jan. - early Mar.
Dry Season	Paddy (50%)	Beg. May - mid. June ~ early Aug. - Mid. Sep.
	Palawija (maize; 10%)	Mid. Jan. - end Jan. ~ mid Apr. - end Apr.
Annual	Paddy - Paddy/Palawija (160%)	

3.3.3 Planned Cropped Area and Cropping Intensity

In accordance with the planned cropping pattern and the selected crops discussed earlier, the target cropped areas and cropping intensities in the scheme under the present Study are planned as shown in Table B-3.3.1 and summarized below.

Planned Cropped Area & Cropping Intensity (%)

Crop	Wet Season		Dry Season		Annual	
	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
Paddy	2,440	100	1,220	50	3,660	150
Palawija (maize)	-	-	244	10	244	10
Total	2,440	100	1,464	160	3,904	160

The increase of annual cropped area of some 2,300 ha of paddy and about 130 ha of palawija from the present level is planned under the Study as shown in Table B-3.3.1. Further, the increase of paddy cropping intensity of 100%, the same of palawija cropping intensity of 6% and the same of overall intensity of 105% is envisaged.

3.3.4 Target Crop Yields and Crop Production Plan

Target yields of paddy and palawija are estimated based on yield levels attained by the existing farmers in the Scheme, yield levels in advanced irrigation schemes in Asahan District and information on potential yield levels provided by PPLs and also considering the poorly drained land conditions of current rainfed fields as shown in Table B-3.3.1 and summarized below.

Target Yields under the Study

Cropping Season/Crops	Present Yield	Target Yield	Increase
In Current Irrigated Field - Wet Season Irrigated Paddy	4.0 t/ha	5.0 t/ha	1.0 t/ha
- Dry Season Irrigated Paddy	4.0 t/ha	5.0 t/ha	1.0 t/ha
In Current Rainfed Field - Wet Season Paddy	2.0 - 2.5 t/ha	4.0 t/ha	1.5 - 2.0 t/ha
- Dry Season Paddy	-	4.5 t/ha	-
Palawija (maize) *1	3.0 t/ha	5.0 t/ha	2.0 t/ha

Note *1: Target yield --- hybrid maize; Present yield --- composite maize

The target yield of 5.0 t/ha is an increase of 1.0 t/ha from the present yield level of 4.0 t/ha in irrigated fields. The target yield of 4.0 & 4.5 t/ha is an increase of 1.5 to 2.5 t/ha from the present yield of 2.0 to 2.5 t/ha in rainfed fields as shown in Table B-3.3.1.

On the basis of the target crops yields and the planned cropping pattern, the with-project crop productions are estimated as shown in Table B-3.3.1 and summarized in the following table.

Planned Crop Production

Crop	Present (ton)	With Project (ton)	Increment (ton)
Paddy	3,859	16,088	12,229
Palawija	345	1,220	875

As shown in the table, the production increase of some 12,200 tons of paddy and 900 tons of palwija (maize) are estimated under the with-project condition.

3.3.5 Crop Budgets

The planned crop budgets estimated for irrigated paddy and palawija (maize hybrid) are estimated as shown in Table B-3.3.2 and summarized below.

Planned Crop Budget per Ha

Crops	Crop Season	Yield (t/ha)	Gross Return (Rp. 000)	Production Cost (Rp. 000)	Net Return (Rp. 000)
Irrigated Paddy	Wet/Dry	5.0	6,500	2,490	4,010
Irrigated Paddy *1	Wet	4.0	5,200	2,170	3,030
	Dry	4.5	5,850	2,410	3,440
Maize (hybrid)	Dry	5.0	5,500	2,240	3,260

Note *1: Newly irrigated field under the project

3.3.6 Farm Economy

The farm economic analyses under the present Study have been made to examine capacity-to-pay or possible contribution of O&M costs by beneficiary farmers after

the project and was based on 1 ha of irrigated paddy field or rainfed paddy field by estimating net farm income from the fields as discussed earlier in Section 1.4.8.

The results of the farm economic analyses thus made are summarized below:

Estimated Net Farm Income from 1ha of Field

Land Use Category	Net Farm Income (Rp. 000)			Cropping Pattern Assumed
	Present	With Project	Increment	
Irrigated Paddy Field	4,840	6,340	1,500	Paddy (1ha) - paddy (0.5ha) /palawija (0.1ha)
Irrigated Paddy *1	1,750	5,080	3,330	
Irrigated Paddy *2	1,320	5,080	3,760	

Note *1: Paddy field in current irrigation command area being under rainfed condition
*2: Newly irrigated field from rainfed field

3.3.7 Agriculture Extension Services Strengthening Plan

(1) Constraints for Development

Major constraints for the attainment of the set agriculture development targets, which are to be duly addressed to the greatest possible extent in the agriculture extension services strengthening (AESS) under the present plan, include;

1) Farmers' Groups (KTs) yet to be empowered to a great extent, especially toward the introduction of agri-business oriented farming activities in collaboration with group members and groups (Constraints 1),
2) Insufficient extension services; insufficient capabilities of agriculture services & extension staff, especially in post-harvest & marketing aspects, lack of facilities and equipment (BPP), limitation of operational funds & transportation and limited coverage of extension services and activities of PPLs (Constraints 2),
3) Farmers in newly irrigated fields have no or limited experiences in irrigated paddy cultivation; intensive technical guidance and support for these target groups are essential in the fields of irrigated paddy production, tertiary level and on-farm water management (Constraints 3),
4) Technical development on irrigated paddy production in areas currently under poorly drained conditions, especially in long fallow land (Constraints 4),
5) Addressing the shortage of hand tractors for land preparation is slated under the with-project condition; strengthening of UPJA is essential from the initial stage of the rehabilitation plan in order to attain the expected project benefits from an early stage of the development (Constraints 5),
6) Participatory approaches for development yet to be introduced; to these constraints a mass guidance or campaign, workshop and farmer/farmers' groups training or empowerment will be essential (Constraints 6), and

7) Other constraints include: i) serious rat infestation in rainfed areas, ii) recommended farming practices not yet adopted and iii) poor or no irrigation water management due to limitation of water supply; all to be addressed through the ordinal extension services activities.

(2) Agriculture Extension Services Strengthening (AESS)

The extension services strengthening programs formulated to meet the requirements discussed in the section above are presented in Table B-3.3.3 and summarized as follows;

Institutional Strengthening Package Program (Constraint 2)

- Establishment of Regional & Sub-regional Task Force Team for AESS
- Staff empowerment program (capacity building of regional & sub-regional & extension staffs)
- Strengthening of extension facilities

Farmer Organizations Empowerment Package Program (Constraint 1 & 5)

- Empowerment of KTs toward agri-business oriented groups.
- Empowerment & formation of UPJA

Technical Guidance Package Program (Constraint 3 & 4)

- Technical development, technical demonstrations, farmer/farmers' group training, study tours, field schools etc.

Participation Enhancement Package Program (Constraint 6)

- Workshops, mass guidance & campaigns etc.

Under the present plan, the provision of farm inputs or farm credit has not been accommodated since the requirements for the same could not be estimated and the justification of dual investments of public funds to the target scheme in addition to a heavy investment for rehabilitation works is doubtful.

The implementation of these strengthening programs should be started from the commencement of the construction works and continue for the period of at least 5 years or up to 3 years after the completion of the construction works. The proposed implementation schedules for AESS are shown in Table B-3.3.1 and Table B-3.3.4 in detail. The overall program costs are estimated at Rp. 530 million as shown in Table B-3.3.4.

3.4 Institutional Strengthening Plan

To realize the targets, the institutional strengthening plan for the scheme consists of two programs in the initial stage, i.e. institutional capacity building and staff capability improvement program, and WUA establishment acceleration program. After WUA is established, step-upped programs will be implemented as follow-up

activities of WUA. These are WUA strengthening program, FWUA and MWUA initial setting-up program, on-the-job training program on operation and maintenance of tertiary irrigation systems, and a guidance to set and collect irrigation management fees.

(1) Institutional Capacity Building and Staff Capability Improvement Program

This program contains two components. One is to enable irrigation officials of the Asahan District to understand and practice the new irrigation management policy. The other is to improve the capacity of organizational units of the Asahan District Government involved in irrigation management and those staff capabilities in line with the new irrigation management policy.

The first component will be done through undertaking a series of seminars and workshops to be facilitated by the central government after the legal framework for water resources and irrigation management is completed. Its program formulation and budget arrangement will be also made by the central government.

The second component should reflect the above nationwide dissemination of the new irrigation policy by the central government. This component will be done as follows:

- To evaluate the capacity of district/municipal government authorities and the capability of those staff involved in irrigation management activities;
- To identify needs for improving institutional capacity and staff capability to cope with the new irrigation management policy as well as supporting requirements for fulfillment of such needs through technical assistance by central/provincial government; and
- To formulate implementation programs on institutional capacity building and staff capability improvement for the respective district/municipal government authorities involved in irrigation management.

Regarding budget arrangements for implementing these programs, the main source is the Asahan District Government budget to cover the cost for institutional capacity building and staff capability improvement, while the supplemental source is provincial government budget to cover the cost for implementation of the supporting menus.

In implementing the institutional capacity building and staff capability improvement program, a group of trainers will be organized by inviting well experienced specialists from consultants, NGOs and universities. Monitoring and supervision of the program implementation should be carried out continuously by relevant organizational units at the provincial level throughout the program

implementation stage with periodical reporting on performance and impact of the program implementation.

(2) WUA Establishment Acceleration Program

To accelerate WUA establishment in the respective tertiary block of the scheme in order to ensure participatory irrigation management, the program is to be implemented based on the following steps:

- hold socialization meetings and workshops to invite representatives and members of Farmers' Groups that are available in non-WUA tertiary blocks for the purpose of accelerating WUA establishment and promoting participatory irrigation management;
- confirm farmer's awareness to establish and participate in WUA as well as needs for guidance about procedures and practices of WUA establishment;
- formulate a guidance menu list, and make a package program of guidance menus to accelerate WUA establishment in non-WUA tertiary blocks to which irrigation water is distributed; and
- estimate unit cost of each guidance menu and total cost of the package program.

Budget to implement the package program for WUA establishment acceleration is to be covered by the project financing.

In implementing the WUA establishment acceleration program before starting rehabilitation works, consultants, NGOs and/or universities are to be recruited as facilitators and supporters in the irrigation command area.

(3) WUA Strengthening Program

The WUA Strengthening Program will be conducted based on the following steps:

- hold WUAs' awareness raising workshops to reconfirm weak points elaborated from recapitulating data on the M&E record on WUA's performance;
- identify technical assistant requirements for improving WUA's capacity to manage organization, capability to conduct operation and maintenance of tertiary irrigation systems, and/or activities to set and collect WUA member's fees;
- formulate a technical assistant menu list and make a package program of technical assistance menus according to WUA's needs to improve its capacity, capability and/or activities; and
- estimate unit cost of each technical assistant menu and total cost of the package program.

Budget for implementing the package program for strengthening WUA is to be covered by the project financing.

In implementing the WUA strengthening program before starting rehabilitation works, consultants, NGOs and/or universities are to be recruited as facilitators and implementers in the irrigation scheme area.

(4) FWUA and MWUA Initial Setting-up Program

The FWUA and MWUA initial setting-up program will be conducted based on the following steps:

- imbue the local society with the necessity of setting up representative groups of WUA to cope with the participatory irrigation management policy if FWUA/MWUA has not been established;
- formulate a guidance menu list, and make a package program of guidance menus to support initial setting-up of FWUA/MWUA according to the current situation in the scheme; and
- estimate unit cost of each guidance menu and total cost of the package program.

Budget for implementing the initial setting-up program of FWUA and MWUA is to be covered by the project financing.

In implementing the initial setting-up of the FWUA and MWUA program, consultants, NGOs and/or universities are to be recruited as facilitators and supporters in the irrigation command area.

(5) Training Program on Operation and Maintenance of Tertiary Irrigation Systems

This training program will be done after completing the rehabilitation works of the irrigation systems. For this purpose, however, preparation of training manuals and programs should be done in parallel with the final stage of rehabilitation works. Also the concept of training programs should synchronize the irrigation water allocation plan to tertiary blocks as well as the cropping pattern and planting schedule in the irrigation scheme.

As this training will be done as one of the rehabilitation project components, a consultant under the project manager is to be responsible for preparing training manuals, formulating training programs, estimating training costs and implementing training programs. To ensure effective and efficient implementation of training on operation and maintenance of tertiary irrigation systems, NGOs and other volunteers will be encouraged to become involved in training activities at the

field level in addition to the project staff, District Government officials and the consultant.

Budget arrangements based on the consultant's cost estimate are the responsibility of the project manager.

(6) Guidance Program for Setting and Collection of Irrigation Service Fees

In parallel with preparation of the guidance manuals, the following points will be considered:

- identify issues on book keeping systems, fee determination methods, payment forms, fee collection systems and payment schedules;
- identify issues affecting the fee allocation system to cover administration, operation, maintenance and other miscellaneous costs;
- identify incentives to members;
- formulate a guidance menu list and a package program of guidance menus for setting and collection of irrigation water service fees; and
- estimate unit cost of each guidance menu and total cost of the package program.

Budget arrangements based on the consultant's cost estimate are the responsibility of the project manager.

In formulating and implementing the guidance program for setting and collection of irrigation water service charges, special attention will be paid to recruit a consultant with specific experience matching with the above terms.

(7) Cost Estimate for Institutional Strengthening Plan

The overall cost for the proposed institutional strengthening plan in the above is estimated at Rp. 335 million in total. The breakdown of estimated cost is as follows:

- Rp. 10 million for Institutional capacity building and staff capability improvement program for Water Resources Sub-service of Asahan District *KIMPRASWIL* based on unit cost of Rp. 5 million and 2-time implementation;
- Rp. 50 million for WUA establishment acceleration program targeting beneficiary farmers in non-WUA tertiary blocks based on unit cost of Rp. 20,000/ha and the existing WUA's coverage area of 2,507 ha;
- Rp. 29 million for WUA strengthening program to reactivate the existing WUA Pahang Mahondang based on unit cost of Rp. 40,000/ha and WUA's coverage area of 724 ha;
- Rp. 65 million for FWUA and MWUA initial setting-up program based on

unit cost of Rp. 20,000/ha and the proposed recovery area of 3,231 ha;

- Rp. 116 million for training program on operation and maintenance of tertiary irrigation systems based on unit cost of Rp. 36,000/ha and the proposed recovery area of 3,231 ha; and
- Rp. 65million for guidance program for setting and collection of irrigation service fees based on unit cost of Rp. 20,000/ha and the proposed recovery area of 3,231 ha.

3.5 Environmental Aspects

Environmental assessment is now accepted as key part of development planning and is as important as economic analysis in project evaluation. In this Study, however, such assessment has not yet been conducted, as the objective of the Study is to recover the function of the existing infrastructures. Nonetheless, environmental assessment for the rehabilitation project is no less important than that of a new development project as far as environmental impact exists. In this regard, it is proposed to carry out environmental assessment prior to the implementation of the project on the basis of the following law and regulation:

- Law No.23/1997 concerning environmental management, and
- Government Regulation No.27/1999 concerning environmental impact assessment

CHAPTER 4 COST ESTIMATE

4.1 Conditions of Project Cost Estimate

Project costs for the proposed project works including construction cost for rehabilitation, consulting services fee, administration cost (salary for the office staff and expenditures for office management), and costs for institutional and extension service strengthening are estimated on the basis of the following conditions:

(a) All the civil works of the project will be executed on a contract basis. Contractors will be selected through international competitive bidding.
(b) Physical contingency of each work is assumed to be 20% in due consideration of the Pre-F/S design level.
(c) Price contingency is not counted taking into account the short construction period.
(d) Costs for institutional strengthening and extension service strengthening are assumed to be 2% of the total costs of civil works construction.
(e) Cost for the consulting services is assumed to be 7% of the costs for civil works and works described in (d) above.
(f) Administration cost of the project office is assumed to be 2.5% of the costs for civil works and works described in (d).
(g) Exchange rate used for the estimate is US$1.00 = Yen 118.9 = Rp. 8,279 as of May 2003, and
(h) Currency for cost estimate is expressed in Indonesian Rupiah (Rp.)

4.2 Project Cost

(1) Direct Construction Cost

The direct construction cost is estimated based on the calculated work quantities of the proposed project works and unit prices of the works. The unit prices are based on those for similar works quoted in recent engineer's estimates of the North Sumatra Province such as PTSL-II Project.

The direct construction cost is estimated at Rp. 43,245 Million (equivalent to US$ 1,985 per ha or Rp. 16.4 million, A= 2,631 ha). The breakdown of direct construction costs is shown in Table-B.4.2.1 and summarized as follows:

Summary of Direct Construction Cost

Work Description	Amount (million. Rp.)
I. Intake	4,577
II. Main Canal Works	12,869
III. Secondary Canal Works	12,866
IV. Drainage Works	5,147
V. On-Farm Development	6,216
VI. Project Facilities	1,570
Total	43,245

(2) Other Costs

Other costs are estimated as shown below:

- Costs for institutional and extension service strengthening: Rp. 865x 1,000
- Cost for the consulting services: Rp. 3,087x 1,000
- Administration cost of the project office: Rp. 1,103 x 1,000

(3) Project Costs

Project costs are estimated at Rp. 48.3 billion as shown in the following table:

Breakdown of Project Costs

Work Description	Costs (million Rp.)
I. Civil works	43,245
II. Institutional and extension service strengthening	865
III. Consulting services	3,087
IV. Project administration cost	1,103
Total	48,300

CHAPTER 5 PROJECT IMPLEMENTATION

5.1 General

The implementation of rehabilitation work of the Padang Mahondang Irrigation Scheme is urgently required for the recovery of function of the existing irrigation scheme to cope with progressing deterioration of the facilities. Implementation schedule of the rehabilitation work after the feasibility study is shown in Figure B-5.3.1 and briefed as follows:

(a) Preparation of Implementation Program (I/P) and budget arrangements,
(b) Establishment of project office,
(c) Preparation of detailed design with tender documents including field survey and investigation,
(d) Tender and selection of contractor(s),
(e) Execution of civil construction and taking over of completed irrigation scheme, and
(f) Execution of strengthening program such as institutional and extension services.

5.2 Implementation Schedule

5.2.1 Schedule on Initiation Stage and Construction Works

(1) Establishment of Project Office

The project office so-called "Function Recovery Project Office" is to be established at Dinas PSDA. Organization and staffing are to be restructured and transferred from other divisions. At the same time, "Function Recovery Forum" is also established. (Details are presented in Chapter 7 of Part 1 of this Report)

(2) Preparation of I/P and Budget Arrangements

Preparation of I/P is to be made by the Dinas PSDA for the submission to DGWR for its approval. DGWR has to make arrangement for budget by means of national fund and/or loan from the international lending agencies.

(3) Preparation of Detail Design

Immediately after completion of budget arrangement and office establishment, the detailed design including field survey and field investigation, and preparation of the tender documents are to be followed. Period for the detail design is estimated to be less than 12 months.

(4) Tender and Selection of Contractor(s)

Tender and its schedule are to be as follows:

- Number of contract: 2 contracts
- Tender call to contract signing: 6 months
- Construction period: 2 years

(5) Construction and Taking Over

Immediately after the contract signing, the construction is commenced. The construction management works including supervision work and quality control are to be carried out by the construction section of the project office. The completed scheme of the rehabilitation works is to be inspected, and after verification by the authority, the scheme is taken over by the provincial government for the commencement of operation.

5.2.2 Strengthening Program

The strengthening programs both institutional and extension service program are commenced with following elements and schedule.

(1) Institutional Strengthening Program

Elements of institutional strengthening program are as follows:

(a) Institutional capacity building and staff improvement program,
(b) WUA strengthening program,
(c) FWUA and MWUA initial setting-up program,
(d) WUA establishment acceleration program,
(e) Training for operation and maintenance of tertiary irrigation system program, and
(f) Guidance program for collection and expense of irrigation management fee.

(2) Extension Services Strengthening Program

Elements of extension services strengthening program are as follows:

(a) Formulation of strengthening program,
(b) Formulation of task force team,
(c) Formulation of implementation program, and
(d) Implementation of strengthening program.

(3) Budgeting and Budget Implementation

In discussing the preparation of budget proposals and implementing of budget to be allocated to the function recovery program, special attention has to be paid to the

following key issues related to the modified irrigation management policy in line with the draft of new Law on Water Resources:

(a) Arrangement of irrigation management responsibility between irrigation water suppliers and water users,
(b) Arrangement of irrigation management responsibility among government authorities,
(c) Funding criteria, and
(d) Mechanism of budget arrangement and utilization

Among irrigation management activities, the responsibility of planning and design works for development, rehabilitation and upgrading purposes is arranged to governments at central and provincial level to assure quality of outputs from these works. Regarding implementation of physical works, it can be considered that the budget availability, staff capability and contractor capacity are crucial factors at district/municipal level. Therefore, it can be considered rational that irrigation schemes commanding more than 1,000 ha (Registered area of the Padang Mahodang Irrigation Scheme is 2,905 ha.) are to be handled by provincial governments in a sense of participatory irrigation management.

CHAPTER 6 PROJECT EVALUATION

6.1 General

The economic evaluation of the present Study has been made to assess the financial and economic feasibility of the rehabilitation plan (the project). The approaches or assumptions applied for the project evaluation are as follows;

- Economic evaluation has been made by estimating project benefits between the without-project and the with-project conditions,
- For the project evaluation, economic internal rate of return (EIRR), financial return per ha, economic benefit-cost ratio (B/C) and economic benefit minus cost (B-C) have been examined,
- For the evaluation, project benefits have estimated based on crop production benefits and indirect or intangible benefits have not been counted,
- To assess the economic viability of the project to possible changes in project costs, project benefits and build-up period, a sensitivity analysis has been made,
- For financial evaluation of the project, the capacity to pay of beneficiary farmers have been analyzed,
- Without-project condition has been assumed to be the same as the present condition as the reliable prediction or estimation of the without-project conditions was not possible and impractical,
- The useful life of the Project was taken as 30 years from project implementation,
- Exchange rate of Indonesian Rupiah (Rp.) to US. Dollar (US$) was taken to be Rp. 8,279 equivalent to US$ 1.00 (as of May, 2003), and
- Constant prices at 2003 level were used in the economic evaluation.

6.2 Economic Evaluation

6.2.1 Project Costs

(1) Project Costs

The project costs for economic evaluation would consist of i) construction cost, ii) institutional & extension services strengthening costs, iii) consulting services cost, iv) administration cost, v) O&M costs, and vi) replacement cost. The economic project costs have been calculated from the financial project costs by

applying the standard conversion factor with 0.90. The economic project costs estimated accordingly are shown in Table B-6.2.1.

6.2.2 Project Benefits

(1) Economic Prices of Farm Inputs and Outputs

Economic prices of farm inputs and outputs were estimated in order to evaluate the expected project benefits. Economic prices of trade goods such as rice, maize, soybeans, groundnuts and fertilizers were estimated on the basis of the projected world market prices of these commodities forecast by the World Bank. Non-trade goods were valued at financial prices which were estimated on the basis of current market or farm gate prices. Farm labor was valued at the shadow wage rate of 0.80. The economic prices of farm inputs and outputs applied for the economic evaluation are presented in Table B-6.2.2 and B-6.2.3.

(2) Project Benefits

Only the crop production benefits are assessed as the project benefits as stated earlier. The net project benefits are defined as the difference in net return from crop production between the with-project and the with-out project conditions. The without-project condition has been assumed to be the same as the present condition as stated earlier. The economic crop budgets applied for the estimation of the net return under the project are as presented in Table B-6.2.4 and B-6.2.5. The project benefits expressed as the incremental net production value from crop production are estimated as shown in Table B-6.2.6.

The annual economic project benefits at full development stage (the incremental net production value) have been estimated at Rp. 10.74 billion as shown in Table B-6.2.6 and summarized below.

Economic Project Benefits/Incremental Net Production Value *1

Net Production Value (Rp. million)		
Without Project	With Project	Increment
2,747	13,487	10,740

Note *1: At full development stage

The benefits would gradually increase up to the full benefit in the 5th year after the completion of construction works.

6.2.3 EIRR, B/C and B-C

The annual economic costs and benefits flows and the results of the economic evaluation (EIRR, B/C & B - C) are presented in Table B-6.2.7 and as summarized below.

Results of Economic Analysis

EIRR	B/C	B - C
17.3 %	1.65	Rp. 25.0 billion

B/C & B - C at 10% discount rate

6.2.4 Sensitivity Analysis

To examine the project economic viability to changes in project cost, project benefits and build-up period, the sensitivity analyses have been made on the four cases as follows.

Results of Sensitivity Analysis

Case		EIRR (%)
0. No Changes	-	17.3
1. Change in Project Costs	+ 10 %	15.9
2. Change in Project Benefits	- 10 %	15.6
3. Benefit Delay	1 year delay	15.0
4. 1 + 2 + 3	-	12.5

6.3 Financial Evaluation

The capacities to pay of beneficiary farmers have been assessed based on the farm budget analyses on 1 ha of paddy field under the with and without project condition, which have been made by applying the results of the farm economic analyses made in Section 1.4.8 and 3.3.6, as shown in Table B-6.3.1 and as summarized below:

Results of Farm Budget Analyses on 1 ha of Paddy Field

Land Use Category	Net Reserve on 1 ha of Paddy Field (Capacity to Pay: Rp.000))		
	Without Project	With Project	Increase
Irrigated Paddy Field *1	4,840	5,710	870
Irrigated Paddy *2	1,750	4,060	2,310
Irrigated Paddy *3	1,320	4,060	2,740

Note *1: Farmers in current irrigated field.
*2: Farmers in current irrigation command area being under rainfed condition.
*3: Farmers newly irrigated field from rainfed field.

The capacity to pay of beneficiary farmers will increase from Rp. 1.3-4.8 million to Rp. 4.1-5.7 million or the increase of Rp. 0.9-2.7 million under the future with project condition. The increases would enable the farmers to bear their contributions to O&M cost of irrigation system.

6.4 Indirect Benefits and Socio-economic Impacts

After implementation of the Project, various indirect benefits and socio-economic impacts are expected as mentioned below.

(1) Employment Opportunities

The Project would create a demand for farm labors due to the increased farming activity, more intensive use of land and higher agricultural production. In addition, the construction of the Project would increase employment opportunities in the area. During the construction stage, the majority of workers would be unskilled laborers, and most of whom would come from farmers and ordinary laborers in and around the Project area.

(2) Farmers Income

After implementation of the Project, income of farmers is expected to increase considerably as a direct result of the increase in crop production. Such increase in income would contribute to improving farmers' living standards. Moreover, it is expected that farmers' purchasing power would increase along with improvement of their living standards, and this increased purchasing power would benefit the development of the regional economy.

(3) Marketing of Farm Inputs and Outputs

Future marketing in the project area is likely to expand as compared with the present condition. With anticipated higher agricultural production, more farm products could be marketed by the farmers and the proportion of sales would also increase relative to consumption. The merchants would have a larger turnover which could increase their incomes.

Marketing functions would not only be influenced by agricultural outputs. It is estimated that when agricultural production develops as a result of the Project, the Project area would be a good market for farm supplies. The farmers need to operate with farm supplies such as tools, equipment and bags. Both ends of marketing channels could, therefore, expect substantial beneficial impacts from the Project.

(4) Food Supply

The incremental production of paddy of some 12,200 tons under the with project condition will directly contribute to the supply-demand balance of rice and the food security in Indonesia.

(5) Other Effects

Implementation of the Project would certainly lead to changes in rural socio-economy in the area. By the construction of inspection roads along the canals, the local transportation system would also be improved, which will contribute to the improvement of rural socio-economic activities.

Tables

Table B-1.1.1 Climate and Hydrological Conditions

1. Monthly rainfall at Malau Estate (mm)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
149	113	131	141	121	217	186	119	321	285	218	264	2,264

Source: Irrigation office, Asahan

2. Preliminary estimated monthly river flow data (m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
118.6	102.2	116.5	136.4	128.0	97.8	94.1	88.8	102.6	122.7	137.8	107.0	112.7

Note: Water level record at upstream of Kalaena weir were preliminary converted to discharge by the JICA Study Team

3. Estimated monthly dependable flow (m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
70.1	61.9	69.7	79.5	50.8	55.9	47.7	69.0	75.4	89.6	104.0	82.5	71.3

Table B-1.4.1 Basic Agriculture Conditions of Padang Mahondang Scheme

1. Agro-demographic Features of Project Sub-district & Desas

1.1 Agro-demographic Features in Rural Areas

Agro-demographic Indicators	Project Sub-district	Project Desa (P. Mahondang)	Asahan District
Proportion of Farm Households to Total Households	51 %	93 %	65 %
Proportion of Farm Households Having Activity in:			
- Food Crops Farming	31 %	56 %	76 %
- Horticulture Crops Farming	5 %	11 %	8 %
- Estate Crops Production	74 %	73 %	18 %
- Working as Farm Labor	96 %	16 %	47 %

1.2 Land Holding & Tenure in Rural Areas

Indicators	Project Sub-district	Project Desa (P. Mahondang)	Asahan District
Average Farm Land Holding Size/Farm Household	1.48 ha	2.47 ha	0.83 ha
Average Holding Size of Paddy Field/Farm Household	0.33 ha	1.22 ha	0.36 ha
Distribution of Farm Household by Land Holding Size < 0.5 ha	35 %	-	43 %
Distribution of Farm Household by Land Holding Size ≧ 0.5 ha	65 %	-	57 %

Source Asahan Dalam Angka 2002, BPS Asahan; Kecamatan Pulau Rakyat Dalam Angka 2002; PPL Office File
Sensus Pertanian 1993, Kantor Statistik Kab. Asahan (% of farm households in district & sub-district)

2. Agriculture Conditions

2.1 Present Land Use of Padang Mahondang Scheme

Item		Land Use Category					Total
		Irrigated Paddy Field	Rainfed Paddy Field			Tree Crop Land 1/ (Oil Palm)	
			Currently Used	Long Fallow Land			
				Bush	Light Forest		
Area	(ha)	724	436	736	735	600	3,231
	(%)	22.4	13.5	22.8	22.7	18.6	100.0

1/: Mostly land converted from paddy fields.
Source: Findings of JICA Study Team; Statistic data of District Agriculture Service Office

2.2 Prevailing Cropping Schedule & Pattern in Padang Mahondang Scheme

Paddy: Wet Season: Nov. - Feb. ~ Feb. - Apr.; Dry Season: May - July ~ Aug. - Oct. (planting ~ harvest)
Palawija: Cultivation both in wet and dry season; but area limited.
Cropping Pattern: Irrigated Paddy Field --- wet season - dry season: paddy - paddy/palawija/fallow
Cropping Pattern: Rainfed Paddy Field --- wet - dry season: paddy/palawija/fallow - fallow (cropped area limited)

2.3 Cropped Area & Intensity in Padang Mahondang Scheme

Cropping Season	Irrigated Paddy Field: 724 ha							
	Irrigated Paddy		Rainfed Paddy 1/		Palawija 2/		Sub-total	
	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)
Wet Season	350	48	374	52			724	100
Dry Season	163	23			62	9	225	31
Annual	513	71	374	52	62	9	949	131
Cropping Season	Rainfed Paddy Field: 1,907 ha							
	Irrigated Paddy		Rainfed Paddy		Palawija 2/		Sub-total	
	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)
Wet Season			436	23	53	3	489	26
Dry Season							0	0
Annual			436	23	53	3	489	26
Cropping Season	Overall Scheme: Paddy Field 2,631 ha							
	Irrigated Paddy		Rainfed Paddy		Palawija 2/		Total	
	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)	Area (ha)	CI(%)
Wet Season	350	13	810	31	53	2	1,213	46
Dry Season	163	6	0	0	62	2	225	9
Annual	513	19	810	31	115	4	1,438	55

1/: Paddy cultivated under rainfed conditions. 2/: Palawija maize composite (mostly) & soybeans (partly)
Source: Findings of JICA Study Team; Statistic data of District Agriculture Services Office

Table B-1.4.1 Basic Agriculture Conditions of Padang Mahondang Scheme

2.4 Crop Yield & Production in Padang Mahondang Scheme

Cropping Season	Irrigated Paddy Field: 724 ha					
	Irrigated Paddy		Rainfed Paddy 1/		Palawija (maize)	
	Yield (t/ha)	Production (t)	Yield (t/ha)	Production (t)	Yield (t/ha)	Production (t)
Wet Season	4.0	1,400	2.5	935		
Dry Season	4.0	652			3.0	186
Annual		2,052		935		186
Cropping Season	Rainfed Paddy Field: 1,907 ha					
	Irrigated Paddy		Rainfed Paddy		Palawija (maize)	
	Yield (t/ha)	Production (t)	Yield (t/ha)	Production (t)	Yield (t/ha)	Production (t)
Wet Season			2.0	872	3.0	159
Dry Season						
Annual				872		159

Cropping Season	Overall Scheme: Paddy Field 2,631 ha			
	Irrigated Paddy	Rainfed Paddy	Paddy Total	Palawija (maize)
	Production (t)	Production (t)	Production (t)	Production (t)
Wet Season	1,400	1,807	3,207	159
Dry Season	652		652	186
Annual	2,052	1,807	3,859	345

1/: Paddy cultivated under rainfed conditions in irrigated paddy field

Source: Findings of JICA Study Team; Statistic data of District Agriculture Services Office

3. Agriculture Support Services

3.1 Extension Services

Project Sub-district	BPP (No office established)	No. of PPLs Deployed in Scheme			No. of PHT
		Male	Female	Total	
Pulau Rakyat	No. PPLs in BPP: 5	2	0	2	1

3.2 Support Facilities

Facility	Name	Location
District Agriculture Services Office	District Agriculture Services Office, Asahan	Kisaran, Kab. Asahan
Food Security & Extension Office	Food Security & Agr. Ext. Office, Asahan	Kisaran, Kab. Asahan
Seed Farm	Balai Benih Pembantu, Indurapura	Kec. Air Petih, Indurapura
Seed Supervision & Certification Office	BPSB, Asahan	Kec. Simpan Kawan, Asahan
Agricultural High School	Agricultural High School, Asahan	Kec. Meranti, Asahan
Plant Protection Center	BPTPH, Sumatra Utara	Medan
Experimental Station	BPTP, Sumatra Utara	Medan
Seed Supervision & Certification Off	BPSB, Asahan	Kec. Simpan Kawan, Asahan

3.3 Farmers Organizations (Kelompok Tani, 2002)

Project	Kelompok Tani (KT)								Total			
	Primary		Secondary		Intermediate		Advanced		KTs		Member	
Sub-district	No.	%	No.	%	No.	%	No.	%	No.	%	Total	per KT
Pulau Rakyat	6	13	25	52	16	33	1	2	48	100	1,947	41
Project Desa Total												

3.4 Farmer Organizations, Credit Institutions

Project Sub-district	KUD	Koptan	UPJA	P3A	BRI Branch
Pulau Rakyat	2 (tree crops; sleeping)	2 (tree crops; active)	1	12	1

Source: Statistic data of District Agriculture Services Office; Findings of JICA Study Team

4. Agriculture Facilities & Machinery

Project Sub-district	Large Rice Mills	RMU	Small Rice Mills	Thresher		Water Pump
				Pedal	Power	
Pulau Rakyat	4	2	4	3	5	9

Project Sub-district	Hand Tractor	4 Wheel Tractor	Harvester	Paddy Dryer	Rat Fumigator	KIOSK (private)
Pulau Rakyat	17	0	18	0	24	1

Source: Statistic data of District Agriculture Services Office

Table B-1.4.2 Records on Cropped Area of Paddy and Palawija in Padang Mahondang Scheme

1. Cropped Area of Paddy in Pulau Rakyat 1/

Statistic Data of District Agriculture & Livestock Services Office (ha)																	
Year	Dry Season									Wet Season							Annual
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sub-total	Sept	Oct	Nov	Dec	Jan	Feb	Sub-total	
1996/97	11	0	0	0	5	657	518	0	1,180	0	0	148	155	622	740	1,665	2,845
1997/98	622	740	120	0	0	235	215	300	870	475	0	35	1,020			1,530	2,400
1998/99																	
1999/00														1,220	0		
2000/01	1,220	0	0	0	130	25	0	0	155	592	0	0	235	42	54	923	1,078
2001/02	42	54	108	0	0	0	115	0	223	20	105	315	588	25	0	1,053	1,276
2002/03	25	0	3	0	0	0	10	0	13	0	0	10	620	0	0	630	643
2003/04	0	0	0	0	50	160	25	25	260	0							
Average	320	132	39	0	31	180	147	54	450	181	21	102	524	382	159	1,160	1,648
%			2	0	2	11	9	3	27	11	1	6	32	23	10	70	100
Avg. of Dry Season (99/00 to 02/03):			28	0	45	46	38	6	163								
Avg. of wet season(96/97 to 2002/03):										181	21	102	524	382	159	1,160	
Current Cropped Area of Paddy Assumed									**163**							**1,160**	**1,323**

1/: Paddy field in the sub-district almost exclusively extended in the Padang Mahondang Irrigation Scheme

2. Cropped Area of Palawija in Pulau Rakyat 1/

Statistic Data of District Agriculture & Livestock Services Office (ha)																	
Year	Dry Season									Wet Season							Annual
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sub-total	Sept	Oct	Nov	Dec	Jan	Feb	Sub-total	
Maize																	
2001/02	4	2			6		9	9	24	7	47		2	7	9	72	96
2002/03	7	9	5	9	2	1	16	11	44	2	2	3	5	2	2	16	60
Average	5.5	5.5	5	9	4	1	12.5	10	34	4.5	24.5	3	3.5	4.5	5.5	44	78
Soybeans																	
2001/02	0	0	0	0	0	0	2	1	3	0	4	0	0	2	6	12	15
2002/03	2	6	7	8	4	1	24	8	52	3	0	1	1			5	57
Avg.	1	3	3.5	4	2	0.5	13	4.5	28	1.5	2	0.5	0.5	2	6	8.5	36
Current Cropped Area of Palawija Assumed (ha)									**62**							**53**	**115**

1/: Palawija cultivation is the sub-district is practiced almost exclusively extended in the Padang Mahondang Irrigation Scheme

3. BPS Statistic Data on Cropped Area of Paddy in Pulau Rakyat 1/

Annual Cropped	1996	1997	1998	1999	2000	2001	2002	Average of 1996 to 2002
Area of Paddy	2,482 ha	2,915 ha	2,976 ha	2,665 ha	2,281 ha	894 ha	878 ha	2156 ha

1/: Kabupaten Asahan Dalam Angka, 1996 to 2002, BPS Asahan

4. JICA Report (1990) 1/

Land Use	Irrigated Paddy Field	Rainfed Paddy Field	Others	Total	Cropped Area of	Wet Season	Dry Season	Annual
	1,100	1,400	830	3,330	Paddy	2,270	660	2,930

1/: Master Plan Study on Lower Asahan River Basin Development, JICA, 1990

Table B-1.4.3 Financial Crop Budget per Ha under Present/Without Project

Items	Unit	Unit Price (Rp.000)	Paddy						Maize (Composite)	
			Rainfed Paddy 1/				Irrigated Paddy			
			Rainfed Field		Rainfed Condition		Wet/Dry Season			
			Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)
1. Gross Return										
Unit Yield	(t/ha)		2.0		2.5		4.0		3.0	
Unit Price	(Rp.000/t)			1,300		1,300		1,300		1,100
Gross Return	(Rp.000)			**2,600**		**3,250**		**5,200**		**3,300**
2. Production cost				**1,386**		**1,497**		**2,173**		**1,049**
2-1. Farm Inputs				*240*		*297*		*542*		*508*
Seed 2/	(kg)		30	60	30	60	30	60	30	120
Fertilizers				130		187		389		338
- Urea	(kg)	1.30	100	130	100	130	150	195	150	195
- SP36	(kg)	1.90	0	0	30	57	50	95	50	95
- KCl	(kg)	1.90	0	0	0	0	30	57	25	48
- ZA	(kg)	1.40	0	0	0	0	30	42		0
Agro chemicals				50		50		93		50
- Insecticide (liquid)	(lit)	50	1.0	50	1.0	50	1.5	75	1.0	50
- Insecticide (powder)	(kg)	30								
- Rodenticide	(kg)	35					0.5	18		
- Herbicide	(kg)	30								
2-2. Labor Costs				*648*		*684*		*1,044*		*216*
Contracted Works										
- Planting/Transplanting 3/	(unit)		1	360	1	360	1	360		
- Harvesting	(unit)									
Labor Requirements										
- Hired Labor	(man-day)	18	16	288	18	324	38	684	12	216
- Family Labor	(man-day)		35		40		44		62	
Total	(man-day)		51		58		82		74	
2-3. Land Preparation				*380*		*380*		*380*		*0*
- Machinery	(unit)		1	380	1	380	1	380		
- Draft Animal	(unit)									
2-4. Field Transportation	(L.S.)		2 %	*52*	2 %	*65*	2 %	*104*	2 %	*66*
2-5. Shelling Cost		Rp.70/kg								*210*
2-6. Miscellaneous Expenses	(L.S.)		5 %	*66*	5 %	*71*	5 %	*103*	5 %	*50*
3. Net Return	Rp.000			**1,214**		**1,753**		**3,027**		**2,251**
	%			***47***		***54***		***58***		**68**
	Rounded			***1,210***		***1,750***		***3,030***		***2,250***

1/: Rainfed paddy --- paddy in rainfed paddy field; rainfed condition --- paddy grown under rainfed condition in irrigation command area

2/: Seed price: Paddy Rp. 2,000/kg; Maize --- composite Rp. 4,000/kg

3/: Contract work for transplanting assumed --- Rp. 360,000/ha at financial price

Table B-1.5.1 Actual Receipts and Expenditures of Asahan District Government

(Unit: Rp. 000)

Receipt/Expenditure	1999/00	2000
A. RECEIPTS	**124,688,494**	**127,415,020**
1. Previous Year Surplus	1,630,667	6,132,412
2. Local Gov. Original Receipt	8,253,938	8,615,428
2.1 Local Taxes Receipt	6,437,481	5,957,852
2.2 Retributions Receipt	1,700,987	2,447,885
2.2.1 Retributions of public service	863,117	711,022
2.2.2 Retributions of commercial service	291,551	273,065
2.2.3 Retributions of special permits	546,319	1,463,798
2.3 Local Gov. Corporate Profit	0	0
2.4 Other Receipt	115,470	209,691
3. Income from Higher Level Gov. and/or Authority	114,803,889	112,667,180
3.1 Tax Share	19,956,766	17,147,656
3.2 Non Tax Share	69,140	48,575
3.3 Subsidies to Local Government	74,773,096	69,655,463
3.4 Development Contribution	19,947,827	25,768,731
3.5 Other Receipt	57,060	46,755
4. Local Government Loan	0	0
B. CURRENT EXPENDITURES	**93,392,779**	**88,250,318**
1. Personnel Current Expenditure	73,007,887	68,512,220
2. Material Current Expenditure	8,908,797	7,384,203
3. Repair & Maintenance Current Expenditure	1,561,395	1,445,988
4. Official Travel Expenditure	863,337	819,140
5. Other Current Expenditure	4,705,926	4,992,780
6. Debt and Interest Repayment	100,000	900,000
7. Fund/Subsidy	1,452,420	1,645,452
8. Other Current Expenditure	2,307,170	1,938,045
9. Unpredicted Current Expenditure	485,847	612,490
C. DEVELOPMENT EXPENDITURES	**25,138,179**	**29,051,918**
1. Industry	470,000	30,000
2. Agriculture and Forestry	1,660,333	494,136
3. Natural Water Resources and Irrigations	988,432	428,011
4. Manpower	94,970	0
5. Trade, Unfolding Regional Initiative, Regional Financial and Cooperatives	1,057,670	1,350,000
6. Transportation	10,538,541	12,373,448
7. Mining and Energy	0	0
8. Tourism and Regional Communications	27,213	134,863
9. Regional Development and Resettlement	1,474,801	3,692,368
10. Environment and Lay Out	80,663	84,830
11. Education, National Culture, Credentials, Youth and Sport	1,649,610	3,271,533
12. Demography and Family Welfare	172,825	0
13. Health, Social Welfare, Women Participation, Child and Adolescent	470,121	299,715
14. Dwelling and Residence	0	0
15. Religion	62,850	0
16. Science and Technology	1,563,417	1,010,991
17. Law	10,000	15,000
18. Civil Servants and Control	3,840,044	5,493,523
19. Politics, Information, Communication and Mass Communication	318,942	0
20. Security and Public Order	99,747	40,000
21. Development Subsidies to Lower Level Gov.	558,000	333,500
D. TOTAL EXPENDITURES (B+C)	**118,530,958**	**117,302,236**

Table B-3.1.1 Hydrological Condition and Water Balance

1. Preliminary estimated monthly river flow data (m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
118.6	102.2	116.5	136.4	128.0	97.8	94.1	88.8	102.6	122.7	137.8	107.0	112.7

Source: Irrigation office, Asahan

2. Monthly rainfall at Malau Estate (mm)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
149	113	131	141	121	217	186	119	321	285	218	264	2,264

Source: Irrigation office, Asahan

3. Catchment area at weir site

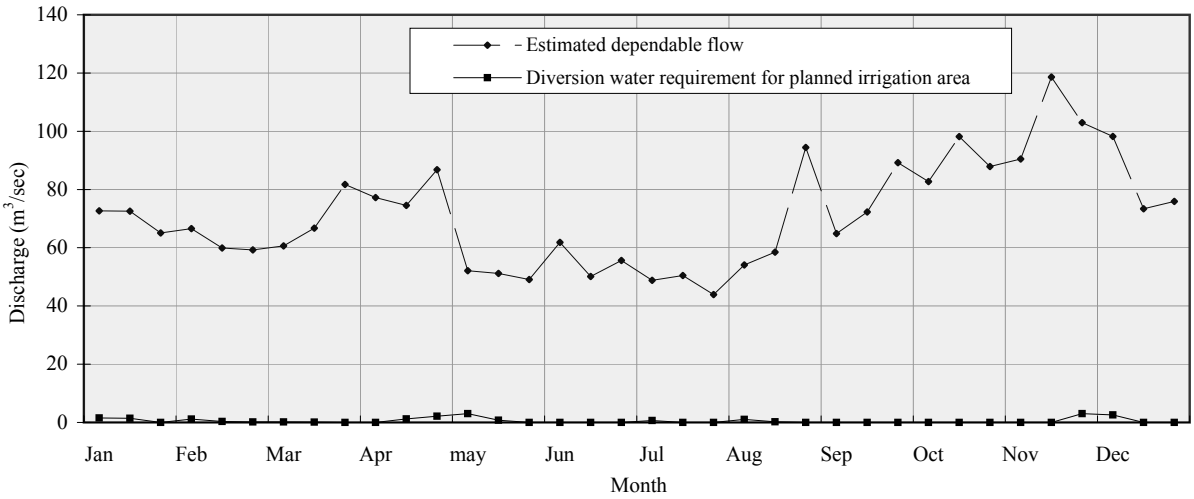
4,669 km^2

4. Estimated monthly dependable flow (m^3/s)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
70.1	61.9	69.7	79.5	50.8	55.9	47.7	69.0	75.4	89.6	104.0	82.5	71.3

5. 10-days basis water balance

Planned irrigation area (ha) 2,631 ha



Water Balance of Padang Mahondang Scheme

Table B-3.1.2 Climate Condition at Medan

Name of the meteorological station	: Medan (Polonia)
Province	: North Sumatra
District	: Deli Serdang
Approximate distance of the station from the scheme	: 150km northwestward
Longitude : 3º33' N Latitude : 98º40' Altitude	: 27m

1. Monthly mean temperature (ºC)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	26.9	28.2	28.3	28.8	28.8	28.0	27.5	26.7	26.8	26.8	26.6	26.2	27.5
1999	26.2	26.6	27.0	27.4	27.2	27.1	27.4	26.9	26.3	26.1	26.5	25.8	26.7
2000	25.9	26.4	27.0	26.3	27.6	27.0	27.3	27.1	26.3	26.9	26.6	26.9	26.8
2001	26.5	26.8	27.3	27.4	27.9	27.4	27.4	27.5	26.5	26.9	26.3	26.5	27.0
2002	26.4	26.9	27.8	27.6	27.8	27.9	27.7	27.1	26.6	26.4	26.8	26.8	27.2
Average	26.4	27.0	27.5	27.5	27.9	27.5	27.5	27.1	26.5	26.6	26.6	26.4	27.0

Source: Monthly data supplied by Meteorological and Geophysical Agency Jakarta, Department of Communication

2. Monthly mean relative humidity (%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	85	83	81	79	80	82	83	86	85	85	86	86	83
1999	85	83	86	85	87	84	81	82	87	84	84	87	85
2000	86	83	82	82	83	84	80	81	86	85	85	83	83
2001	86	82	83	83	84	82	80	83	86	86	87	85	84
2002	85	82	80	83	83	78	81	82	85	87	86	86	83
Average	85	83	82	82	83	82	81	83	86	85	86	85	84

Source: Monthly data supplied by Meteorological and Geophysical Agency Jakarta, Department of Communication

3. Monthly mean sunshine duration (hours/day)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	3.1	4.3	3.4	3.0	3.7	4.2	4.4	3.0	3.3	3.2	2.5	-	3.5
1999	2.2	3.2	3.0	3.4	2.6	2.8	3.5	2.9	3.2	3.4	2.6	1.3	2.9
2000	1.8	3.0	3.4	3.2	4.4	3.6	3.9	4.1	2.1	2.6	2.3	2.9	3.1
2001	2.2	3.0	3.0	2.2	3.2	3.4	4.5	3.4	2.2	2.4	2.2	2.7	2.9
2002	2.0	2.2	2.6	2.1	3.2	3.6	2.9	2.8	2.5	1.7	2.2	2.2	2.5
Average	2.3	3.2	3.1	2.8	3.4	3.5	3.8	3.2	2.6	2.7	2.3	2.3	3.0

Source: Monthly data supplied by Meteorological and Geophysical Agency Jakarta, Department of Communication

4. Monthly mean wind velocity (knots)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	6.0	7.0	7.0	7.0	7.0	7.5	7.0	6.0	6.0	6.0	6.0	6.0	6.5
1999	6.0	6.0	6.0	7.0	6.0	7.0	7.0	7.0	7.0	3.7	6.4	6.0	6.3
2000	5.7	6.1	6.0	6.0	6.3	6.4	6.2	6.4	6.0	5.0	5.9	6.0	6.0
2001	5.9	6.2	6.7	6.0	6.2	7.0	7.3	6.7	6.3	6.2	6.3	6.2	6.4
2002	6.5	6.5	6.7	6.2	7.0	6.5	6.5	6.5	8.9	6.1	8.3	5.9	6.8
Average	6.0	6.4	6.5	6.4	6.5	6.9	6.8	6.5	6.8	5.4	6.6	6.0	6.4

Source: Monthly data supplied by Meteorological and Geophysical Agency Jakarta, Department of Communication

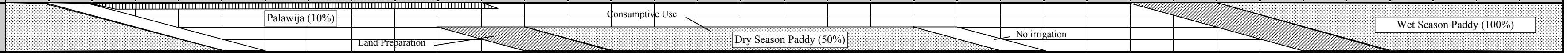
5. Estimated monthly mean ETo by modified Penman method (mm/day)

Estimated	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
ETo	3.1	3.7	3.9	3.8	3.8	3.8	4.0	3.7	3.4	3.4	3.2	3.1	3.6

TableB-3.1.3 Water Requirement for Padang Mahondang Irrigation Scheme

Item		Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Basic Data: **ETo**	(mm/day)	3.11	3.11	3.11	3.74	3.74	3.74	3.87	3.87	3.87	3.76	3.76	3.76	3.77	3.77	3.77	3.76	3.76	3.76	3.95	3.95	3.95	3.74	3.74	3.74	3.42	3.42	3.42	3.38	3.38	3.38	3.19	3.19	3.19	3.08	3.08	3.08
Percolation (P)	(mm/day)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Reff Paddy	(mm/day)	2.80	2.10	9.80	-	-	0.70	1.40	2.10	23.80	7.00	-	3.50	1.40	5.60	7.00	11.90	27.30	41.30	3.50	14.00	12.60	-	-	-	16.10	42.00	47.60	29.40	81.20	28.00	31.50	35.00	0.70	1.40	10.50	31.50
Reff Palawija	(mm/day)	2.00	1.50	7.00	-	-	0.50	1.00	1.50	17.00	5.00	-	2.50	1.00	4.00	5.00	8.50	19.50	29.50	2.50	10.00	9.00	-	-	-	11.50	30.00	34.00	21.00	58.00	20.00	22.50	25.00	0.50	1.00	7.50	22.50
Eo = ETo * 1.1	(mm/day)	3.42	3.42	3.42	4.11	4.11	4.11	4.26	4.26	4.26	4.14	4.14	4.14	4.15	4.15	4.15	4.13	4.13	4.13	4.35	4.35	4.35	4.11	4.11	4.11	3.76	3.76	3.76	3.71	3.71	3.71	3.51	3.51	3.51	3.39	3.39	3.39
M = Eo + P	(mm/day)	5.42	5.42	5.42	6.11	6.11	6.11	6.26	6.26	6.26	6.14	6.14	6.14	6.15	6.15	6.15	6.13	6.13	6.13	6.35	6.35	6.35	6.11	6.11	6.11	5.76	5.76	5.76	5.71	5.71	5.71	5.51	5.51	5.51	5.39	5.39	5.39
T	(days)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
S	(mm)	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
K = M * T / S		0.43	0.43	0.43	0.49	0.49	0.49	0.50	0.50	0.50	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.51	0.51	0.51	0.49	0.49	0.49	0.46	0.46	0.46	0.46	0.46	0.46	0.44	0.44	0.44	0.43	0.43	0.43
LP = M * e^k / (e^k -1)	(mm/day)	15.41	15.41	15.41	15.80	15.80	15.80	15.89	15.89	15.89	15.82	15.82	15.82	15.83	15.83	15.83	15.82	15.82	15.82	15.94	15.94	15.94	15.81	15.81	15.81	15.60	15.60	15.60	15.57	15.57	15.57	15.46	15.46	15.46	15.39	15.39	15.39

Cropping Pattern



Item		Jan 1	Jan 2	Jan 3	Feb 1	Feb 2	Feb 3	Mar 1	Mar 2	Mar 3	Apr 1	Apr 2	Apr 3	May 1	May 2	May 3	Jun 1	Jun 2	Jun 3	Jul 1	Jul 2	Jul 3	Aug 1	Aug 2	Aug 3	Sep 1	Sep 2	Sep 3	Oct 1	Oct 2	Oct 3	Nov 1	Nov 2	Nov 3	Dec 1	Dec 2	Dec 3
Land Preparation (LP) with Area Factor																																					
- Wet season paddy *schedule-1*		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.80	15.57	7.79	-	-	-	-	-	-	-
schedule-2		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	15.57	7.79	-	-	-	-	-	-
schedule-3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	15.57	7.73	-	-	-	-	-
schedule-4		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.79	15.46	7.73	-	-	-	-
LP for the crop	(mm/day)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.95	5.84	7.79	7.79	5.80	1.93	-	-	-	-
- Dry season paddy *schedule-1*		-	-	-	-	-	-	-	-	-	-	7.91	15.82	7.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
schedule-2		-	-	-	-	-	-	-	-	-	-	-	7.91	15.83	7.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LP for the crop	(mm/day)	-	-	-	-	-	-	-	-	-	-	3.95	11.86	11.87	3.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crop Coefficient (Kc) with Area Factor																																					
- Wet season paddy *schedule-1*		0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05	1.05	1.00	0.73
schedule-2		0.73	0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05	1.05	1.00
schedule-3		1.00	0.73	0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05	1.05
schedule-4		1.05	1.00	0.73	0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05
Kc for the crop	(mm/day)	0.82	0.62	0.37	0.19	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.14	0.41	0.69	0.96	1.08	1.07	1.04	0.96
- Dry season paddy *schedule-1*		-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05	1.05	1.00	0.73	0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
schedule-2		-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	1.10	1.10	1.08	1.05	1.05	1.00	0.73	0.50	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-
Kc for the crop	(mm/day)	-	-	-	-	-	-	-	-	-	-	-	-	0.28	0.83	1.10	1.09	1.06	1.05	1.03	0.86	0.61	0.38	0.13	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija *schedule-1*		-	-	0.38	0.53	0.58	0.87	0.99	1.04	1.03	0.99	0.96	0.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kc for the crop	(mm/day)	-	-	0.38	0.53	0.58	0.87	0.99	1.04	1.03	0.99	0.96	0.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consummative Use (ETc)																																					
- Wet season paddy	(mm/day)	2.55	1.93	1.15	0.70	0.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.46	1.39	2.19	3.05	3.45	3.29	3.21	2.94
- Dry season paddy	(mm/day)	-	-	-	-	-	-	-	-	-	-	-	-	1.04	3.11	4.15	4.09	3.99	3.95	4.05	3.41	2.42	1.40	0.47	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija	(mm/day)	-	-	1.17	1.99	2.16	3.24	3.85	4.02	3.98	3.74	3.61	0.89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Percolation (P) with Area Factor																																					
- Wet season paddy *schedule-1*		2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
schedule-2		2.00	2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00	2.00	2.00
schedule-3		2.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00	2.00
schedule-4		2.00	2.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00
P for the crop	(mm/day)	2.00	1.75	1.25	0.75	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	0.75	1.25	1.75	2.00	2.00	2.00	2.00
- Dry season paddy *schedule-1*		-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
schedule-2		-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-
P for the crop	(mm/day)	-	-	-	-	-	-	-	-	-	-	-	-	0.50	1.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Layer Replacement (WLR) with Area Factor																																					
- Wet season paddy *schedule-1*		2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50	-	-	2.50
schedule-2		2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50	-	-
schedule-3		-	2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50	-
schedule-4		-	-	2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50
WLR for the crop	(mm/day)	1.25	1.25	1.25	0.63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.63	1.25	1.25	1.25	1.25
- Dry season paddy *schedule-1*		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50	-	-	2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
schedule-2		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	2.50	-	-	2.50	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WLR for the crop	(mm/day)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.25	2.50	1.25	-	1.25	2.50	1.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Field Requirement																																					
- Wet season paddy	(mm/day)	3.00	2.83	-	2.08	0.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.00	5.14	-	-
- Dry season paddy	(mm/day)	-	-	-	-	-	-	-	-	-	-	3.95	8.36	12.01	2.97	-	-	-	-	2.55	-	-	4.15	0.97	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija	(mm/day)	-	-	-	1.99	2.16	2.74	2.85	2.52	-	-	3.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Wet season paddy	(l /s/ha)	0.35	0.33	-	0.24	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.69	0.59	-	-
- Dry season paddy	(l /s/ha)	-	-	-	-	-	-	-	-	-	-	0.46	0.97	1.39	0.34	-	-	-	-	0.30	-	-	0.48	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija	(l /s/ha)	-	-	-	0.23	0.25	0.32	0.33	0.29	-	-	0.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	(l /s/ha)	0.35	0.33	-	0.47	0.31	0.32	0.33	0.29	-	-	0.88	0.97	1.39	0.34	-	-	-	-	0.30	-	-	0.48	0.11	-	-	-	-	-	-	-	-	-	0.69	0.59	-	-
Diversion Water Requirement																																					
- Wet season paddy	(l /s/ha)	0.58	0.55	-	0.40	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.16	0.99	-	-
- Dry season paddy	(l /s/ha)	-	-	-	-	-	-	-	-	-	-	0.76	1.61	2.32	0.57	-	-	-	-	0.49	-	-	0.80	0.19	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija	(l /s/ha)	-	-	-	0.38	0.42	0.53	0.55	0.49	-	-	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	(l /s/ha)	0.58	0.55	-	0.79	0.51	0.53	0.55	0.49	-	-	1.46	1.61	2.32	0.57	-	-	-	-	0.49	-	-	0.80	0.19	-	-	-	-	-	-	-	-	-	1.16	0.99	-	-
Diversion Water Requirement with Cropping Intensity (CI)																																					
- Wet season paddy CI 100%	(l /s/ha)	0.58	0.55	-	0.40	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.16	0.99	-	-
- Dry season paddy CI 50%	(l /s/ha)	-	-	-	-	-	-	-	-	-	-	0.38	0.81	1.16	0.29	-	-	-	-	0.25	-	-	0.40	0.09	-	-	-	-	-	-	-	-	-	-	-	-	-
- Palawija CI 10%	(l /s/ha)	-	-	-	0.04	0.04	0.05	0.05	0.05	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	(l /s/ha)	0.58	0.55	-	0.44	0.14	0.05	0.05	0.05	-	-	0.45	0.81	1.16	0.29	-	-	-	-	0.25	-	-	0.40	0.09	-	-	-	-	-	-	-	-	-	1.16	0.99	-	-

Max. Diversion Requirement = 1.16 lit/sec/ha (Irrigation efficiency was estimated at 60%)

Table B-3.2.1 List of Irrigation Canals and Related Structures

List of Canals		
Name of Canal	Length (m)	Type of Rehabilitation
Main	9,000	RG4 (New)
Secondary -1	3,000	RG4 (New)
SC-2	4,000	RG4 (New)
SC-3	3,000	RG4 (New)
SC-4	3,000	RG4 (New)
SC Total	13,000	RG4 (New)

List of Structures on Main Canal				
Structure Serial No.	Structure	Hm	Name/Mark of Str.	Type of Rehabilitation
MC-1	Box CV	5.00	BK. PM1b	RG4 (New)
MC-2	Box CV	10.00	BK.PM1a	RG4 (New)
MC-3	Division Str.	20.00	BK.PM1	RG4 (New)
MC-4	Division Str.	30.00	BK.PM2	RG4 (New)
MC-5	Box CV	33.00	BK.PM3b	RG4 (New)
MC-6	Drainage CV	37.00	BK.PM3a	RG4 (New)
MC-7	Division Str.	40.00	BK.PM3	RG4 (New)
MC-8	Box CV	50.00	BKPM4a	RG4 (New)
MC-9	Division Str.	60.00	BK.PM4	RG4 (New)
MC-10	Drainage CV	70.00	BKPM5a	RG4 (New)
MC-11	Division Str.	80.00	BK.PM5	RG4 (New)
MC-12	Division Str.	90.00	BK.PM6	RG4 (New)

Table B-3.2.2 Dimension of Main Canal

HM	BK	Distance (m)	Canal Dimension						
			Design discharge (m^3/s)	Canal bottom wide (m)	Canal height (m)	Lining height (m)	Uniform water depth (m)	Side slope	Hydraulic gradient
			Q	B	H + 0.50	H	d	m	1/I
0	BP of MC								
		2,000	3.16	2.00	2.40	1.90	1.30	1.25	6,000
20	BK. PM 1								
		1,000	3.12	2.00	2.40	1.90	1.29	1.25	6,000
30	BK. PM 2								
		1,000	2.88	2.00	2.40	1.90	1.24	1.25	6,000
40	BK. PM 3								
		2,000	2.82	2.00	2.30	1.80	1.22	1.25	6,000
60	BK. PM 4								
		2,000	2.04	2.00	2.10	1.60	1.03	1.25	6,000
80	BK. PM 5								
		1,000	1.92	2.00	2.10	1.60	1.00	1.25	6,000
90	BK. PM 6								

Table B-3.2.3 Work Quantity

Work Description	Unit	Quantity
I. Intake		
1.1 Construction of New Intake		
1.1.1 Embankment of dike	m3	1,200
1.1.2 Sod facing to dike	m2	500
1.1.3 Excavation of intake	m3	3,000
1.1.4 Concrete works	m3	500
1.1.5 Form works	m2	1,500
1.1.6 Reinforcement bars	ton	20
1.1.7 Gabion mattress	m3	300
1.1.8 Backfill/embankment	m3	1,500
1.1.9 Gate works	ton	4
1.1.10 Metal works	ton	2
1.1.11 Dewatering works	day	60
1.2 Settling Basin		
1.2.1 Excavation	m3	16,000
1.2.2 Backfill	m3	8,500
1.2.3 Concrete 18N	m3	600
1.2.4 Concrete 13N	m3	40
1.2.5 Reinforcement bars	ton	60
1.2.6 Form	m2	4,100
1.2.7 Gate works	ton	3
1.2.8 Stoplog	ton	1
II. Main Canal Works		
2.1 Main Canal, Canal Works		
2.1.1 Excavation	m3	21,000
2.1.2 Excavation, existing canal	m3	0
2.1.3 Embankment, dike	m3	172,000
2.1.4 Embankment, inside	m3	0
2.1.5 Lining concrete	m3	5,700
2.1.6 Sod facing	m2	44,000
2.2 Main Canal, Structure Works		
2.2.1 Excavation	m3	1,800
2.2.2 Embankment/backfill	m3	800
2.2.3 Concrete	m3	1,100
2.2.4 Form	m2	5,000
2.2.5 Reinforcement bars	ton	80
2.2.6 Gate	ton	12
2.2.7 Metal works	ton	2
2.3 Main Canal, Inspection Road		
2.3.1 Gravel pavement	m3	8,000
2.3.2 Related facilities (10% of above)	lot	1

Work Description	Unit	Quantity
III. Secondary Canal (4 nos. of SC)		
3.1 Secondary Canal, Canal Works		
3.1.1 Excavation	m3	3,000
3.1.2 Excavation, existing canal	m3	0
3.1.3 Embankment, dike	m3	180,000
3.1.4 Embankment, inside	m3	0
3.1.5 Lining concrete	m3	5,900
3.1.6 Sod facing	m2	36,000
3.2 Secondary Canal, Structure Works		
3.2.1 Excavation	m3	1,600
3.2.2 Embankment/backfill	m3	600
3.2.3 Concrete	m3	1,100
3.2.4 Form	m2	4,700
3.2.5 Reinforcement bars	ton	70
3.2.6 Gate	ton	16
3.3 Secondary Canal, Inspection Road		
3.3.2 Gravel pavement	m3	7,800
3.3.3 Related facilities (10 % of above)	lot	1
IV. Drainage Works (20 % of (II+III))	L.S	1
V. On-Farm Development		
5.1 Irrigated Paddy Field	ha	724
5.2 Land for reclamation	ha	1,907
VI. Project Facility		
6.1 Gate keepers house	house	4
6.2 Field cars	nos.	3
6.3 Motor cycle	nos.	20
6.4 Office equipment	L.S	1

Table B-3.3.1 Agriculture Plan

1. Land Use Plan

Land Use Category	Present/Without Project		With Project		Increment (With-Without)	
	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Irrigated Paddy Field	724	27.5	2,440	92.7	1,716	90.0
Rainfed Paddy Field	1,907	72.5	-		-1,907	-100.0
- Currently Used	(436)	(16.6)	-		(-436)	-
- Long Fallow Land	(1,471)	(55.9)	-		(-1,471)	-
Right-of-ways2/	-	-	191	7.3	191	10.0
Project Area	2,631	100.0	2,631	100.0	0	0
Tree Crop Land (alih fungsi) 1/	600	-	600	-	0	-
Registration Area	3,231	-	3,231	-	0	-

1/: Mostly converted from paddy field; oil palm planted land 2/: Estimated to be 10% of rainfed fields

2. Planned Cropping Schedule & Pattern (illustrated in Figure B- 3.3.1)

Wet Season: Paddy (100%) Middle Oct. to end Nov. ~ early Jan. to early Mar.
Dry Season: Paddy (50%) Paddy (50%) -- Beginning May to mid. June ~ early Aug. to mid. Sep.
Palawija (10%) Maize (10%) -- Mid. Jan. to end Jan. ~ mid. Apr. to end Apr.

3. Planned Cropped Area & Cropping Intensity

Land Use Category/ Crops	Wet Season		Dry Season		Annual	
	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)
Present/Without Project						
Irrigated Paddy Field (724 ha)						
- Irrigated Paddy	350	48	163	23	513	71
- Rainfed Paddy 1/	374	52		0	374	52
- Palawija (maize)			62		62	
Sub-total	724	100	225	31	949	131
Rainfed Paddy Field (1,907 ha)						
- Rainfed Paddy	436	23			436	23
- Palawija (maize)	53	3			53	3
Sub-total	489	26	0		489	26
Overall Scheme (paddy field 2,631 ha)						
- Irrigated Paddy	350	13	163	6	513	19
- Rainfed Paddy	810	31	0	0	810	31
- Palawija (maize)	53	2	62	2	115	4
Total	1,213	46	225	9	1,438	55
With Project						
Irrigated Paddy Field (2,440 ha)						
- Irrigated Paddy	2,440	100	1,220	50	3,660	150
- Palawija (maize)			244	10	244	10
Total	2,440	100	1,464	60	3,904	160
Increment (With - Without)						
Overall Scheme (paddy field 2,440 ha)						
- Irrigated Paddy	2,090	87	1,057	44	3,147	131
- Rainfed Paddy	-810	-31	0	0	-810	-31
- Palawija (maize)	-53	-2	182	-2	129	-4
Total	1,227	54	1,239	51	2,466	105

1/: Paddy grown under rainfed conditions in irrigated fields

Table B-3.3.1 Agriculture Plan

4. Planned Crop Yield

Crop	Present/Without Project		With Project		Increment (t/ha)	
	Wet Season	Dry Season	Wet Season	Dry Season	Wet	Dry
Irrigated Paddy	4.0 t/ha	4.0 t/ha	5.0 t/ha	5.0 t/ha	1.0	1.0
Irrigated Paddy 1/	-	-	4.0 t/ha	4.5 t/ha	1.5-2.0	-
Rainfed Paddy 2/	2.5 t/ha	-	-	-	-	-
Rainfed Paddy	2.0 t/ha	-	-	-	-	-
Palawija (maize)	3.0 t/ha	3.0 t/ha	-	5.0 t/ha	-	2.0

1/: With project irrigated paddy yield in current rainfed fields (1,716 ha)

2/: Paddy grown under rainfed conditions in irrigated fields (374 ha)

5. Planned Crop Production

Crop	Present/Without Project			With Project			Increment
	Wet Season	Dry Season	Annual	Wet Season	Dry Season	Annual	Annual
Irrigated Paddy	1,400	652	2,052	3,620	3,620	7,240	5,188
Irrigated Paddy 1/				6,864	1,984	8,848	8,848
Rainfed Paddy 2/	935		935				-935
Rainfed Paddy	872		872				-872
Paddy Total	3,207	652	3,859	10,484	5,604	16,088	12,229
Palawija (maize)	159	186	345		1,220	1,220	875

1/: With project irrigated paddy yield in current rainfed fields (wet: 1,716 ha; dry: 496ha)

2/: Paddy grown under rainfed conditions in irrigated fields (374 ha)

6. Extension Services Strengthening Plan

Major development constraints & extension services required for the earlier attainment of the project target.

Major Constraints for Agriculture Development:

- Farmers groups (KTs) yet to be empowered to a great extent,
- Insufficient extension services, insufficient capabilities of extension staffs especially in post-harvest & marketing aspects,
- Technical constraints; farmers limited experiences in irrigated farming, poor water management, long fallow land etc.
- Shortage of hand tractors for future expansion of irrigated fields, and
- Participatory approaches for agriculture development yet to be introduced.

Extension Services Required:

- Institutional Strengthening Package Program
- Farmer Organizations Empowerment Package Program
- Technical Guidance Package Program
- Participation Enhancement Package Program

Implementation Plan of AESS (tentative)

Program	Implementation Schedule / Year				
	Construction Stage		Operation Stage		
	1st	2nd	3rd	4th	5th
Institutional Strengthening Package Program	.....	.....	.....	.....	.....
Farmer Organizations Empowerment P. Program		.....	.....	.....	.....
Technical Guidance Package Program			.....	.....	.....
Participation Enhancement Package Program		.....	.....	.....	.....

Table B-3.3.2 Financial Crop Budget per Ha under With Project: Padang Mahondang

Items	Unit	Unit Price (Rp000)	Irrigated Paddy 1/						Maize (Hybrid)	
			Newly Irrigated Field				Current Irrigated Field			
			Wet Season		Dry Season		Wet/Dry Season			
			Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)	Q'ty	Value (Rp000)
1. Gross Return										
Unit Yield	(t/ha)		4.0		4.5		5.0		5.0	
Unit Price	(Rp.000/t)			1,300		1,300		1,300		1,100
Gross Return	(Rp.000)			**5,200**		**5,850**		**6,500**		**5,500**
2. Production cost				**2,173**		**2,413**		**2,492**		**2,244**
2-1. Farm Inputs				*542*		*685*		*748*		*1,138*
Seed 1/	(kg)		30	60	30	90	30	90	20	440
Fertilizers				389		488		535		545
- Urea	(kg)	1.30	150	195	175	228	175	228	200	260
- SP36	(kg)	1.90	50	95	50	95	75	143	100	190
- KCl	(kg)	1.90	30	57	50	95	50	95	50	95
- ZA	(kg)	1.40	30	42	50	70	50	70		0
Agro chemicals				93		108		123		153
- Insecticide (liquid)	(lit)	50	1.5	75	1.5	75	1.5	75	1.5	75
- Insecticide (powder)	(kg)	30			0.5	15	1.0	30		
- Rodenticide	(kg)	35	0.5	18	0.5	18	0.5	18	0.5	18
- Herbicide	(kg)	30							2.0	60
2-2. Labor Costs				*1,044*		*1,116*		*1,116*		*540*
Contracted Works										
- Planting/Transplanting 2/	(unit)		1	360	1	360	1	360		
- Harvesting	(unit)									
Labor Requirements										
- Hired Labor	(man-day)	18	38	684	42	756	42	756	30	540
- Family Labor	(man-day)		44		44		44		68	
Total	(man-day)		82		86		86		98	
2-3. Land Preparation				*380*		*380*		*380*		*0*
- Machinery	(unit)		1	380	1	380	1	380		
- Draft Animal	(unit)									
2-4. Field Transportation	(L.S.)		2 %	*104*	2 %	*117*	2 %	*130*	2 %	*110*
2-5. Shelling Cost		70/t								*350*
2-6. Miscellaneous Expenses	(L.S.)		5 %	*103*	5 %	*115*	5 %	*119*	5 %	*107*
3. Net Return	Rp.000			**3,027**		**3,437**		**4,008**		**3,256**
	%			***58***		***59***		***62***		**59**
	Rounded			***3,030***		***3,440***		***4,010***		***3,260***

1/: Paddy --- yield level < 4.5 Rp. 2,000; yield level ≧4.5 Rp. 3,000; Maize hybrid Rp. 22,000/kg

2/: Contract work for transplanting assumed --- Rp. 360,000/ha at financial price

Table B-3.3.3 (1/7): Program Description Sheet: Institutional Strengthening Package Program

1. Establishment of Task Force Team for Agriculture Extension Services Strengthening (AESS)

1-1. Regional (province or district) Task Force Team

1) Program Objectives and Description

The formation of "Task Force Team" at a regional level is proposed in order to ensure the establishment of a standing institution responsible for the planning, implementation and monitoring of AESS.

2) Task Force Team Members

Proposed members of Task Force Team are:

Chief:	Chief of Food Crops Agriculture Services Office
Secretary:	Food Crops Agriculture Services Office
Members:	Planning agencies (BAPPEDA etc.)
	Technical agencies (Food Crops, Irrigation etc.)
	Marketing agencies
	Adhoc members on need basis
	Technical guidance members (provincial technical agencies)

3) Job Description of Task Force Team

- Formulation of implementation program of AESS
- Preparation of annual work programs for AESS
- Preparation of budget proposal for the annual work program
- Monitoring & evaluation of AESS
- Guidance, support & supervision of Sub-regional Task Force Teams

4) Organizational Set-up and Authority

The Task Force Team should better be organized as a development institution directly responsible to regional governor. The Team should better be given the entire authority on AESS under the governor.

5) Estimated Program Cost

The costs for the program should better be accommodated in the regional administration budget.

1-2. Sub-regional (district or sub-district) Task Force Team

1) Program Objectives and Description

The formation of "Task Force Team" at a sub-regional level is planned in order to ensure the establishment of a standing institution responsible for the planning, implementation and monitoring of AESS.

2) Task Force Team Members

Proposed members of Task Force Team are:

Chief:	Chief of Food Crops Agriculture Services Sub-regional Office
Secretary:	Local government staff
Members:	Planning agencies
	Technical agencies (Food Crops, Irrigation etc.)
	Marketing agencies
	Adhoc members on need basis
	Technical guidance members (regional technical agencies)

3) Job Description of Task Force Team

- Preparation of proposal for an sub-regional annual work program for AESS through participatory approaches of beneficiaries.
- Monitoring & evaluation of AESS

4) Organizational Set-up and Authority

The Task Force Team should better be organized as an institution directly responsible to Regional Task Force Team . The Team should better be given the entire authority on AESS at sub-regional level.

5) Estimated Program Cost

The costs for the program should better be accommodated in the regional or sub-regional administration budget.

TableB-3.3.3 (2/7): Program Description Sheet: Institutional Strengthening Package Program

2. Staff Empowerment Program

2-1. Regional (province or district) Staff Empowerment Sub-program

1) Program Objectives

The program aims at empowerment of regional level staffs of agencies concerned with AESS through provision of periodical and specific staff empowerment programs.

2) Program Description and Subjects

The periodical empowerment program is for: 1) seasonal & annual planning and review of AESS at regional level participated by staffs concerned of province & district and representatives of sub-districts and 2) general empowerment program of district staffs concerned.

The special staff empowerment program is for: 1) empowerment of staffs on specific subjects such as marketing, partnership promotion, products processing, institutional strengthening etc. through training, workshop & seminar, 2) empowerment of Regional Task Force Teams members organized under AESS and 3) empowerment of staffs on specific subjects through field activities including OJT and study tour.

3) Target Groups

Periodical Empowerment Program:	- Province & district staffs concerned with AESS - Representatives of sub-districts
Special Empowerment Program:	- District staffs concerned with the selected subjects & Regional Task Force Teams members organized under AESS

4) Program Requirements and Timing

Periodical Empowerment Program:	2 programs per year (seasonal) in principle
Special Empowerment Program:	On need basis (intensive implementation required in the initial stage)

- Periodical program should be after the same in the sub-regional level

5) Estimated Program Cost

Periodical Empowerment Program:	Rp. 5,000,000/program
Special Empowerment Program:	Rp. 5,000,000/program & Rp. 10,000,000/program (field activities)

2-2. Agriculture & Extension Staff (Sub-regional Staff) Empowerment Sub-program

1) Program Objectives

The program aims at empowerment of sub-regional level staffs (district or sub-district) of agencies concerned with AESS through provision of periodical and specific staff empowerment programs.

2) Program Description and Subjects

The periodical empowerment program is for: 1) seasonal & annual planning and review of AESS at sub-regional level participated by staffs concerned of sub-regions and representatives of producers and 2) general empowerment program of sub-regional staffs concerned.

The special staff empowerment program is for: 1) empowerment of staffs on specific subjects through training, workshop & seminar, 2) empowerment of Sub-regional Task Force Teams members organized under AESS and 3) empowerment of staffs on specific subjects through field activities including OJT and study tour.

3) Target Groups

Periodical Empowerment Program:	- Sub-regional staffs concerned with AESS - Representatives of farmers/producers
Special Empowerment Program:	- Sub-regional staffs concerned with the selected subjects & Sub-regional Task Force Teams members organized under AESS.

4) Program Requirements and Timing

Periodical Empowerment Program:	2 programs per year (seasonal) in principle
Special Empowerment Program:	On need basis (intensive implementation required in the initial stage)

- Periodical program should be prior to the same in the regional level

5) Estimated Program Cost

Periodical Empowerment Program:	Rp. 3,000,000/program
Special Empowerment Program:	Rp. 3,000,000/program & Rp. 7,000,000/program (field activities)

3. Strengthening of Extension Facilities

3.1 Program Objectives

The program aims to establish agricultural extension facilities at Pulau Rakyat Sub-district through:

3.2 Estimated Program Cost

Renovation of Office Space	Rp. 50 million/un (office space at the sub-district office)
Extension Equipment & facilities	Rp. 10 million/unit
Total	Rp. million 50.-

Table B-3.3.3 (3/7): Program Description Sheet: Farmer Organizations Empowerment Package Program

4. Kelompok Tani Empowerment Sub-program

4-1. Program Background

The primary constraint for the introduction of business oriented agriculture activities in the project area appears to be capabilities of individual farmers and farmers groups toward the same. While, the decentralization policy as well as the economic development policy of Indonesia will bring in privatization of agriculture including agriculture support activities currently being undertaken by the government. This dictates the necessity of the establishment of producers groups (better be called so rather than farmers groups) who are well organized and are technically capable, business minded and market oriented legal bodies.

4-2. Program Objectives

The program challenges against a long lasting and envisaged theme of the Indonesian agriculture to establish and strengthening of farmers group (*Kelompok Tani*). Therefore, the program aims to establish units of "Producers & Marketing Group (P&MG)".

Major activities of P&MG will include group purchase of farm inputs and group marketing of products.

4-3. Program Activities and Descriptions

The activities (program components) involved in this program are:

- Establishment of Farmer Groups Empowerment Task Force Team (FGE TFT)
- Inventory on agricultural farmer groups
- Selection of target areas & groups
- Socialization of programs & workshops
- Implementation of empowerment programs
- Formation of new organization, "producers & marketing groups"
- Monitoring & evaluation

4-4. Program Descriptions

The descriptions of individual activities (program components) are as follows;

4-4-1. Establishment of Farmer Groups Empowerment Task Force Team (FGE TFT)

Formation of Task Force Team

Task:	Responsible for KT & UPJA Empowerment Program in a district
Chief:	Chief of Agriculture Services Office
Member:	Agricultural technical agencies
	Chief of sub-district agriculture services office
Secretary:	Agriculture Services Office

Empowerment of Task Force Team

- Induction training of members under Staff Empowerment Program
- Official establishment of Task Force Team by District Governor

4-4-2. Inventory on Agricultural Farmer Groups (*Kelompok Tani* /KT)

- Inventory on KTs formed by sub-district
- Identification of area covered, membership, activities, financial status, constraints, future plans etc.

4-4-3. Selection of Target Areas & KTs

Selection of target areas & KTs for further programs by sub-district

Table B-3.3.3(4/7): Program Description Sheet: Farmer Organizations Empowerment Package Program

4-4-4. Socialization of Programs & Workshops

1st Workshop at Sub-district Level

- Socialization of programs
- Preliminary identification of constraints, needs, future plans or aspirations of KTs
- Workshop for preparation of preliminary action plans

Workshop at KT Level

- Socialization of programs
- Identification of constraints, needs, future plans or aspirations of KTs
- Workshop for preparation of action plans by KT

2nd Workshop at Sub-district Level

- Identification of constraints, needs, future plans or aspirations of KTs
- Workshop for preparation of action plans by sub-district

4-4-5. Implementation of Empowerment Programs

Support activities in the empowerment programs include;
- Training program on technical, marketing, managerial & institutional issues
- Study tour to advanced groups, marketing places, processing factories etc.
- Partnership promotion
- Follow-up & continuous guidance by extension staffs and Task Force Team members

4-4-6. Formation of New Organization, "Producers & Marketing Groups (P&MG)"

- Formation of new organizations by farmers supported by extension staffs & Task Force Team
- Legalization of new organizations by preparing by-laws and with registration by district governor
- Major activities of P&MG will include group purchase of farm inputs and group marketing of products.

4-4-7. Monitoring & Evaluation

Monitoring & evaluation by P&MGs themselves supported by extension staffs.

4-5. Approaches for Program Implementation and Selection of Target Areas & KTs

At the initial stage, the selection of existing progressive KTs in the scheme are suggested.

4-6. Program Volumes

Program volumes per year depends on the capability of Task Force Team and staffs concerned with.

4-7. Estimated Program Cost

Roughly estimated program costs are as follows;

Item	Estimated Cost (Rp.000)		Remarks
1. Establishment of FGE TFT		3,000	per district
Empowerment of Task Force Team	3,000		
2. Inventory on agricultural farmer groups		2,000	per sub-district
3. Socialization of programs & workshops		4,500	per sub-district
1st Workshop at Sub-district Level	2,000		
Workshop at KT Level	1,000		per sub-district
2nd Workshop at Sub-district Level	1,500		
4. Implementation of empowerment programs		10,000	per sub-district
Training program	3,000		
Study Tour	5,000		
Partnership promotion	2,000		
5. Formation of new organization		2,000	per sub-district
6. Administrative & miscellaneous cost		1,000	≒ 5 % of 1 to 5
Estimated Program Cost		22,500	

TableB-3.3.3 (5/7): Program Description Sheet: Farmer Organizations Empowerment Package Program

5. UPJA Empowerment & Formation Sub-program

5-1. Program Background and Objectives

In the project area, land preparation works for food crop production are mostly carried out by using hand tractor under hiring service arrangement. UPJA (Farm Machinery Hiring Services Farmer Group) system was introduced under SPL OECF in the province and there are 10 UPJAs in Asahan District. UPJAs are providing hiring services of hand tractor, power thresher, RMU, water pump and drier. With the expansion of irrigated paddy field under the rehabilitation plan, the number of UPJAs in and around the project area is extremely limited and the expansion of UPJA services is considered inevitable to provide hiring services to farming community.

UPJAs themselves are facing problems of management and services system. The present program envisages to empower the existing and new-coming UPJAs in and around the project area in order them to perform anticipated functions.

5-2. Program Activities

The activities (program components) involved in this program are:

- Review of current UPJA system jointly by province and district
- UPJA Empowerment Sub-program
- UPJA Formation Sub-program
- Monitoring & evaluation

5-3. Program Descriptions

5-3-1. UPJA Empowerment Sub-program

(1) Review of Current UPJA System

The review of current UPJA system and improvement of the system, if deemed necessary, is considered essential under the province and district joint workshop as follows;

- Inventory on UPJA performances and review of current UPJA system by individual districts
- Workshop for joint review of UPJA system by province and district:
  - Participated by Provincial & District Food Crops Agriculture Services Offices
  - Formulation of draft standard UPJA system by provincial agencies
- Formulation of standard UPJA system by provincial agencies
- Workshop with UPJAs at district level
- Formulation of updated UPJA system by individual district agencies

(2) UPJA Empowerment Training Package Program

- Training program to UPJA management staffs on the updated system, management, planning, accounting, institutional issues, monitoring requirements etc.
- Study tour to advanced UPJAs
- Preparation of UPJA empowerment plan by individual UPJA

(3) Operator & Mechanic Refresher Training

Refresher training of operators & mechanic on O&M and service discipline etc.

5-3-2. UPJA Formation Sub-program

(1) UPJA Formation Program

- Formation of UPJA farmer groups
- Training program to UPJA management staffs on the updated system, management, planning, accounting, institutional issues, monitoring requirements etc.
- Provision of farm machinery (hand tractor 1 unit; power thresher 1 unit; trailer 1 units per UPJA)

TableB-3.3.3 (6/7): Program Description Sheet: Farmer Organizations Empowerment Package Program

(2) Operator & Mechanic Training

Training of operators & mechanic on O&M and service discipline etc.

5-3-4. Monitoring & Evaluation

- Monitoring & evaluation of the program by district and extension staffs
- Monitoring & evaluation of UPJA activities to be done by UPJA themselves

5-4. Approaches for Program Implementation and Selection of Target UPJAs

- The initial step is the province & district joint review of current UPJA system and the review of current system followed at individual district level.
- All the existing UPJAs to be supported with this program, and new-coming UPJAs if possible.
- Operator and mechanic refresher training to be held annually at district level, depending needs basis.

5-5. Program Volumes

Tentatively assumed that the program completes in 4 years.

5-6. Estimated Program Cost

Roughly estimated program costs are as follows;

Item	Estimated Cost (Rp.000)		Remarks
1. UPJA Empowerment Sub-program			
(1) Review of Current UPJA System		-	Administrative budget
- Joint workshop by province and district:	-		
- Workshop with UPJAs at district level	-		
(2) UPJA Empowerment Sub-program		10,000	per 3 UPJAs
- Empowerment Package Program	5,000		
- Operator & Mechanic Refresher Training	5,000		
(3) Administrative & miscellaneous cost		1,000	≒10 % of (2)
Estimated Program Cost		11,000	
2. UPJA Formation Sub-program		77,000	per 3 UPJAs
(1) Formation of UPJA farmer groups	2,000		
(2) UPJA formation training program	5,000		
(3) Operator & Mechanic Training	5,000		
(4) Provision of farm machinery	65,000		
(5) Administrative & miscellaneous cost		4,000	≒5 % of 1 to 4
Estimated Program Cost		81,000	

Table B-3.3.3 (7/7): Program Description Sheet: Technical Guidance & Participation Enhancement Package Program

6. Technical Guidance Package Program

6-1. Candidate Programs

6-1-1. Field Extension Sub-program

(1) Program Objectives & Description

Verification/simple trial	To verify or make simple trial on adaptability of recommended varieties & farming practices
Field demonstration	Demonstration of area specific farming technologies & on-farm water management for paddy & palawija at different scale
IPM	To adopt agronomic/biological control method of pests & diseases with appropriate use of chemicals through establishing field schools at 3ry unit level

(2) Estimated Unit Program Costs (Rp.000)

Verification or simple trial	10,000 per unit	Demonstration area	20,000 per unit
Demonstration plot	3,000 per unit	Cropping pattern demonstration	20,000 per unit
Demonstration farm	10,000 per unit	IPM	15,000 per unit

6-1-2. Farmer Training Sub-program

(1) Programs

- Farmer/farmer group training
- Mass guidance/campaign/ workshop
- Farmer groups formation/ activation guidance
- Integrated farmer group formation guidance

(2) Estimated Program Costs (Rp.000)

Farmer/farmer group training	10,000 per unit	Farmer groups formation	7,500 per unit
Integrated farmer group formation	15,000 per unit	Mass guidance/workshop	3,000 per unit

6-1-3. Farmer-to Farmer Training Sub-program

(1) Programs

- Field school on farm or water management
- Field school on agri-business approaches
- Study tour

(2) Estimated Program Costs (Rp.000)

Field school on farm/water management	10,000 per unit	Study tour	10 ～ 25,000 per unit
Field school on agri-business approach	15,000 per unit		

6-2. Program Selection & Estimated Annual Program Cost

Program selection to be made at the time of preparation of the Annual Work Program on need basis.

Annual program costs tentatively estimated: Rp. 30 million

7. Participation Enhancement Package Program

7-1. Program Objectives

The program aims at introducing the participatory planning and evaluation of government agricultural support programs or activities to ensure implementation of such activities based on area specific needs.

7-2. Program Activities

Workshop at (project or program) sub-district & district level for planning & evaluation

7-3. Participants

Workshop at sub-district: Representatives of target groups (farmers)
Workshop at district: Representatives of extension staffs & target groups (farmers)

7-4. Program Requirements

- In time for planning of support services activities
- At the end of support services activities

7-5. Estimated Program Costs (Rp. 000)

Workshop at sub-district: 1,000 per unit Workshop at district: 3,000 per unit

Table B-3.3.4 Proposed Implementation Schedule for Agriculture Extension Services Strengthening (AESS)

Activities/Programs	Item	Implementation Schedule / Year					Overall	Remarks
		Construction Stage		Operation Stage				
		1st	2nd	3rd	4th	5th		
Project Activates								
1. Formulation of Implementation Plan	Schedule							
2. Establishment of Extension System	Schedule							
3. Formulation of Annual Work Program & Budget Arrangement	Schedule							Program cost to be accommodated in the regional administration budget.
4. Preparation of Extension Materials	Schedule							
5. Monitoring & Evaluation	Schedule							
Project Programs								
1. Institutional Strengthening Package Program	Schedule							
1.1 Establishment of Regional Task Force Team								Program cost to be accommodated in the regional administration budget.
- Regional Task Force Team	Schedule							
- Sub-regional Task Force Team	Schedule							
1.2 Staff Empowerment Program								
- Regional Staff Empowerment Sub-program	Schedule							
	Packet	1	3	2	2		8 packets	With field activities: Rp. 7 M
	Cost Schedule	5	20	10	15		50 Rp. million	Without field activities: Rp. 3 M
- Agriculture & Extension Staffs Empowerment Sub-program	Schedule							
	Unit	1	3	2	3	1	10 packets	With field activities: Rp. 10 M
	Cost Schedule	3	13	6	13	3	38 Rp. million	Without field activities: Rp. 5 M
1.3 Strengthening of Extension Facilities (BPP)	Schedule							Renovation of sub-district office space
	Unit		1				1 unit	
	Cost Schedule		50				50 Rp. million	
2. Farmer Organizations Empowerment Package Program	Schedule							
2.1 Kelompok Tani (KT) Empowerment Sub-program	Schedule							50 ha/KT = 49 KTs/scheme
	Packet		1	1	1	1	4 packets	1 packet/10 KTs
	Cost Schedule		22.5	22.5	22.5	22.5	90 Rp. million	
2.2 UPJA Formation & Empowerment Package Program	Schedule							
- UPJA Empowerment Sub-program	Schedule							
	Packet			1	1		2 packets	3 UPJAs/packet
	Cost Schedule			11	11		22 Rp. million	
- UPJA Formation Sub-program	Schedule							
	Packet		1	1			2 packets	1 UPJA/packet
	Cost Schedule		81	81			162 Rp. million	
3. Technical Guidance Package Program	Schedule							
	Packet			1	1	1	3 packets	
	Cost Schedule			30	30	30	90 Rp. million	
4. Participation Enhancement Package Program	Schedule							2 packets each at sub-district & district level
	Packet		4	4	4	2	14 packets	
	Cost Schedule		8	8	8	4	28 Rp. million	
Overall Cost Schedule		8	195	169	100	60	530 Rp. million	
Ordinal Extension Programs	Schedule							

Programs not accommodated in the project costs .....

Table B-4.2.1 Direct Construction Cost

(1/2)

Work Description	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
I. Intake				
1.1 Construction of New Intake				
1.1.1 Embankment of dike	m3	1,200	30,000	36,000,000
1.1.2 Sod facing to dike	m2	500	6,000	3,000,000
1.1.3 Excavation of intake	m3	3,000	13,000	39,000,000
1.1.4 Concrete works	m3	500	350,000	175,000,000
1.1.5 Form works	m2	1,500	100,000	150,000,000
1.1.6 Reinforcement bars	ton	20	6,000,000	120,000,000
1.1.7 Gabion mattress	m3	300	500,000	150,000,000
1.1.8 Backfii/embankment	m3	1,500	30,000	45,000,000
1.1.9 Gate works	ton	4	30,000,000	120,000,000
1.1.10 Metal works	ton	2	20,000,000	40,000,000
1.1.11 Dewatering works	day	60	7,500,000	450,000,000
1.1.12 Contingency (20%)				265,600,000
Sub-total				1,593,600,000
1.2 Settling Basin				
1.2.1 Excavation	m3	16,000	13,000	208,000,000
1.2.2 Backfill	m3	8,500	30,000	255,000,000
1.2.3 Concrete 18N	m3	600	350,000	210,000,000
1.2.4 Concrete 13N	m3	40	320,000	12,800,000
1.2.5 Reinforcement bars	ton	60	6,000,000	360,000,000
1.2.6 Form	m2	4,100	100,000	410,000,000
1.2.7 Gate works	ton	3	40,000,000	120,000,000
1.2.8 Stoplog	ton	1	20,000,000	10,000,000
1.2.9 Contingency (20%)				317,160,000
Sub-total				1,902,960,000
1.3 Access Road from National Highway	m	1,500	600,000	900,000,000
Contingency (20%)				180,000,000
Sub-total				1,080,000,000
Total I				4,576,560,000
II. Main Canal Works				
2.1 Main Canal, Canal Works				
2.1.1 Excavation	m3	21,000	13,000	273,000,000
2.1.2 Embankment, dike	m3	172,000	30,000	5,160,000,000
2.1.3 Lining concrete	m3	5,700	400,000	2,280,000,000
2.1.4 Sod facing	m2	44,000	6,000	264,000,000
2.1.5 Contingency (20%)				1,595,400,000
Sub-total				9,572,400,000
2.2 Main Canal, Structure Works				
2.2.1 Excavation	m3	1,800	13,000	23,400,000
2.2.2 Embankment/backfill	m3	800	30,000	24,000,000
2.2.3 Concrete	m3	1,100	400,000	440,000,000
2.2.4 Form	m2	5,000	100,000	500,000,000
2.2.5 Reinforcement bars	ton	80	6,000,000	480,000,000
2.2.6 Gate	ton	12	30,000,000	360,000,000
2.2.7 Metal works	ton	2	20,000,000	40,000,000
2.2.8 Contingency (20%)				373,480,000
Sub-total				2,240,880,000
2.3 Main Canal, Inspection Road				
2.3.1 Gravel pavement	m3	8,000	100,000	800,000,000
2.3.2 Related facilities (10% of above)	lot	1	80,000,000	80,000,000
2.3.3 Contingency (20%)				176,000,000
Sub-total				1,056,000,000
Total II				12,869,280,000

Table B-4.2.1 Direct Construction Cost

(2/2)

	Work Description	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
III.	**Secondary Canal (4 nos. of SC)**				
3.1	Secondary Canal, Canal Works				
	3.1.1 Excavation	m3	3,000	13,000	39,000,000
	3.1.2 Embankment, dike	m3	180,000	30,000	5,400,000,000
	3.1.3 Lining concrete	m3	5,900	400,000	2,360,000,000
	3.1.4 Sod facing	m2	36,000	6,000	216,000,000
	3.1.5 Contingency (20%)				1,603,000,000
	Sub-total				9,618,000,000
3.2	Secondary Canal, Structure Works				
	3.2.1 Excavation	m3	1,600	13,000	20,800,000
	3.2.2 Embankment/backfill	m3	600	30,000	18,000,000
	3.2.3 Concrete	m3	1,100	400,000	440,000,000
	3.2.4 Form	m2	4,700	100,000	470,000,000
	3.2.5 Reinforcement bars	ton	70	6,000,000	420,000,000
	3.2.6 Gate	ton	16	30,000,000	480,000,000
	3.2.7 Contingency (20%)				369,760,000
	Sub-total				2,218,560,000
3.3	Secondary Canal, Inspection Road				
	3.3.1 Gravel pavement	m3	7,800	100,000	780,000,000
	3.3.2 Related facilities (10 % of above)	lot	1	78,000,000	78,000,000
	3.3.3 Contingency (20%)				171,600,000
	Sub-total				1,029,600,000
	Total III				12,866,160,000
IV.	**Drainage Works**				
4.1	20 % of (II+III)	L.S	1	5,147,088,000	5,147,088,000
	Total IV				5,147,088,000
V.	**On-Farm Development**				
5.1	Irrigated Paddy Field	ha	724	2,000,000	1,448,000,000
5.2	Land for reclamation	ha	1,907	2,500,000	4,767,500,000
	Total V				6,215,500,000
VI.	**Project Facility**				
6.1	Gate keepers house	house	4	30,000,000	120,000,000
6.2	Field cars	nos.	3	300,000,000	900,000,000
6.3	Motor cycle	nos.	20	20,000,000	400,000,000
6.4	Office equipment	L.S	1	150,000,000	150,000,000
	Total VI				1,570,000,000
	Grand Total				43,244,588,000

Table B-6.2.1 Economic Project Costs of Padang Mahondang Scheme

(Unit: million Rp.)

Item	Cost		Remarks
Initial Investment Costs			
(1) Direct Construction Cost (Irrigation System Rehabilitation)	41,566		including physical contingency and project facilities
(2) Institutional & Extension Services Strengthening	843	*2.0% of (1)*	
(3) Consulting Service	2,933	*7.0% of (1)+(2)*	
(4) Administration	992	*2.5% of (1)+(2)*	
Total	46,335		
Running Costs			
(5) Incremental O&M cost	416		per year
(6) Replacement Cost	1,570		per 10 years
Total	1,986		

Table B-6.2.2 Estimation of Economic Prices

(1/2)

Item	Import Parity			Export Parity		
	Operation	US$/ton	Rp/kg	Operation	US$/ton	Rp/kg
Rice						
1. Thai 5% broken, 2005 (constant 1990 price) *1*3		226.9			226.9	
2. Adjusted to 2003 constant price	99.33%	225.4		99.33%	225.4	
3. Quality adjustment	90%	202.8		90%	202.8	
4. Freight and insurance (Bangkok-Indonesia)	+	40.0				
5. CIF Indonesia		242.8			202.8	
6. Conversion to Rupiah *2			2,010			1,679
7. Losses and port handling	5% +		101	5% -		84
8. Transportation (port to wholesaler)	+		40	-		40
9. Ex-wholesaler			2,151			1,555
10. Handling and transportation (wholesaler to mill)	-		80	-		80
11. Ex-mill			2,071			1,475
12. Conversion to paddy	68%		1,408	68%		1,003
13. By-products (rice bran: 20% of paddy x Rp100/kg)	+		100	+		100
14. Milling cost	-		100	-		100
15. Transportation (mill to farm)	-		20	-		20
16. Economic farm gate price			1,388			983
(Rounded)			1,390			980
17. Weighted average economic farm gate price (import 100%, export 0%)						1,390
Maize						
1. Export price, 2005 (constant 1990 price) *1		111.0			111.0	
2. Adjusted to 2003 constant price	99.33%	110.3		99.33%	110.3	
3. Freight and insurance (gulf ports-Indonesia)	+	40.0				
4. CIF Indonesia		150.3			110.3	
5. Conversion to Rupiah *2			1,244			913
6. Losses and port handling	5% +		62	5% -		46
7. Transportation (port to wholesaler)	+		40	-		40
8. Ex-wholesaler			1,346			827
9. Handling and transportation (wholesaler to project area)	-		80	-		80
10. Ex-wholesaler price			1,266			747
11. Local transportation and handling losses	-		50	-		50
12. Economic farm gate price			1,216			697
(Rounded)			1,220			700
13. Weighted average economic farm gate price (import 100%, export 0%)						1,220
Soybean						
1. Export price, 2005 (constant 1990 price) *1		226.9			226.9	
2. Adjusted to 2003 constant price	99.33%	225.4		99.33%	225.4	
3. Freight and insurance (gulf ports-Indonesia)	+	35.0				
4. CIF Indonesia		260.4			225.4	
5. Conversion to Rupiah *2			2,156			1,866
6. Losses and port handling	5% +		108	5% -		93
7. Transportation (port to wholesaler)	+		40	-		40
8. Ex-wholesaler			2,303			1,733
9. Handling and transportation (wholesaler to project area)	-		80	-		80
10. Local transportation and handling losses	-		50	-		50
11. Economic farm gate price			2,173			1,603
(Rounded)			2,170			1,600
12. Weighted average economic farm gate price (import 100%, export 0%)						2,170

*1 Projected price in 2005 at constant 1990 price

*2 Exchange Rate as of May, 2003 (US$1.00=Rp. 8,279)

*3 Thai, white, milled, 5% broken, FOB Bangkok.

Source: World Bank, Global Economic Prospects 2003.

Table B-6.2.2 Estimation of Economic Prices

(2/2)

Item	Import Parity			Export Parity		
	Operation	US$/ton	Rp/kg	Operation	US$/ton	Rp/kg
Groundnut						
1. Export price, 2005 (constant 1990 price) *1		791.6			791.6	
2. Conversion to price of shelled groundnut	63%	498.7		63%	498.7	
3. Adjusted to 2003 constant price	99.33%	495.4		99.33%	495.4	
4. Freight and insurance (gulf ports-Indonesia)	+	35.0				
5. CIF Indonesia		530.4			495.4	
6. Conversion to Rupiah *2			4,391			4,101
7. Losses and port handling	5% +		220	5% -		205
8. Transportation (port to wholesaler)	+		40	-		40
9. Ex-wholesaler			4,650			3,856
10. Handling and transportation (wholesaler to project area)	-		80	-		80
11. Local transportation and handling losses	-		50	-		50
12. Economic farm gate price			4,520			3,726
(Rounded)			4,520			3,730
13. Weighted average economic farm gate price (import 50%, export 50%)						4,130
Urea						
1. Export price, Europe, bagged, 2005 (constant 1990 price) *1					122.3	
2. Adjusted to 2003 constant price				99.33%	121.5	
3. FOB Indonesia port					121.5	
4. Conversion to Rupiah *2						1,006
5. Transportation (port to wholesaler)				+		40
6. Port handling, storage, and losses				+		80
7. Handling and transportation cost to project site				+		120
8. Economic price of bagged urea at farm gate						1,246
(Rounded)						1,250
TSP						
1. Export price, Europe, bagged, 2005 (constant 1990 price) *1		144.8			144.8	
2. Adjusted to 2003 constant price	99.33%	143.8			143.8	
3. Freight and insurance	+	55.0				
4. CIF Indonesia port		198.8			143.8	
5. Conversion to Rupiah *2			1,646			1,191
6. Port handling, storage, and losses	+		120	+	120.0	120
7. Bagging cost	+		50	+	50.0	50
8. Handling and transportation cost to project site	+		120	+	120.0	120
9. Economic price of bagged TSP at farm gate			1,936		290.0	1,481
(Rounded)			1,940			1,480
10 Weight average economic farm gate price (import 80%, export 20%)						1,710
Potassium Chloride (KCl)						
1. Export price, Europe, bagged, 2005 (constant 1990 price) *1		119.7				
2. Adjusted to 2003 constant price	99.33%	118.9				
3. Freight and insurance	+	50.0				
4. CIF Indonesia port		168.9				
5. Conversion to Rupiah *2			1,398			
6. Port handling, storage, and losses	+		120			
7. Bagging cost	+		50			
8. Handling and transportation cost to project site	+		120			
9. Economic price of bagged urea at farm gate			1,688			
(Rounded)			1,690			

*1 Projected price in 2005 at constant 1990 price

*2 Exchange Rate as of May, 2003 (US$1.00=Rp. 8,279)

Source: World Bank, Global Economic Prospects 2003.

Table B-6.2.3 Economic Prices: Summary Table

Item	Unit	Financial Price (FP) *1	Economic Price *2
(1) Farm Products			
Paddy	(Rp/kg)	1,300	1,390
Maize	(Rp/kg)	1,100	1,220
(2) Seeds			
Paddy	(Rp/kg)	2,000 & 3,000	2,000 & 3,000
Maize	(Rp/kg)	4,000	4,000
Maize (Hybrid)	(Rp/kg)	22,000	22,000
(3) Fertilizers			
Urea	(Rp/kg)	1,300	1,250
TSP	(Rp/kg)	1,900	1,710
KCl	(Rp/kg)	1,900	1,690
ZA *3	(Rp/kg)	1,400	1,250
(4) Agro-chemicals			
Insecticide (liquid type)	(Rp/lit)	50,000	50,000
Insecticide (powder type)	(Rp/kg)	30,000	30,000
Herbicide	(Rp/lit)	30,000	30,000
Rodenticide	(Rp/kg)	35,000	35,000
(5) Hired Labor			
Labor	(Rp/man-day)	Financial prices x 0.8	
Contracted works			
- Planting/transplanting	(Rp)	Financial prices x 0.8	
- Harvesting	(Rp)	Financial prices x 0.8	
(6) Land Preparation Work (machinery)		Financial prices x 1.0	
(7) Shelling Cost		Financial prices x 0.8	
(8) Field Transportation Cost		Financial price x SCF (0.9)	

*1 As of 2003
*2 Projected Prices in 2005
*3 ZA is estimated as equivalent to Urea

Table B-6.2.4 Economic Crop Budget per Ha under Present/Without Project

Items	Unit	Unit Price (Rp. 000)	Paddy						Maize (Composite)	
			Rainfed Paddy 1/				Irrigated Paddy			
			Rainfed Field		Rainfed Condition		Wet/Dry Season			
			Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)
1. Gross Return										
Unit Yield	(t/ha)		2.0		2.5		4.0		3.0	
Unit Price	(Rp.000/t)			1,390		1,390		1,390		1,220
Gross Return	(Rp.000)			**2,780**		**3,475**		**5,560**		**3,660**
2. Production cost				**1,769**		**1,941**		**2,579**		**1,867**
2-1. Farm Inputs				*235*		*286*		*514*		*485*
Seed 2/	(kg)		30	60	30	60	30	60	30	120
Fertilizers				125		176		361		315
- Urea	(kg)	1.25	100	125	100	125	150	188	150	188
- SP36	(kg)	1.71	0	0	30	51	50	86	50	86
- KCl	(kg)	1.69	0	0	0	0	30	51	25	42
- ZA	(kg)	1.25	0	0	0	0	30	38		0
Agro chemicals				50		50		93		50
- Insecticide (liquid)	(lit)	50	1.0	50	1.0	50	1.5	75	1.0	50
- Insecticide (powder)	(kg)	30								
- Rodenticide	(kg)	35					0.5	18		
- Herbicide	(kg)	30								
2-2. Labor Costs				*1,022*		*1,123*		*1,469*		*1,066*
Contracted Works										
- Planting/Transplanting 3/	(unit)	F x 0.8	1	288	1	288	1	288		
- Harvesting	(unit)									
Labor Requirements										
- Hired Labor	(man-day)	14	16	230	18	259	38	547	12	173
- Family Labor	(man-day)	14	35	504	40	576	44	634	62	893
Total	(man-day)		51		58		82		74	
2-3. Land Preparation				*380*		*380*		*380*		*0*
- Machinery	(unit)		1	380	1	380	1	380		
- Draft Animal	(unit)									
2-4. Field Transportation 4/	(L.S.)	F x 0.9		*47*		*59*		*94*		*59*
2-5. Shelling Cost		Rp. 56/kg								*168*
2-6. Miscellaneous Expenses	(L.S.)		5 %	*84*	5 %	*92*	5 %	*123*	5 %	*89*
3. Net Return	Rp.000			**1,011**		**1,534**		**2,981**		**1,793**
	%			***36***		***44***		***54***		**49**
	Rounded	%		***1,010***		***1,530***		***2,980***		***1,790***

1/: Rainfed paddy --- paddy in rainfed paddy field; rainfed condition --- paddy grown under rainfed condition in irrigation command area

2/: Seed price: Paddy Rp. 2,000/kg; Maize --- composite Rp. 4,000/kg

3/: Contract work for transplanting assumed --- Financial cost x 0.8

4/: Financial cost x 0.8

Table B-6.2.5 Economic Crop Budget per Ha under With Project

Items	Unit	Unit Price (Rp. 000)	Irrigated Paddy 1/						Maize (Hybrid)	
			Newly Irrigated Field				Current Irrigated Field			
			Wet Season		Dry Season		Wet/Dry Season			
			Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)	Q'ty	Value (Rp. 000)
1. Gross Return										
Unit Yield	(t/ha)		4.0		4.5		5.0		5.0	
Unit Price	(Rp. 000/t)			1,390		1,390		1,390		1,220
Gross Return	(Rp. 000)			**5,560**		**6,255**		**6,950**		**6,100**
2. Production cost				**2,579**		**2,793**		**2,866**		**3,033**
2-1. Farm Inputs				*514*		*649*		*707*		*1,098*
Seed 2/	(kg)		30	60	30	90	30	90	20	440
Fertilizers				361		451		494		506
- Urea	(kg)	1.25	150	188	175	219	175	219	200	250
- SP36	(kg)	1.71	50	86	50	86	75	128	100	171
- KCl	(kg)	1.69	30	51	50	85	50	85	50	85
- ZA	(kg)	1.25	30	38	50	63	50	63		0
Agro chemicals				93		108		123		153
- Insecticide (liquid)	(lit)	50	1.5	75	1.5	75	1.5	75	1.5	75
- Insecticide (powder)	(kg)	30			0.5	15	1.0	30		
- Rodenticide	(kg)	35	0.5	18	0.5	18	0.5	18	0.5	18
- Herbicide	(kg)	30							2.0	60
2-2. Labor Costs				*1,469*		*1,526*		*1,526*		*1,411*
Contracted Works										
- Planting/Transplanting 3/	(unit)	F x 0.8	1	288	1	288	1	288		
- Harvesting	(unit)									
Labor Requirements										
- Hired Labor	(man-day)	14	38	547	42	605	42	605	30	432
- Family Labor	(man-day)	14	44	634	44	634	44	634	68	979
Total	(man-day)		82		86		86		98	
2-3. Land Preparation				*380*		*380*		*380*		*0*
- Machinery	(unit)		1	380	1	380	1	380		
- Draft Animal	(unit)									
2-4. Field Transportation 4/	(L.S.)	F x 0.9	2 %	*94*	2 %	*105*	2 %	*117*	2 %	*99*
2-5. Shelling Cost		Rp.56/kg								*280*
2-6. Miscellaneous Expenses	(L.S.)		5 %	*123*	5 %	*133*	5 %	*136*	5 %	*144*
3. Net Return	Rp.000			**2,981**		**3,462**		**4,084**		**3,067**
	%			***54***		***55***		***59***		**50**
	Rounded			***2,980***		***3,460***		***4,080***		***3,070***

1/: Current irrigated field --- paddy grown in field currently irrigated condition

Current rainfed field --- paddy grown in field currently under rainfed condition

2/: Paddy --- yield level < 4.5 Rp. 2,000; yield level ≧4.5 Rp. 3,000; Maize hybrid Rp.22,000/kg

3/: Contract work for transplanting assumed --- Financial cost x 0.8

4/: Financial cost x 0.8

Table B-6.2.6 Financial and Economic Net Production Values under With and Without Project Conditions

1. Financial Net Production Value

Crops/Cropping Season	Without Project			With Project			
	Area (ha)	Net Return (Rp. 000)	Net Prod. Value (Rp. million)	Area (ha)	Net Return (Rp. 000)	Net Prod. Value (Rp. million)	Increment (Rp. million)
Irrigated Paddy [1/]							
Wet Season	350	3,030	1,061	724	4,010	2,903	1,843
Dry Season	163	3,030	494	724	4,010	2,903	2,409
Annual	513		1,554	1,448		5,806	4,252
Irrigated Paddy [2/]							
Wet Season				1,716	3,030	5,199	5,199
Dry Season				496	3,440	1,706	1,706
Annual				2,212		6,906	6,906
Rainfed Paddy [3/]							
Wet Season	374	1,750	655				
Rainfed Paddy [4/]							
Wet Season	436	1,210	528				
Palawija (maize)							
Wet Season	53	2,250	119				
Dry Season	62	2,250	140	244	3,260	795	656
Annual	115		259	244		795	537
Total	1,438		2,995	3,904		13,508	10,512

2. Economic Net Production Value

Crops/Cropping Season	Without Project			With Project			
	Area (ha)	Net Return (Rp. 000)	Net Prod. Value (Rp. million)	Area (ha)	Net Return (Rp. 000)	Net Prod. Value (Rp. million)	Increment (Rp. million)
Irrigated Paddy							
Wet Season	350	2,980	1,043	724	4,080	2,954	1,911
Dry Season	163	2,980	486	724	4,080	2,954	2,468
Annual	513		1,529	1,448		5,908	4,379
Newly Irrigated Paddy							
Wet Season				1,716	2,980	5,114	5,114
Dry Season				496	3,460	1,716	1,716
Annual				2,212		6,830	6,830
Rainfed Paddy [1/]							
Wet Season	374	1,530	572				
Rainfed Paddy [2/]							
Wet Season	436	1,010	440				
Palawija (maize)							
Wet Season	53	1,790	95				
Dry Season	62	1,790	111	244	3,070	749	638
Annual	115		206	244		749	543
Total	1,438		2,747	3,904		13,487	10,740

1/: Irrigated paddy in current irrigated field
2/: Irrigated paddy in newly irrigated field under the rehabilitation plan
3/: Paddy grown under rainfed condition in irrigation command area
4/: Paddy grown in rainfed paddy field

TableB-6.2.7 Annual Economic Costs and Benefit flow and Results of Economic Evaluation

(Rp. Million)

Year	Economic Costs				Economic Benefit	Balance
	Initial Investment	O&M	Replace-ment	Total		
1	1,215	416		1,630	0	-1,630
2	1,215	416		1,630	0	-1,630
3	21,953	416		22,368	0	-22,368
4	21,953	416		22,368	3,222	-19,146
5		416		416	6,444	6,028
6		416		416	7,518	7,102
7		416		416	8,592	8,176
8		416		416	9,666	9,250
9		416		416	10,740	10,324
10		416		416	10,740	10,324
11		416	1,570	1,986	10,740	8,754
12		416		416	10,740	10,324
13		416		416	10,740	10,324
14		416		416	10,740	10,324
15		416		416	10,740	10,324
16		416		416	10,740	10,324
17		416		416	10,740	10,324
18		416		416	10,740	10,324
19		416		416	10,740	10,324
20		416		416	10,740	10,324
21		416	1,570	1,986	10,740	8,754
22		416		416	10,740	10,324
23		416		416	10,740	10,324
24		416		416	10,740	10,324
25		416		416	10,740	10,324
26		416		416	10,740	10,324
27		416		416	10,740	10,324
28		416		416	10,740	10,324
29		416		416	10,740	10,324
30		416		416	10,740	10,324

	B-C =	**25,034**	**B/C =**	**1.65**	**EIRR =**	**17.3%**

Table B-6.3.1 Farm Budget Analysis on 1 Ha of Paddy Field

1. Current Irrigated Paddy Field

Items	Without/Present Condition			Without/Present Condition			Incremental
	Cropped	Net Return		Cropped	Net Return		Net Return
	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	per Farm (Rp.000)
1. Net Farm Income from 1 Ha of Paddy Field							
- Irrigated Paddy			4,454			6,015	1,561
Wet Season	1.00	3,030	3,030	1.00	4,010	4,010	980
Dry Season	0.47	3,030	1,424	0.50	4,010	2,005	581
- Rainfed Paddy [1/]							
- Rainfed Paddy							
- Palawija (maize composite)	0.17	2,250	383				-383
- Palawija (maize hybrid)				0.10	3,260	326	326
Total			4,837			6,341	1,504
		Rounded	***4,840***		Rounded	***6,340***	***1,500***
2. Incremental Family Expenditures [2/]			-			634	634
3. Net Reserve			***4,840***			***5,706***	***866***

2. Paddy Field in Current Irrigation Command Area Being under Rainfed Condition

Items	Without/Present Condition			Without/Present Condition			Increment
	Cropped	Net Return		Cropped	Net Return		per Farm
	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	(Rp.000)
1. Net Farm Income from 1 Ha of Paddy Field							
- Irrigated Paddy						4,750	4,750
Wet Season				1.00	3,030	3,030	3,030
Dry Season				0.50	3,440	1,720	1,720
- Rainfed Paddy [1/]	1.00	1,750	1,750				
- Rainfed Paddy							
- Palawija (maize composite)							
- Palawija (maize hybrid)				0.10	3,260	326	326
Total			1,750			5,076	3,326
		Rounded	***1,750***		Rounded	***5,080***	***3,330***
2. Incremental Family Expenditures [3/]			-			1,016	1,016
3. Net Reserve			***1,750***			***4,064***	***2,314***

3. Rainfed Paddy Field

Items	Without/Present Condition			Without/Present Condition			Increment
	Cropped	Net Return		Cropped	Net Return		per Farm
	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	Area (ha)	per Ha (Rp.000)	per Farm (Rp.000)	(Rp.000)
1. Net Farm Income from 1 Ha of Paddy Field							
- Irrigated Paddy						4,750	4,750
Wet Season				1.00	3,030	3,030	3,030
Dry Season				0.50	3,440	1,720	1,720
- Rainfed Paddy [1/]							
- Rainfed Paddy	0.89	1,210	1,077				
- Palawija (maize composite)	0.11	2,250	248				-248
- Palawija (maize hybrid)				0.10	3,260	326	326
Total			1,324			5,076	3,752
		Rounded	***1,320***		Rounded	***5,080***	***3,760***
2. Incremental Family Expenditures [3/]			-			1,016	1,016
3. Net Reserve			***1,320***			***4,064***	***2,744***

1/: Paddy grown under rainfed condition in irrigation command area

2/: Incremental family expenditure under with project condition assumed to be 10% of net return per ha; which to be covered by an income increase from paddy field

3/: Incremental family expenditure under with project condition assumed to be 20% of net return per ha; which to be covered by an income increase from paddy field

Figures

D : TERTIARY STRUCTURE

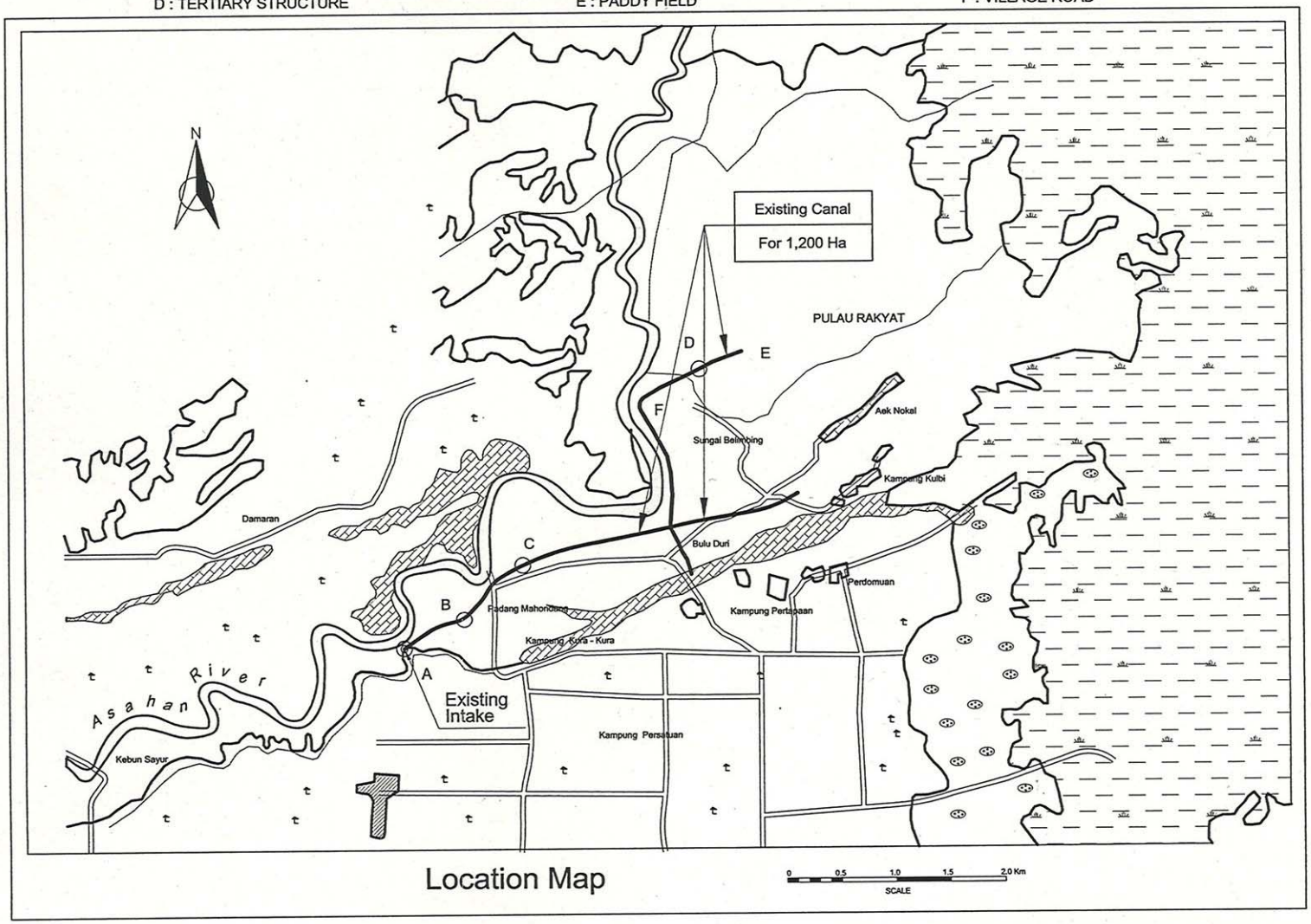
E : PADDY FIELD

F : VILLAGE ROAD

C : OFF TAKE STRUCTURE

B : MAIN CANAL & BRIDGE

A : FREE INTAKE



Location Map

The Study on Comprehensive Recovery Program of Irrigation Agriculture	Figure B-1.3.1 Padang Mahondang Location Map of Padang Mahondang Irrigation Scheme
Japan International Cooperation Agency	

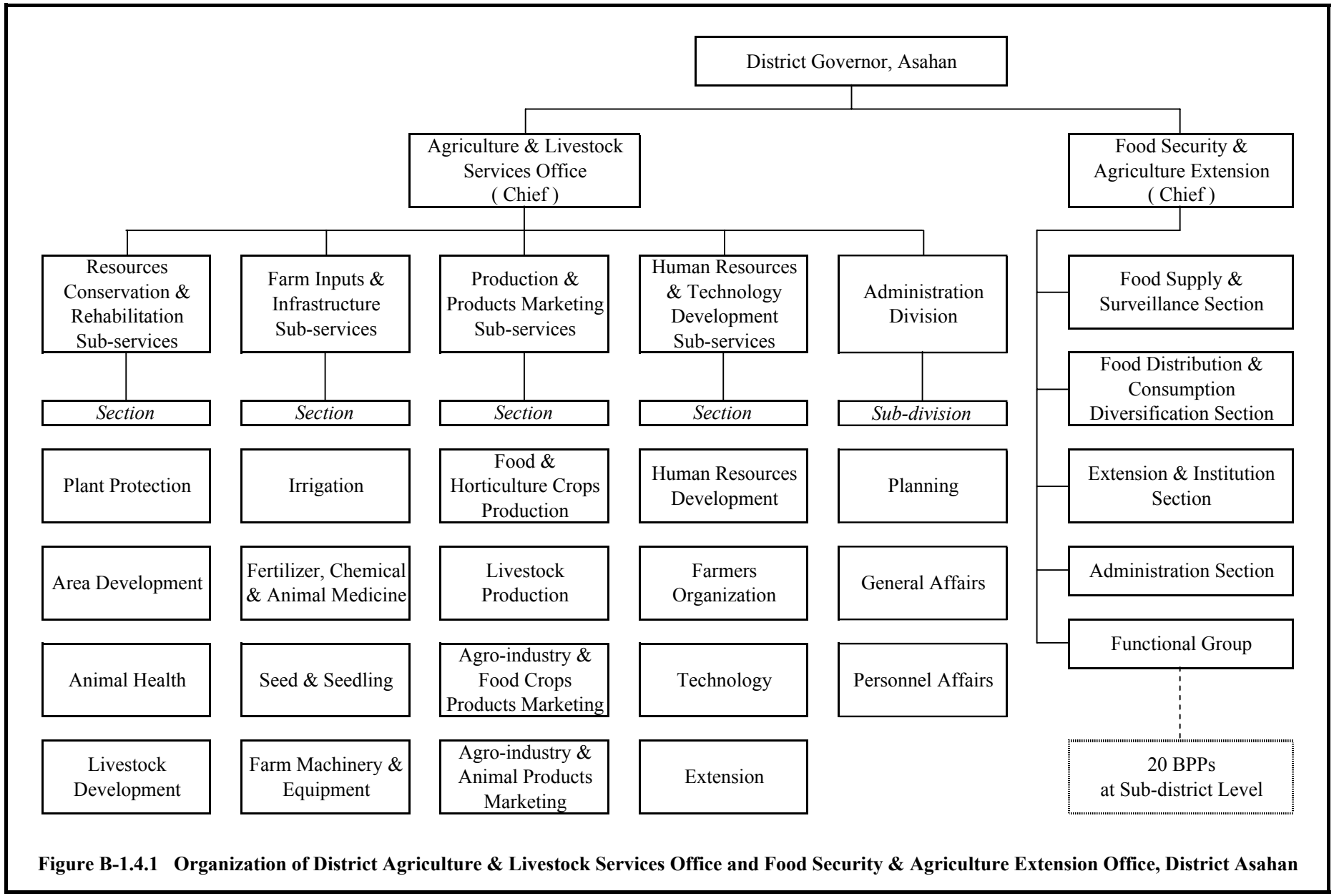


Figure B-1.4.1 Organization of District Agriculture & Livestock Services Office and Food Security & Agriculture Extension Office, District Asahan

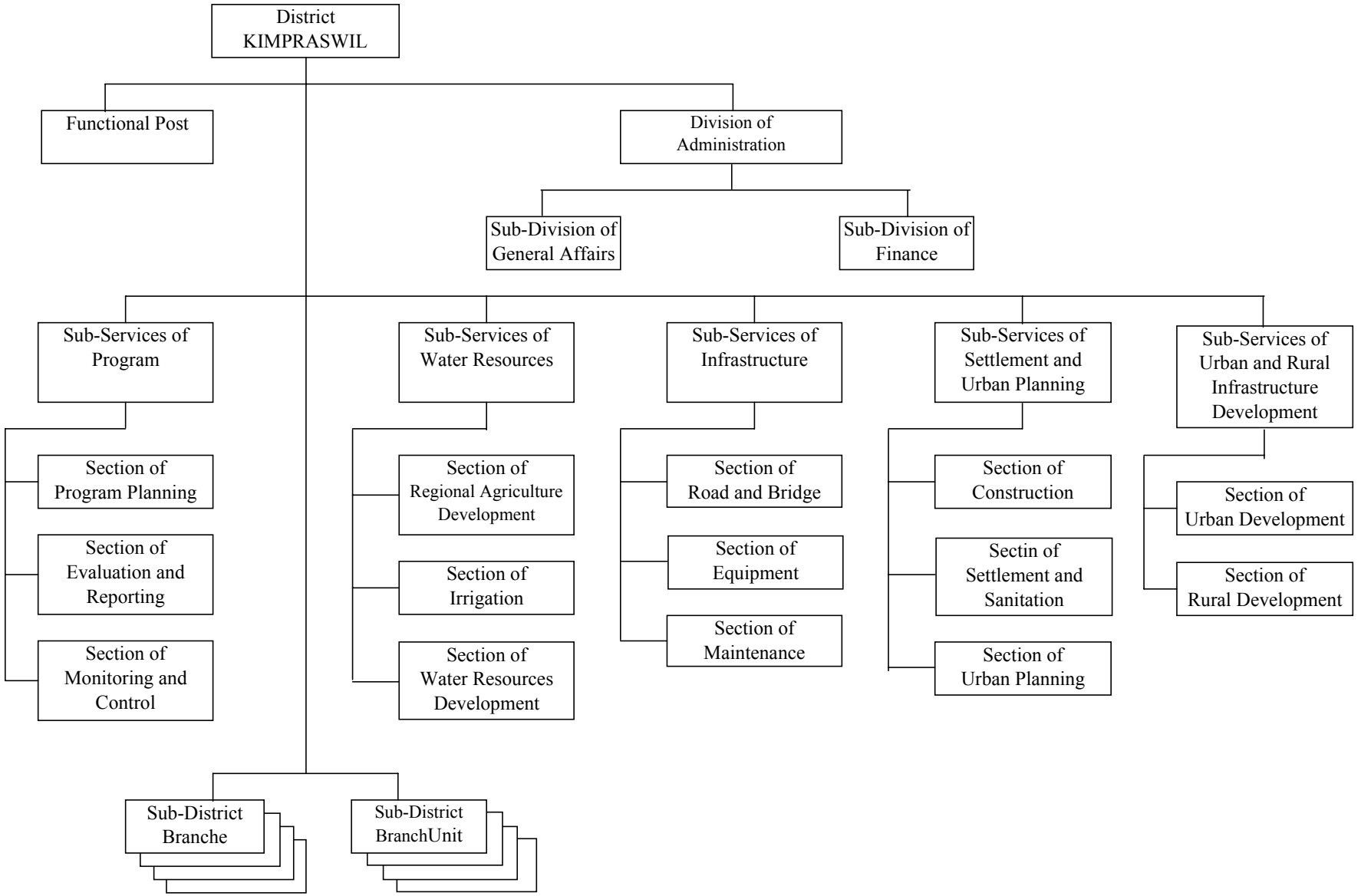


Figure B-1.5.1 Organization Chart of Settlement and Regional Infrastructure, Asahan

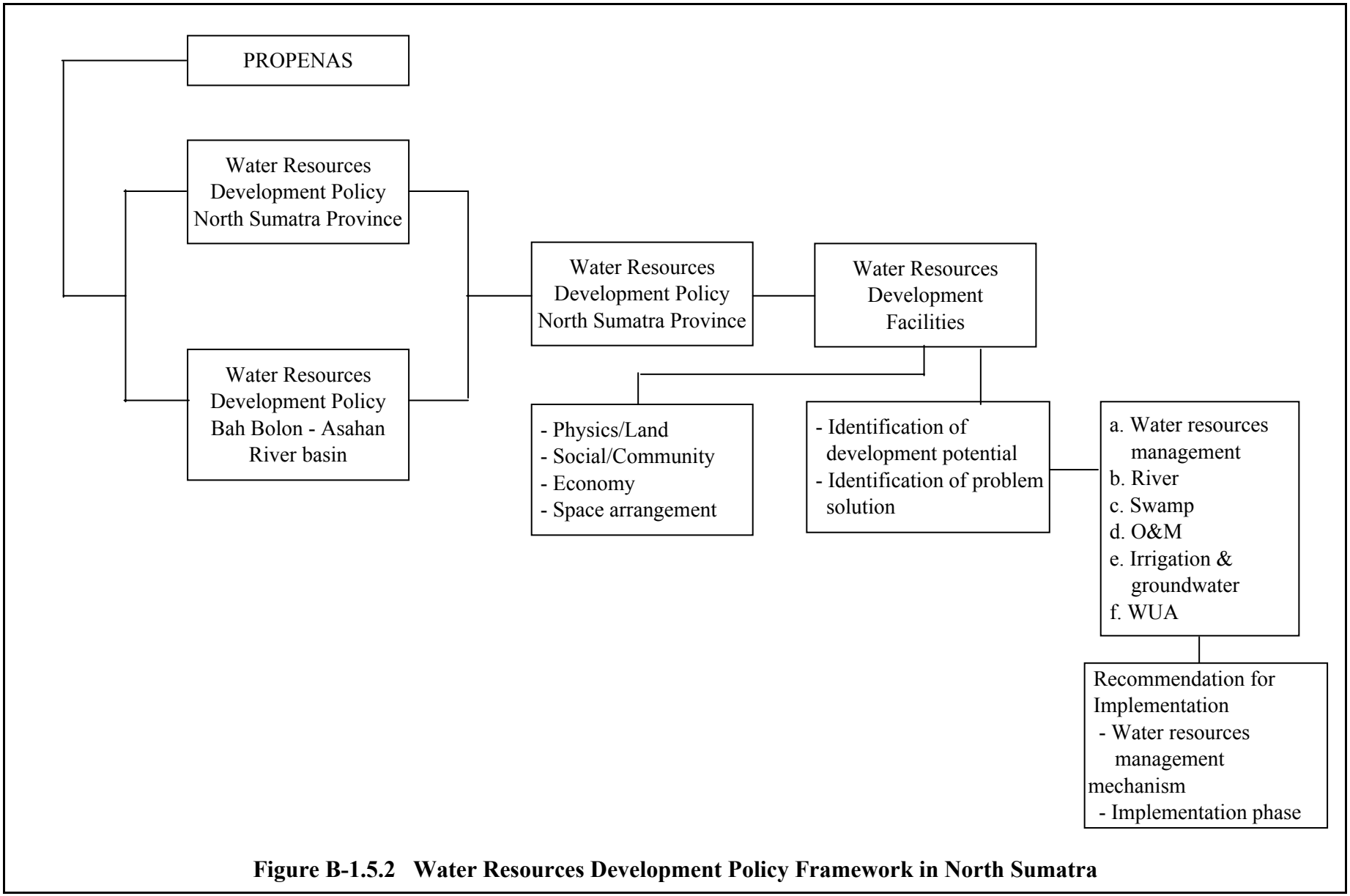
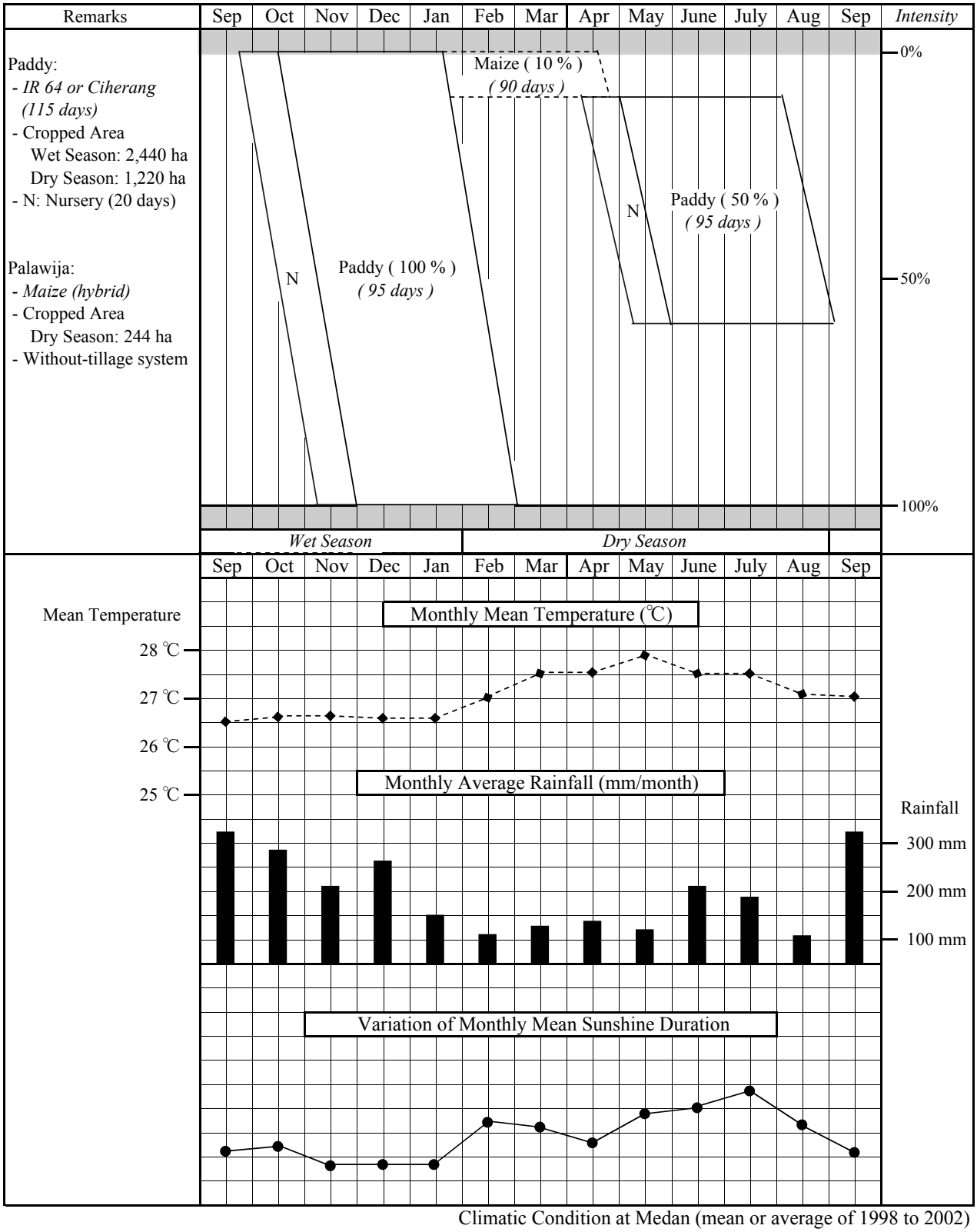


Figure B-1.5.2 Water Resources Development Policy Framework in North Sumatra

Figure B-3.3.1 Planned Cropping Pattern: Padang Mahondang Irrigation Scheme



Climatic Condition at Medan (mean or average of 1998 to 2002)

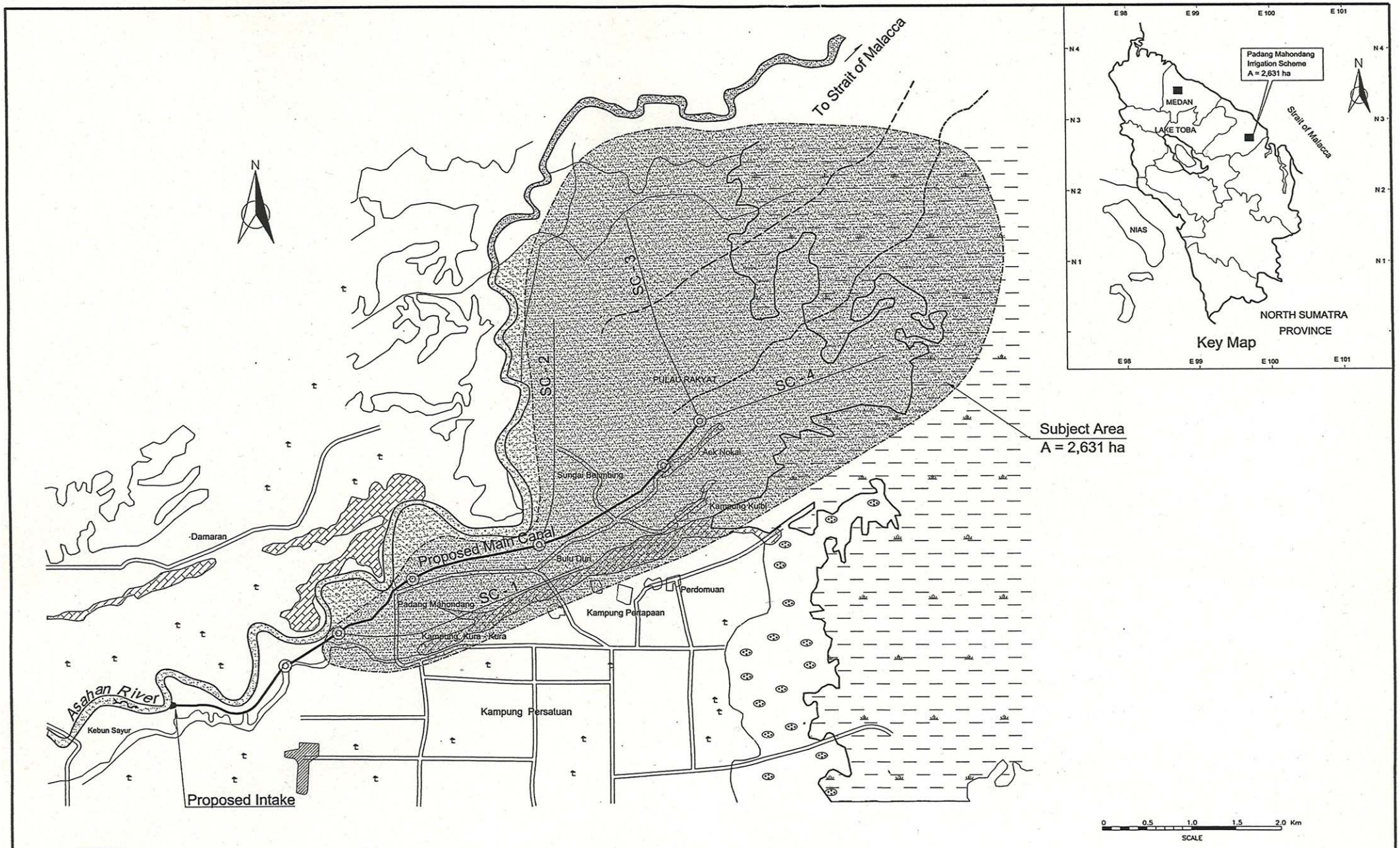
Figure B-5.3.1 Implementation Program of Rehabilitation Work for Padang Mahondang Irrigation Scheme

Phase	Sector	Item of Implementation		Year from Commencement of Midterm Phase									
		Item	Works	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Midterm	1. Irrigation/ Civil Works	**Feasibility Study**	Procurement of consultant										
			Preparation of F/S										
			Preparation of Implementation Schedule										
	2.Institution	**Strengthening Program**	Government staff										
			Water Users Association										
			Initial setting-up of FWUA and MWUA										
	3.Project Budget		Budget arrangement										
Final	1. Irrigation/ Civil Works	**Implementation**	Procurement of consultant										
			Detailed design										
			Tender for procurement of contractor										
			Civil works for rehabilitation										
	2.Institution	**Training and Guidance**	O&M for tertiary and on-farm										
			Collection of irrigation service fee and accounting										
	3. Extension Service												
		Formulation of task force team											
		Formulation of strengthening program											
		Identification and confirmation of constraints											
		Countermeasures or technology to be introduced for mitigation of constraints											
		Preparation of detailed program for strengthening											
		Implementation of program											
		Preparation of annual program											
		Budget arrangement											
		Preparation of detailed agreed plan of operation											
		Preparation extension materials											
		Implementation of program, monitoring and evaluation											

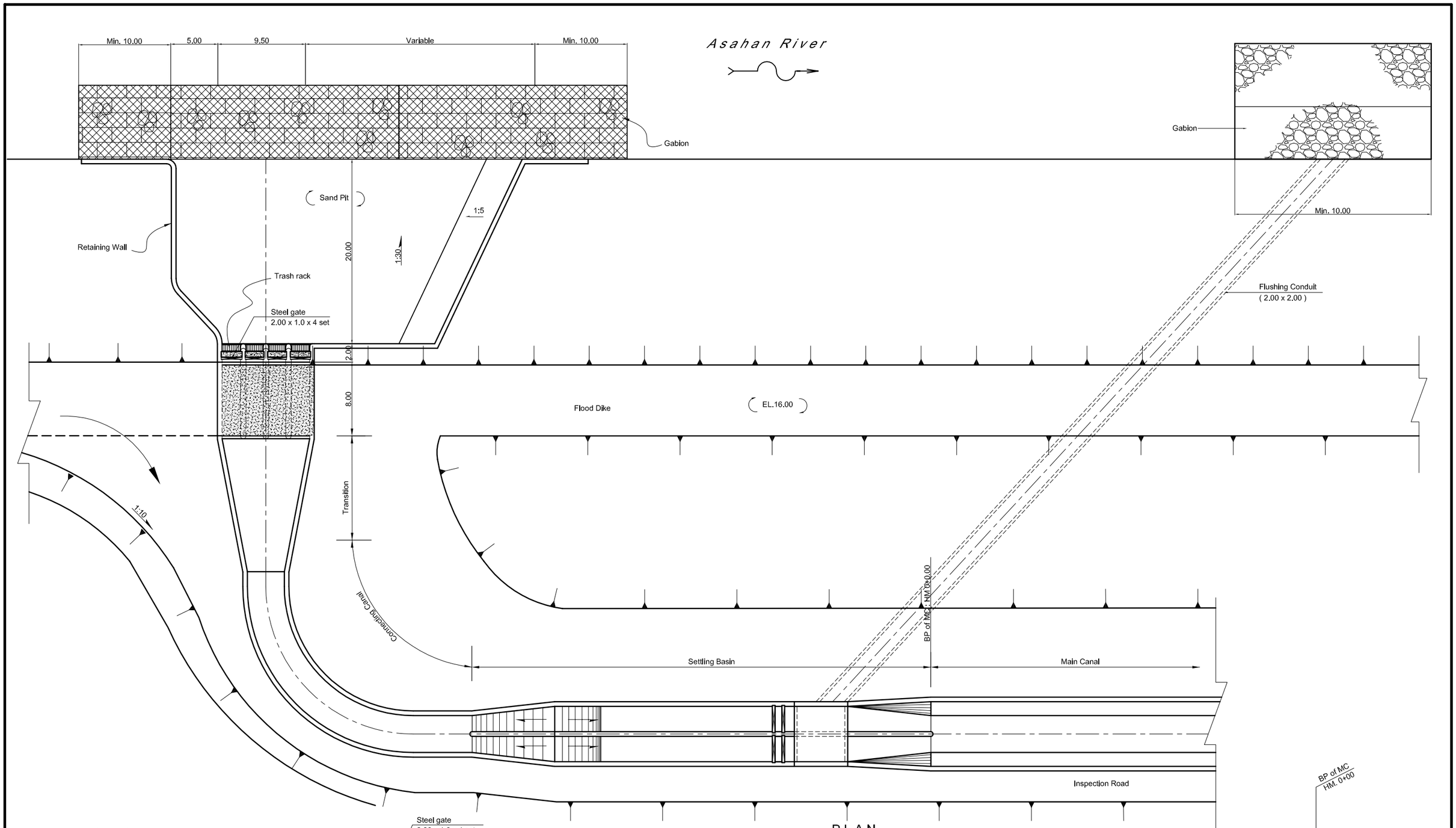
Drawings

List of Drawings

Drawing No.	Title
100	GENERAL
100-01	General Layout
200	WATER RESOURCES FACILITY
200-01	Development Plan of Intake Structure
300	CANALS
300-01	Irrigation Diagram and Development Plan of Canals & Related Structures



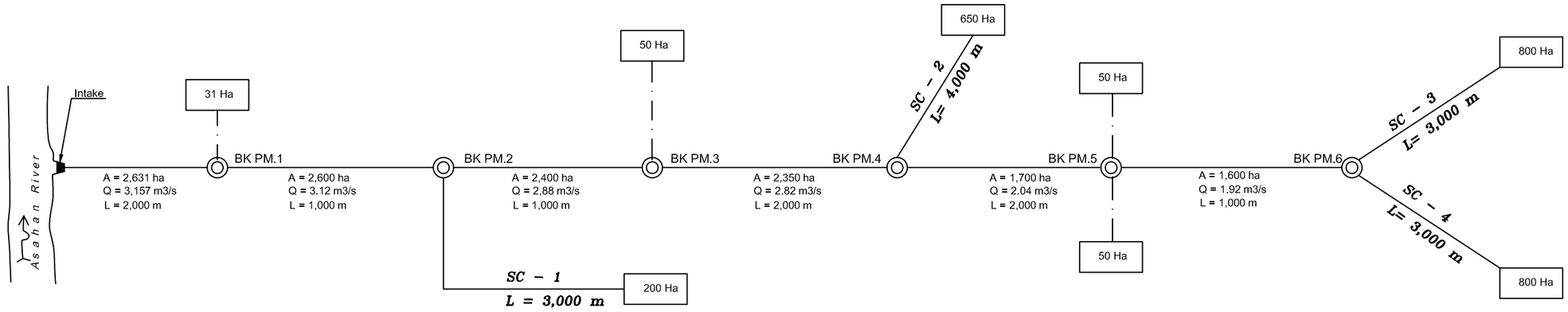
The Study on Comprehensive Recovery Program of Irrigation Agriculture	Drawing 100-01
Japan International Cooperation Agency	Padang Mahondang Scheme General Layout



The Study on Comprehensive Recovery Program of Irrigation Agriculture	Drawing 200–01 Padang Mahondang Scheme Development Plan of Intake Structure
Japan International Cooperation Agency	

IRRIGATION DIAGRAM

A=2,631ha



Dimension of Main Canal

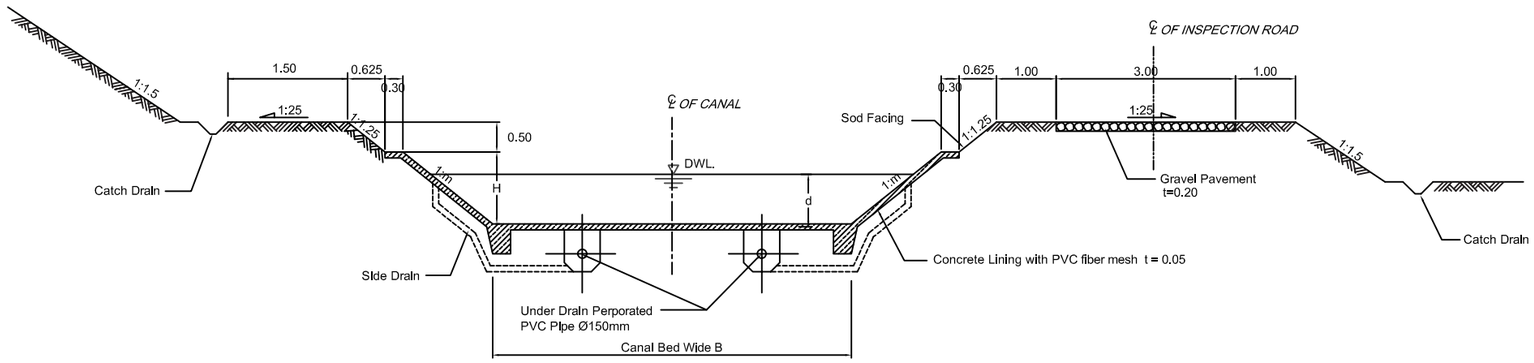
HM	BK	Distance (m)	Canal Dimension						
			Design discharge (m^3/s)	Canal bed width (m)	Canal height (m)	Lining height (m)	Uniform water depth (m)	Side slope	Hydraulic gradient
			Q	B	H + 0.50	H	d	m	1/I
0 + 00	BP of MC								
		2,000	3.16	2.00	2.40	1.90	1.30	1.25	6,000
20 + 00	BK. PM 1								
		1,000	3.12	2.00	2.40	1.90	1.29	1.25	6,000
30 + 00	BK. PM 2								
		1,000	2.88	2.00	2.40	1.90	1.24	1.25	6,000
40 + 00	BK. PM 3								
		2,000	2.82	2.00	2.30	1.80	1.22	1.25	6,000
60 + 00	BK. PM 4								
		2,000	2.04	2.00	2.10	1.60	1.03	1.25	6,000
80 + 00	BK. PM 5								
		1,000	1.92	2.00	2.10	1.60	1.00	1.25	6,000
90 + 00	BK. PM 6								

List of Irrigation Canals and Related Structures

List of Canals		
Name of Canal	Length (m)	Rehabilitation Grade
Main	9,000	RG4 (New)
Secondary -1	3,000	RG4 (New)
(SC-1)		
Secondary -2	4,000	RG4 (New)
(SC-2)		
Secondary -3	3,000	RG4 (New)
(SC-3)		
Secondary -4	3,000	RG4 (New)
(SC-4)		
SC Total	13,000	RG4 (New)

Rehabilitation Grade :
RG4 = New Construction

List of Structures on Main Canal				
Structure Serial No.	Structure	HM	Name/Code of Structure	Rehabilitation Grade
MC-1	Road Crossing Culvert	5 + 00	BK. PM1b	RG4 (New)
MC-2	Road Crossing Culvert	10 + 00	BK.PM1a	RG4 (New)
MC-3	Division Structure	20 + 00	BK.PM1	RG4 (New)
MC-4	Division Structure	30 + 00	BK.PM2	RG4 (New)
MC-5	Road Crossing Culvert	33 + 00	BK.PM3b	RG4 (New)
MC-6	Drainage Culvert	37 + 00	BK.PM3a	RG4 (New)
MC-7	Division Structure	40 + 00	BK.PM3	RG4 (New)
MC-8	Road Crossing Culvert	50 + 00	BKPM4a	RG4 (New)
MC-9	Division Structure	60 + 00	BK.PM4	RG4 (New)
MC-10	Drainage Culvert	70 + 00	BKPM5a	RG4 (New)
MC-11	Division Structure	80 + 00	BK.PM5	RG4 (New)
MC-12	Division Structure	90 + 00	BK.PM6	RG4 (New)



TYPICAL CROSS SECTION OF CANAL

LEGEND:

- River
- Intake
- Main Canal
- Secondary Canal
- Sub Secondary Canal
- Division Structure with Offtake
- Offtake
- b. Net Area (ha)

The Study on Comprehensive Recovery Program of Irrigation Agriculture

Japan International Cooperation Agency

Drawing 300-01
Padang Mahondang Scheme
Irrigation Diagram and Development Plan of Canals & Related Structures