Ministry of Agriculture, Forestry and Fishery

The team conducted a research which is related to the 4 items of the project contained in the R/D, TSI, condition of the achievements done so far, the input derived both from Japanese and Indonesian side, impact caused by the project and the aspects of self-supporting levels as well as future progress.

Among the 4 mentioned items of the project, the achievements within 3 particular fields namely Production of Thematic maps and Evaluation maps, Establishment of Data Base System and Execution of Training are relatively satisfactory. However, as concerns the Establishment of Guideline, it was recommended that for the finalization of the work the terms of the technical cooperation should be extended for one year more.

Based on the above, the Indonesian Government arranged necessary procedure and one year follow up cooperation was realized.

Holding the "3rd seminar on the role of Remote Sensing Technology and GIS for the Spatial Planning"

Despatch of six(6) short term experts

Acceptance of four(4) trainees to Japan

Middle level trainees training : Basic course 4 times
62 persons
Advance course 2 time
25 persons

Ⅲ -6. 1993 Fiscal year (93/94) Follow up period

Change of Indonesian Counterpart

Head of PUSDATA

17, Jul. from Dr. Soenarno to Ir. Akil

Project manager

21, Sep. from Drs. Suroso to Drs. Katamsi

Return of three(3) Japanese experts

4, June Project coordinator Mr. IZUMI

4, June System development Mr. SHIZUKUIKSHI

4, June Software development Mr. SUWABE

Then, following remained two(2) Japanese experts, had responsibility on cooperation in follow up period

System evaluation Mr. SAKAI

Agricultural development Mr. KAMIMURA

Development of Guideline element

Following worthfull GIS models are developed as the elements of Guideline. Some of them have simulation function which enables to offer more predictive information toward user side.

1) Geomorphological simulation model
2) Hydrological simulation model
3) Soil erosion estimation model
4) Sedimentation estimation model
5) Sifting cultivation field analysis model
6) Product transportation simulation model

Application trial of Guideline elements

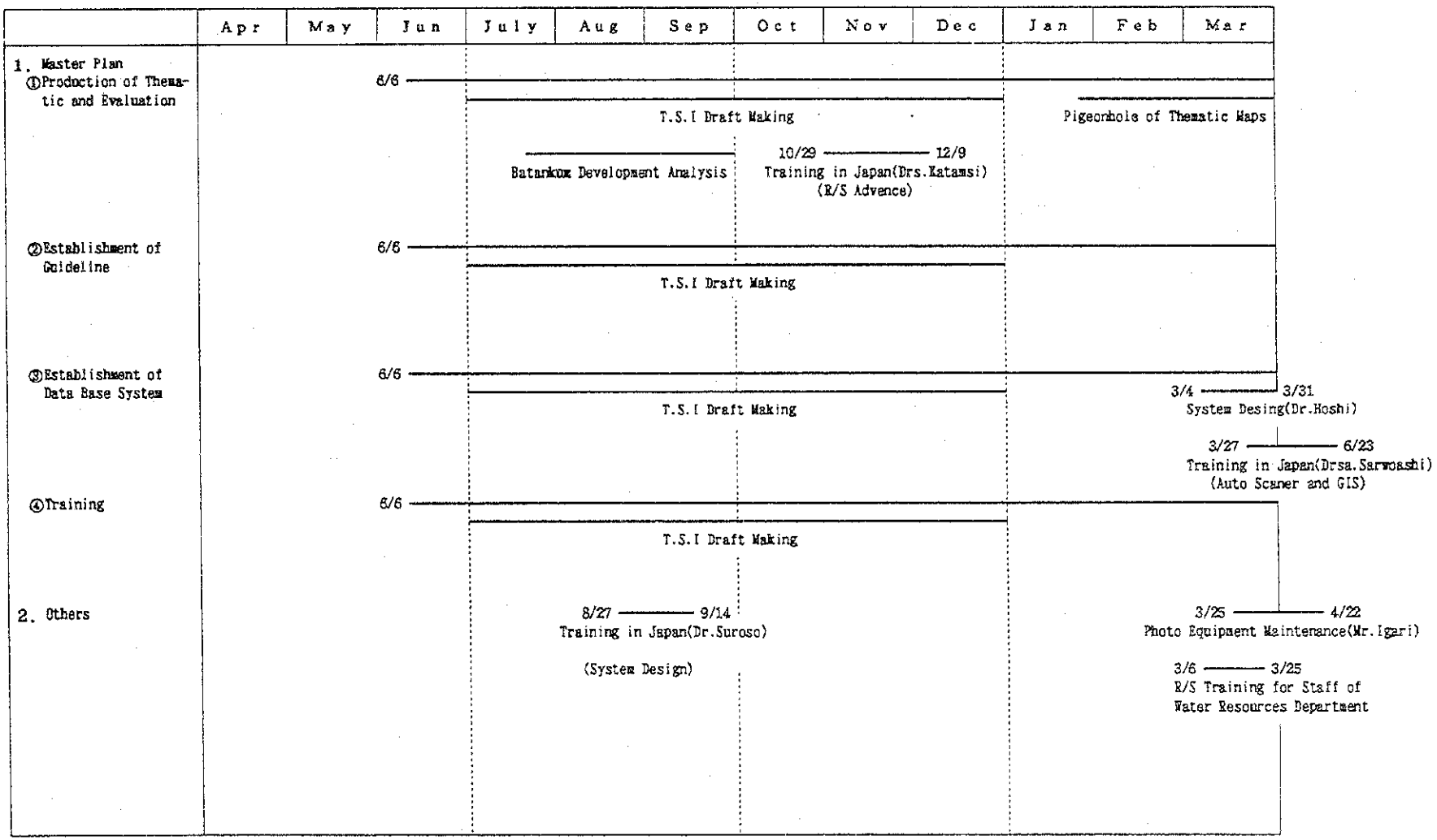
1) JRATUNSURNA river basin, Central Jawa
   - Geomorphological simulation model
   - Hydrological simulation model
   - Soil erosion estimation model
   - Sedimentation estimation model
2) Swamp estate, Indragiri river mouth, Riau province, Sumatera
   - Product transportation simulation model
3) Upper Kampar river basin, Riau province, Sumatera
   - Geomorphological simulation model
   - Hydrological simulation model
   - Soil erosion estimation model
   - Sedimentation estimation model
   - Sifting cultivation field analysis model

Overall compiling of the Guideline

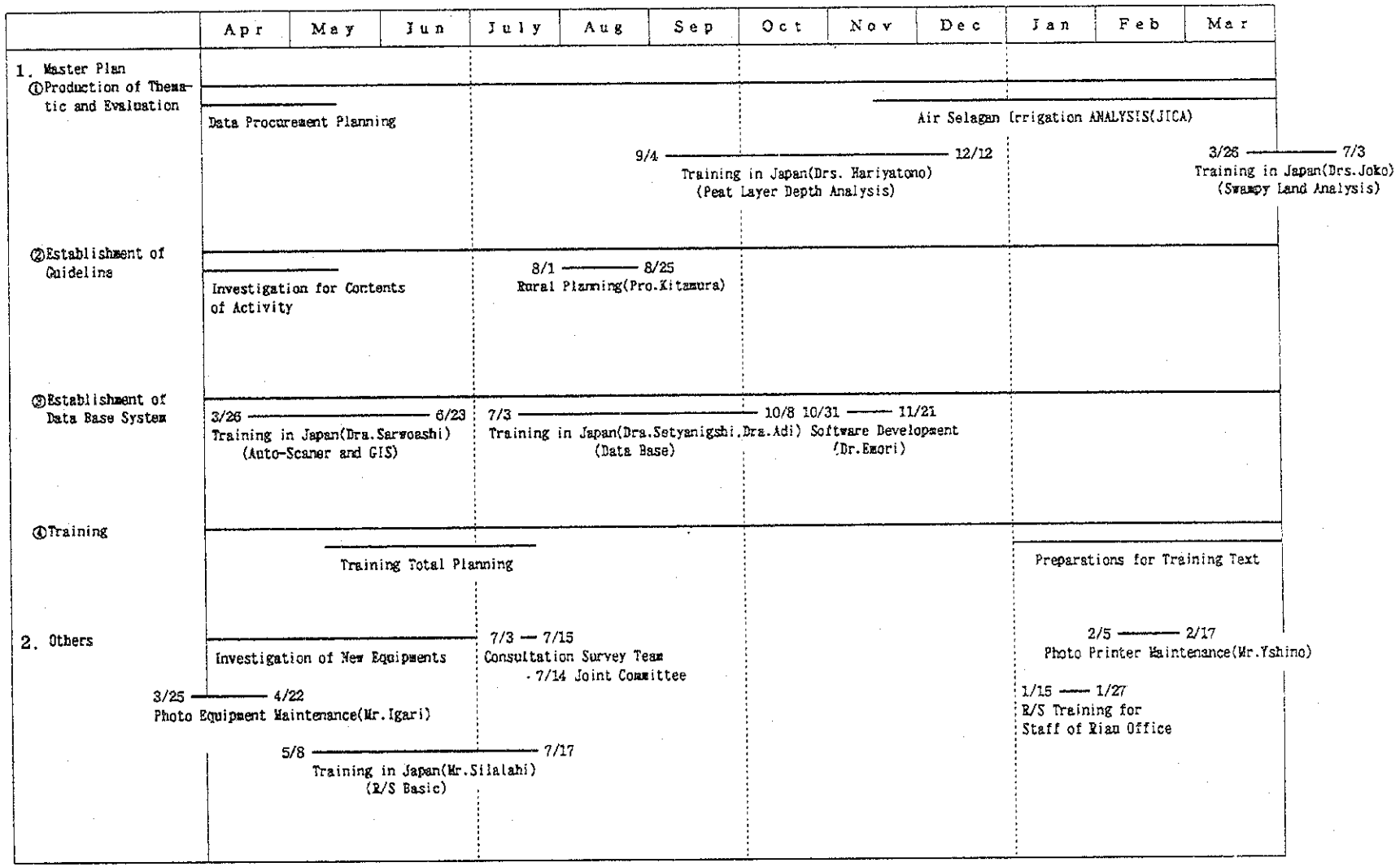
Holding the "4th seminar on the role of Remote Sensing Technology and GIS for the Spatial Planning"

Despatch of four(4) short term experts
Acceptance of four(4) trainees to Japan
Middle level trainees training : On the regional office training style 1 times 56 persons

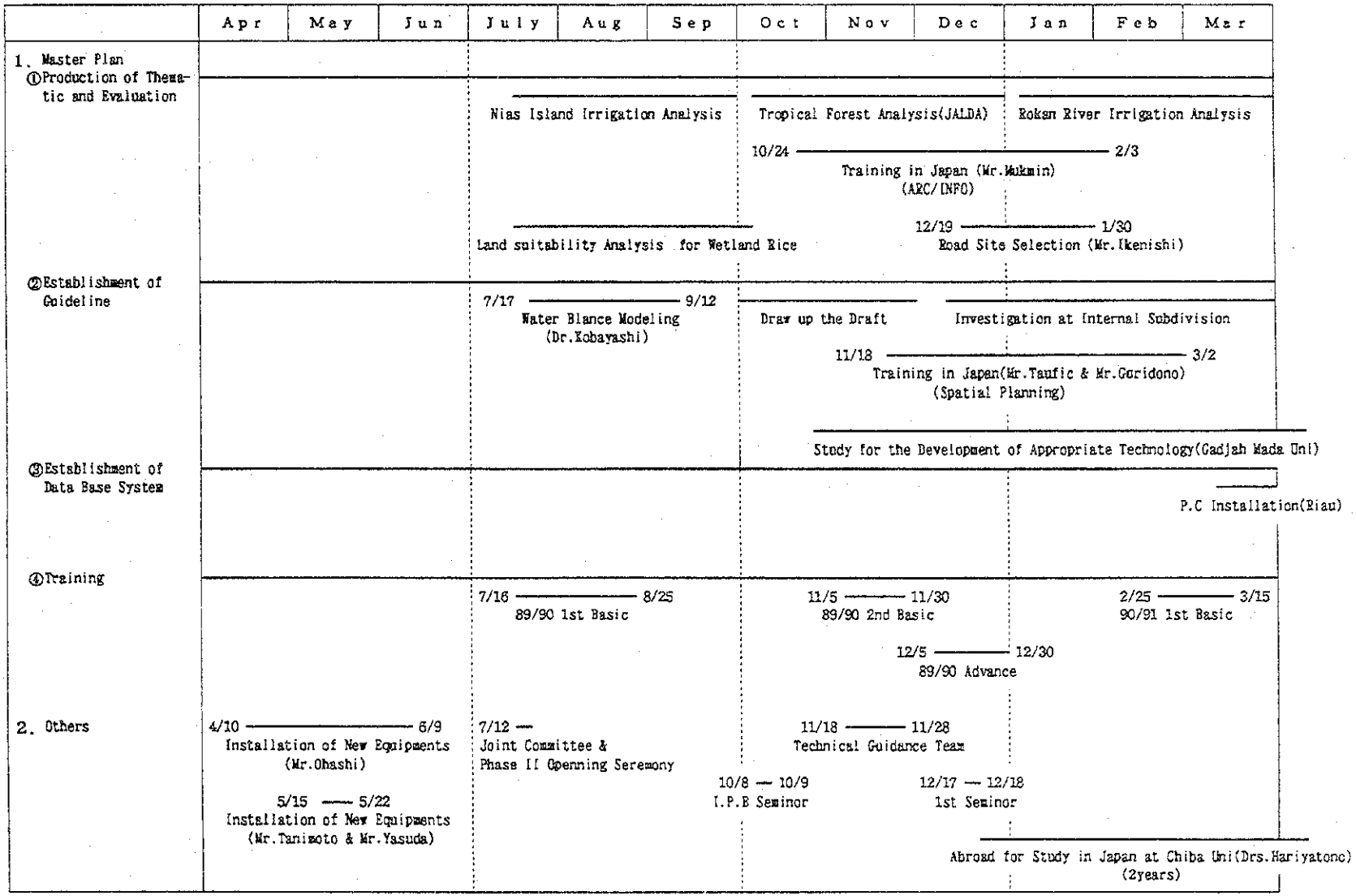
Results of 88/89 fiscal year



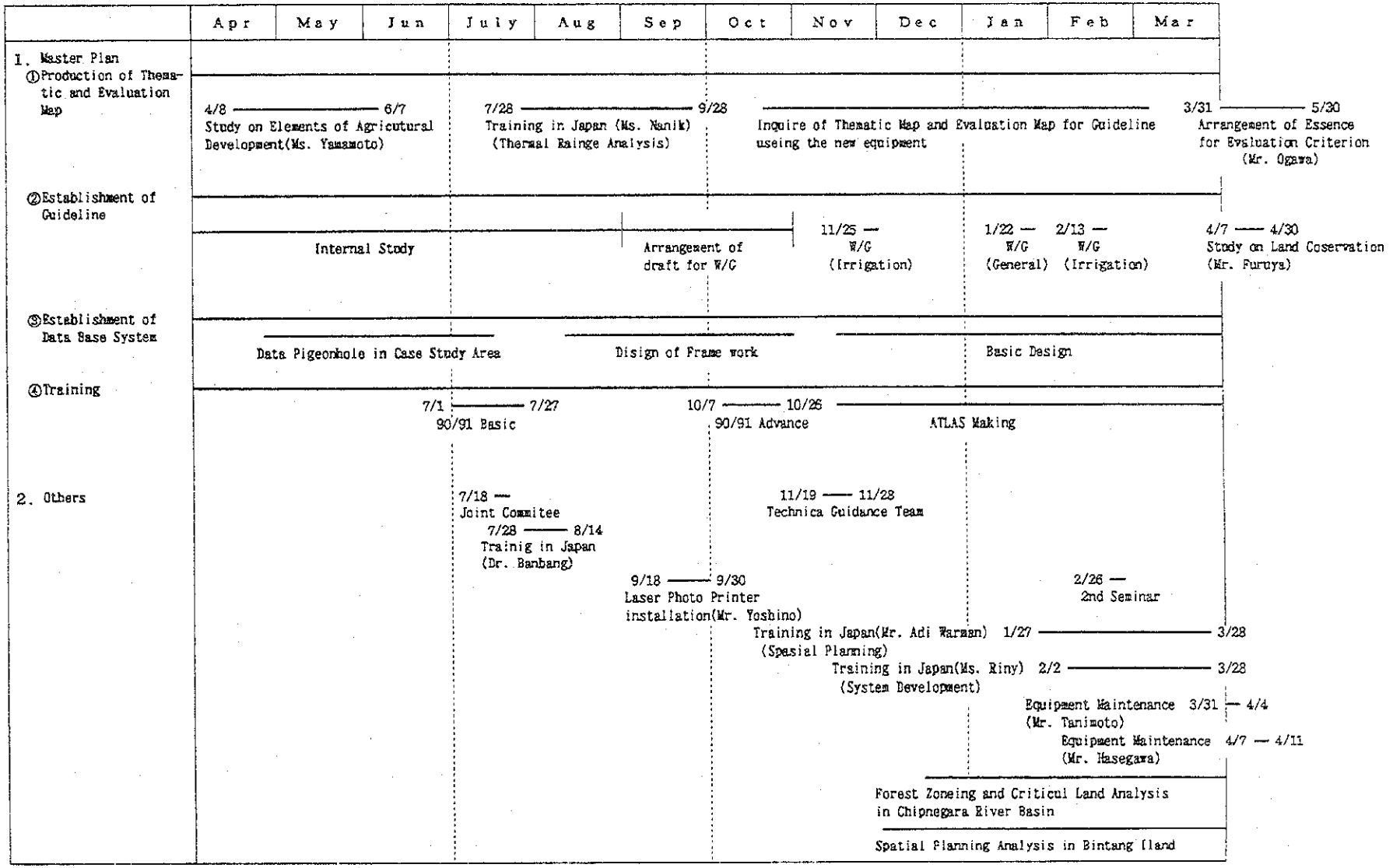
Results of 89/90 fiscal year



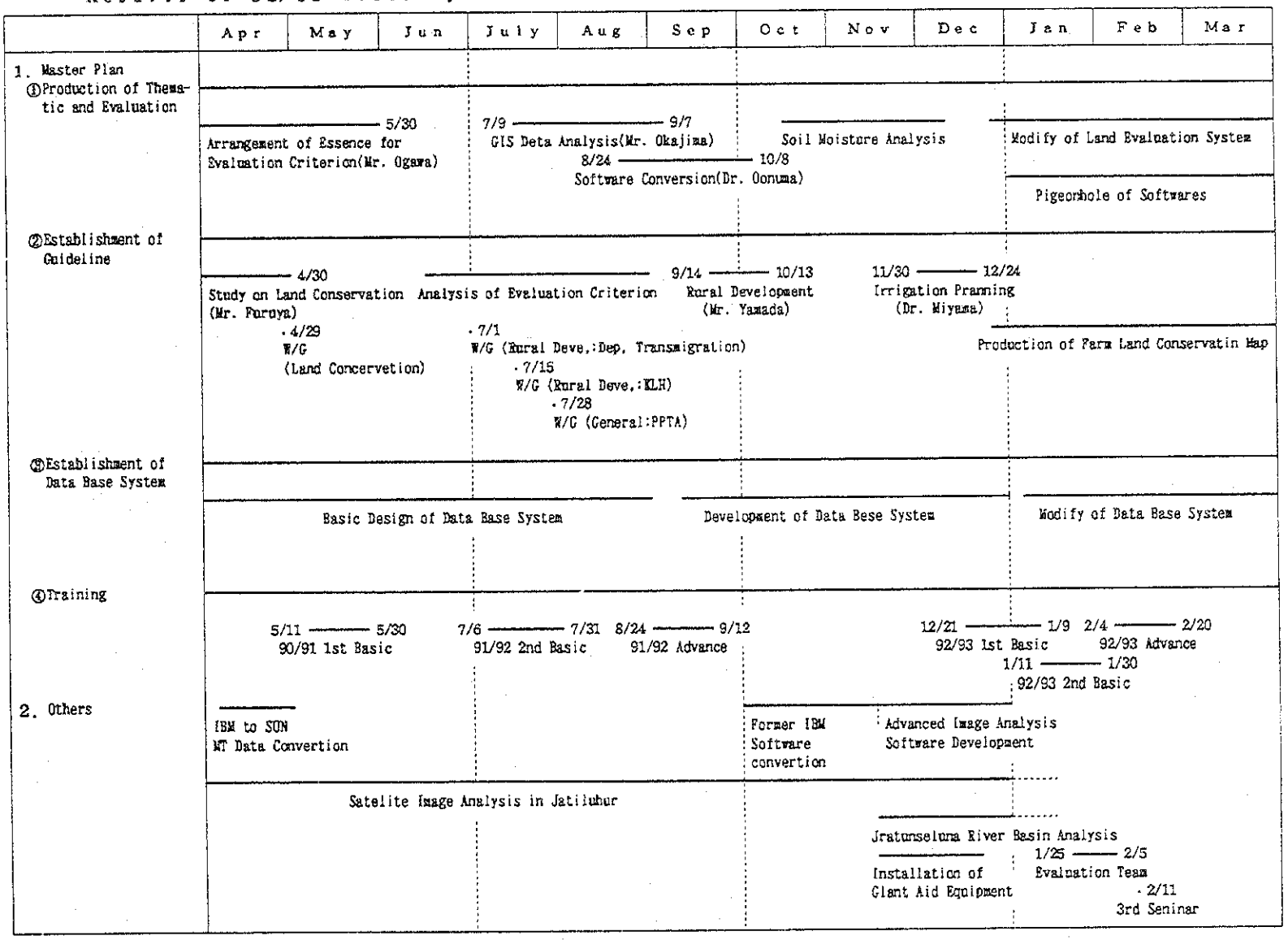
Results of 90/91 fiscal year



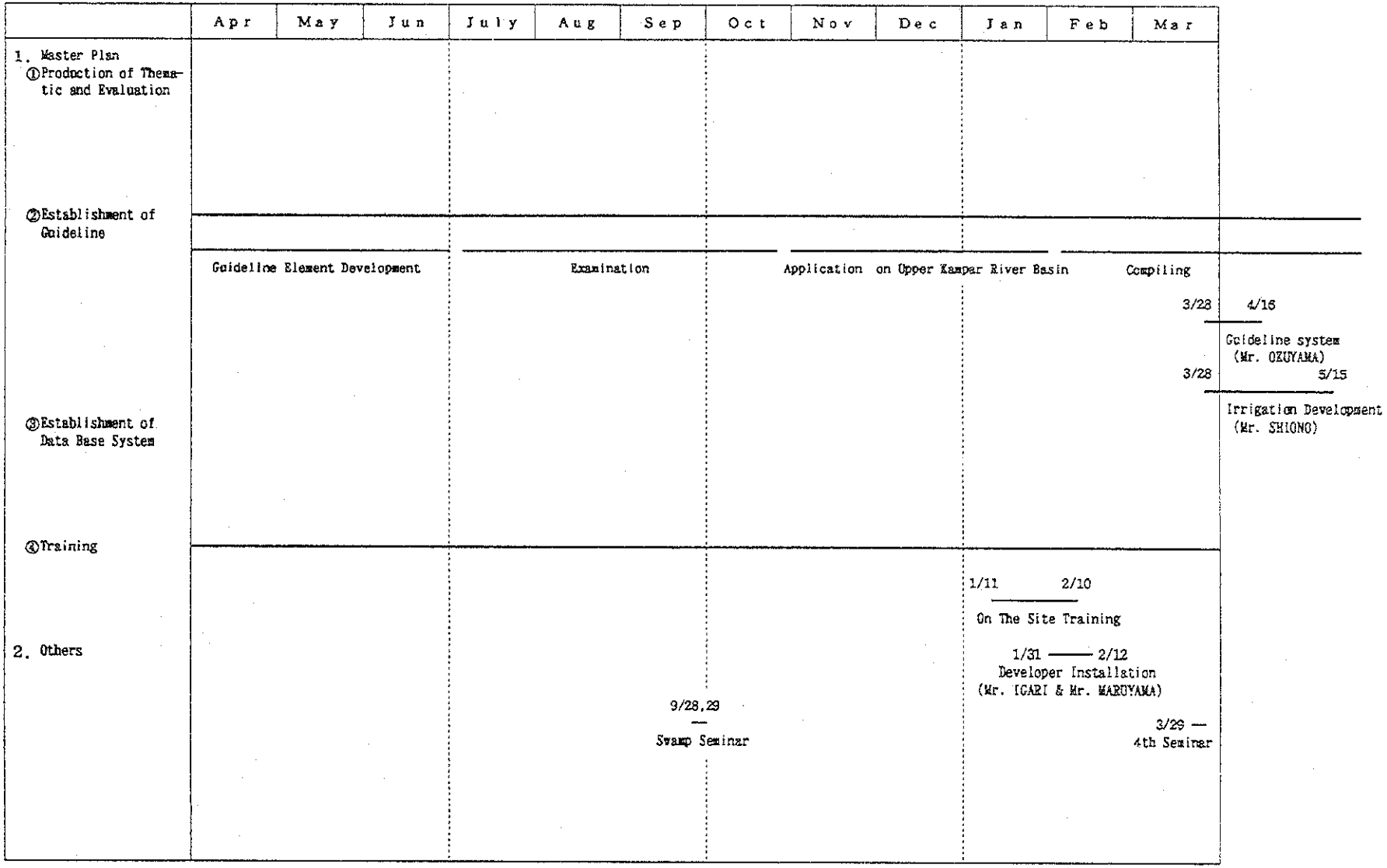
Results of 91/92 fiscal year



Results of 92/93 fiscal year



Results of 93/94 fiscal year (Follow up Period)



VI. Recommendation

It is recommend that Indonesian side would take serious effort to take measure against following items to make sure the self support of PUSDATA R/S and GIS activity by transferred technology and system after termination of Project.

1. Establishment of maintenance formation

(1) General (on call) maintenance contract between PUSDATA and local agency

(2) Maintenance contract between PUSDATA and supplier in Japan on the equipment which is no agency in Indonesia.

(3) Dairy maintenance formation in site

(3) Site repair formation for slight trouble

(4) preparation of fund for maintenance, spare parts and consumption

1) PUSDATA routine budget

2) Cost allocation among cooperation organization

3) Accumulation of trust work fee

2. Development of demand

(1) Advertisement of PUSDATA function

1) Public Relation materials (Leaflet, Book)

2) Arrangement of references on Guideline and it's result

(2) Grasp and inducement of needs

1) Investigation of activity in another organizations

2) Research the possibility of application of Guideline

3) Proposal on contribution to another organizations

3. Promotion of self support of regional office

(1) Trust work ask to regional office from Headquarter
  1) Data entry of raw information for national spatial plan
  2) Data arrangement of provincial development plan
  3) Job allocation of data base preparation

(2) Inducement of regional level demand
  1) Production of provincial development potential map
  2) Inducement activity against relevant organizations

(3) Establishment of data communication
  1) Supply PUSDATA data to regional office
     Satellite image data
     Analyzed result
  2) Accumulation of regional data to PUSDATA
     Local digitized data
     Field (survey) data
  3) Job trust between regional office and PUSDATA
     High technology process by PUSDATA
     Job allocation to regional office

Furthermore, it is earnestly expected that Japanese side continue any support for a while to accelerate the sustainable activity of PUSDATA after termination of the Project.

ANNEX

ANNEX

ANNEX - 1 - (1).

<LIST OF JAPANESE EXPERTS>(LONG TERM)

NAME		FILDE	PERIOD
KOICHI	YAMAZAKI	TEAM LEADER	16.JUL.1988 - 15.JUL.1990
HIROSHI	ISHIDA	AGRICULTURAL DEVE,PLANNING	1.AUG.1988 - 31.JUL.1991
HIDEMOTO	TANAKA	COODINATOR	18.NOV.1988 - 16.MAR.1991
SATOSHI	UCHIDA	SOFTWARE DEVELOPMENT	31.JUL.1989 - 30.JUL.1991
RYOTA	NAGASAWA	SYSTEM DEVELOPMENT	15.AUG.1989 - 14.SEP.1991
SHINOBU	SAKAI	TEAM LEADER	5.JUL.1990 - 5.JUN.1993
MAMORU	IZUMI	COODINATOR	10.MAR.1991 - 5.JUN.1993
KEN-ICHIRO	KAMIMURA	AGRICULTURAL DEVE,PRANNING	25.JUL.1991 - 5.JUN.1993
MASAMI	SHIZUKUISHI	SOFTWARE DEVELOPMENT	5.AUG.1991 - 5.JUN.1993
KAZUMI	SUWABE	SYSTEM DEVELOPMENT	1.OCT.1991 - 5.JUN.1993

ANNEX - 1 - (2).

<LIST OF JAPANESE EXPERTS>(SHORT TERM)

NAME		FILDE	PERIOD
TAKASHI	HOSHI	SOFTWARE(DATA BASE MANAGEMENT SYSTEM)	4.MAR.1989 - 31.MAR.1989
TOSHIO	IGARI	HARDWARE(PHOTO EQUIPMENT MAINTENANCE)	25.MAR.1989 - 22.APR.1989
TEITARO	KITAMURA	SOFTWARE(GUIDELINE FOR RURAL DEVELOPMENT)	1.AUG.1989 - 25.AUG.1989
YASUFUMI	EMORI	" (SOFTWARE DEVELOPMENT)	31.OCT.1989 - 21.NOV.1989
MICHIO	YOSHINO	HARDWARE(PHOTO PRINTER MAINTENANCE)	5.FEB.1990 - 17.FEB.1990
MAKOTO	OHASHI	SOFTWARE(P.C. SYSTEM INSTALLATION)	10.APR.1990 - 9.JUN.1990
JUN-ICHI	TANIMOTO	HARDWARE(W.E.S. INSTALLATION)	15.MAY.1990 - 22.MAY.1990
MOTOKAZU	YASUDA	" (COLOR PROTTER INSTALLATION)	15.MAY.1990 - 22.MAY.1990
SHINTARO	KOBAYASHI	SOFTWARE(WATER AVAILABILITY APPRAISAL)	17.JUL.1990 - 12.SEP.1990
NOBORU	IKENISHI	" (ROAD SITE SELLECTION)	19.DEC.1990 - 30.JAN.1991
YUKIYO	YAMAMOTO	" (LAND EVALUATION STUDY)	8.APR.1991 - 7.JUN.1991
MICHIO	YOSHINO	HARDWARE(LAZER PHOTO PRINTER INSTALLATION)	18.SEP.1991 - 29.SEP.1991
JUN-ICHI	TANIMOTO	" (E.W.S. MAINTENANCE)	31.MAR.1992 - 5.APR.1992
SHIGEO	OGAWA	SOFTWARE(EVALUATION MAP MAKING)	31.MAR.1992 - 30.MAY.1992
SEIJI	HASEGAWA	HARDWARE(M.T. UNIT MAINTENANCE)	7.APR.1992 - 12.APR.1992
TAMOTU	FURUYA	SOFTWARE(FARM LAND CONSERVATION)	7.APR.1992 - 30.APR.1992
MASAO	OKAJIMA	" (G.I.S. DATA ANALYSIS)	9.JUL.1992 - 8.SEP.1992
KAZUHIKO	ONUMA	" (SOFTWARE CONVERSION)	24.AUG.1992 - 9.OCT.1992
YASUHARU	YAMADA	" (RURAL DEVELOPMENT PLANNING)	14.SEP.1992 - 14.OCT.1992
KAZUYA	MIYAMA	" (IRRIGATION & DRAINAGE PLANNING)	30.NOV.1992 - 25.DEC.1992
TOSHIO	IGARI	HARDWARE(DEVELOPER INSTALLATION)	31.JAN.1994 - 12.FEB.1994
MITSO	MARUYAMA	HARDWARE(DEVELOPER INSTALLATION)	31.JAN.1994 - 12.FEB.1994
MANABU	OKUYAMA	SOFTWARE(GUIDELINE SYSTEM)	28.MAR.1994 - 16.APR.1994
TAKAHIRO	SHIONO	SOFTWARE(IRRIGATION DEVELOPMENT)	28.MAR.1994 - 15.MAY.1994

ANNEX - 1 - (3).

<LIST OF REPORTRS>-- 1

NUMBER	NAME	ASSIGNMENT FILDE	NAME OF REPORT
RSII-88-1	MR. HOSHI	SOFTWARE	DATA BASE MANEGEMENT SYSTEM IN R/S DATA
-88-2	〃	〃	〃
-88-3	〃	〃	〃
-88-4	〃	〃	〃
-88-5	MR. IGARI	HARDWARE	REPORT ON HARDWARE DEVELOPMENT
-88-6	〃	〃	〃
-88-7	PROJECT		ANNUAL REPORT
-89-1-8	DR. KITAMURA	SOFTWARE	GUIDELINE FOR RURAL DEVELOPMENT PLANNING
-89-2-9	〃	〃	〃
-89-3-10	DR. EMORI	〃	SOFTWARE DEVELOPMENT MAIN REPORT
-89-4-11	〃	〃	〃
-89-5-12	MR. YOSHINO	HARDWARE	HARDWARE DEVELOPMENT REPORT
-89-6-13	MR. OHASI	SOFTWARE	SOFTWARE DEVELOPMENT REPORT
-89-7-14	PROJECT		ANNUAL REPORT
-90-1-15	MR. TANIMOTO	HARDWARE	HARDWARE DEVELOPMENT
-90-2-16	MR. YASUDA	〃	HARDWARE DEVELOPMENT
-90-3-17	MR. YAMAZAKI	TEAM LEADER	FINAL REPORT
-90-4-18	〃	〃	〃
-90-3-19	DR. KOBAYASI	SOFTWARE	WATER AVAILABILITY APPRAISAL FOR PADDY FIELD
-90-4-20	MR. IKENISHI	〃	ROAD SITE SELECTION STUDY IN THE RIAU PROVINCE
-90-6-22	MR. TANAKA	COODINATOR	FINAL REPORT
-90-7-23	MS. YAMAMOTO	SOFTWARE	LAND EVALUATION STUDY FOR TRANSMIGRATION AREA
-90-8-24	PROJECT		ANNUAL REPORT
-91-1-25	MR. ISHIDA	AGRICULTRAL DEV,	FINAL REPORT
-91-3-27	MR. NAGASAWA	SYSTEM DEVELOPMENT	〃
-92-1-28	MR. FURUYA	SOFTWARE	SOIL ERODIBILITY FOR FARMLAND CONSERVATION

<LIST OF REPORTS>－2

NUMBER	NAME	ASSIGNMENT FILDE	NAME OF REPORT
-92-2-29	MR. OGAWA	SOFTWARE	EVALUATION MAP MAKING
-92-3-30	MR. OKAJIMA	〃	THE LAND EVALUATION SYSTEM FOR AGRICULTURAL DEV,
-92-4-31	DR. ONUMA	〃	SOFTWARE CONVERSION OF BULK PROCESSING PL1 TO C
-92-5-32	DR. MIYAMA	〃	MANAGEMENT OF DAM CATCHMENT AND IRRIGATION DAM BY USING R/S AND GIS TECHNIQUE
-92-6-33	MR. YAMADA	〃	AN ESTIMATION OF ACCESSIBILITY IN SUITABLE AREA SELECTION FOR AGRICULTURAL INFRASTRUCTURE DEVE,
-92-7-34	PROJECT		ANNUAL REPORT
-93-1-35	MR. IZUMI	COORDINATOR	FINAL REPORT
-93-2-36	MR. SUWABE	SOFTWARE DEVELOP,	〃
-93-3-37	MR. SHIZUKU-ISHI	SYSTEM DEVELOPMENT	〃
-94-1-38	Mr. OKUYAMA	SOFTWARE	SOFTWARE DEVELOPMENT
-94-2-39	Mr. SHIONO	SOFTWARE	STUDY ON ESTIMATION OF WATER DEMAND POTENTIAL IN IRRIGATED AGRICULTURAL AREA
-94-3-40	Mr. KAMIMURA	AGRICULTURE DEV.	FINAL REPORT
-94-4-41	Mr. SAKAI	TEAM LEADER	FINAL REPORT

ANNEX - 1 - (4).

Assignment of counterparts

	NAME	POST	ASSIGN	REMARK
1	Ir. Tubagus Haedar Ali	HEAD OF PUSDATA	1980.04.01	PROJECT HEAD(90.10 CHANGED)
2	Dr.Ir. Bambang Soemtoroadi	〃	1990.10.20	〃 (91.09 CHANGED)
3	Dr. Soenarno	〃	1991.09.14	〃 (93.07 CHANGED)
4	Ir. Akil	〃	1993.07.17	〃
5	Drs. Suroso M. Djojosoekarto	HEAD OF R/S DIVISION	1980.04.01	PROJECT MANAGER (Retired)
6	Drs. Ibnu Katamsi	HEAD OF R/S DIVISION	1993.09.21	〃
7	Ir. Hariyatno Soemarman	SECSION CEEF	1981.06.15	AGRICULTURAL DEVELOPMENT
8	Dra. Setyaningsih	〃	1981.04.01	SYSTEM DEVELOPMENT
9	Drs. Joko Setiyono	SUTAFF	1983.02.25	AGRICULTURAL DEVELOPMENT
10	Dra. Sri Sarwoasih	〃	1983.02.25	〃
11	Ir. Naniek Siti Nurdjiati	〃	1981.03.01	SOFTWARE DEVELOPMENT
12	Drs. Muh Dimyati	〃	1983.02.25	〃(91.03 CHANGED)
13	Dra. Marcelina Rinny	〃	1982.07.01	〃
14	Dra. Adi Sasutji	〃	1982.04.01	SYSTEM DEVELOPMENT
15	Dra. Sri Yumadiati	〃	1982.10.01	AGRICULTURAL DEVELOPMENT
16	Ms. Hayrita Woworuntu	〃	1980.04.01	ACCOUNTANT
17	Ms. Henny Purwihati	〃	1981.04.01	ADMINISTRATION
18	Mr. Win Ellas Yekti M.	〃	1985.03.01	ADMINISTRATION, TECHNICAL
19	Mr. Sutarno Lestari	〃	1983.06.06	ADMINISTRATION (Passed)
19	Mr. Gunanto	〃	1987.03.01	ADMINISTRATION
21	Mr. Heru Sasongko	〃	1983.02.25	EQUIPMENT MANAGEMANT
22	Mr. Suhadi Nurwedha	〃	1981.04.01	ADMINISRATION
23	Mr. Wagiyo	〃	1983.06.01	PHOTO MANAGEMENT
24	Mr. Abdul Mukmin	〃	1983.10.24	TECHNICAL SAPORT
25	Mr. Alisu	〃	1993.04.01	〃

ANNEX - 1 - (5).

<LIST OF INDONESIAN PERSONNEL TRAINED IN JAPAN> - 1

NAME	TRAINING ITEM	PERIOD	ACCEPTANCE OF TRAINEE
Drs. Suroso	SYSTEM DESIGN	27.AUG.1988 - 14.SEP.1988	M.O.A.F.F.,JICA,CHIBA-UNIV, etc
Drs. Ibnu Katamsi	R/S ADVANCE	29.OCT.1988 - 9.DEC.1988	RESTEC(GROUP TRAINING)
Dra. Sri Sarwoasih	AUTO SCANER & GIS	27.MAR.1989 - 23.JUN.1989	PASCO CO,. TUKUBA-UNIV
Drs. Taruli Silalahi	R/S BASIC	8.MAY.1989 - 23.JUN.1989	RESTEC(GROUP TRAINING)
Dra. Setyningsih Haryadi	DATA-BESE	3.JUL.1989 - 8.OCT.1989	TUKUBA-UNIV, PASCO CO,.
Dra. Adi Sasutji	〃	〃	〃
Ir. Hariyatno Soemarman	SWAMP ANALYSIS	4.SEP.1989 - 8.OCT.1989	CHIBA-UNIV,
Drs. Joko Setiyono	〃	26.MAR.1990 - 3.MAR.1990	M.O.A.F.F.(TUKUBA)
Mr. Abdul Mukmin	ARC/INFO	24.OCT.1990 - 3.FEB.1991	PASCO CO,.
Mr. Guridno	SPATIAL ANALYSIS	18.NOV.1990 - 2.MAR.1991	PASCO CO,. KYOTO-UNIV
Mr. Taufic	〃	〃	〃 〃
Dr. Ir.Bambang Soemitroadi	PROJECT MANAGEMENT	28.JUL.1991 - 14.AUG.1991	M.O.A.F.F., JICA, KYOTO-UNI, etc
Ir.Naniek Siti	TEMPERATURE ANALYSIS OF T.M.	28.JUL.1991 - 28.SEP.1991	M.O.A.F.F.(HOKKAIDO)
Mr. Adiwarman	SPATIAL ANALYSIS	27.JAN.1992 - 28.MAR.1992	PASCO CO,.
Dra. Marcelina Rinny	SYSTEM DEVELOPMENT	2.FEB.1992 - 28.MAR.1992	CHIBA-UNIV, PASCO CO,.

<LIST OF INDONESIAN PERSONNEL TRAINED IN JAPAN>－2

NAME	TRAINING ITEM	PERIOD	ACCEPTANCE OF TRAINEE
Dra. Sri Yumadiati	FARM LAND CONSERV-ATION	20.JAN.1993 - 30.MAR.1993	CHIBA-UNIV, PASCO CO,.
Ms. Andrianita	SAPTIAL ANALYSIS	15.FEB.1993 - 19.MAR.1993	PASCO CO,.
Mr. Wagiyo	PHOTO PROCESS	25.FEB.1993 - 16.MAR.1993	SHURIRO TRADING COMPANY
Dr. Soenarno	PROJECT MANAGEMENT	2.MAR.1993 - 13.MAR.1993	JICA, M.O.A.F.F, etc
Mr. Heru Sasongko	Equipment Mainte-nance	26.AUG.1993 - 30.OCT.1993	PASCO CO,.
Mr. Win Elas Yekti Marmono	SAPTIAL ANALYSIS	26.AUG.1993 - 30.OCT.1993	PASCO CO,.
Mr. Djoko Paryoto	SAPTIAL ANALYSIS	26.AUG.1993 - 30.OCT.1993	PASCO CO,.
Mr. Warih Kusma S.P.	SAPTIAL ANALYSIS	26.AUG.1993 - 30.OCT.1993	PASCO CO,.

*M.O.A.F.F. : MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
RESTEC : REMOTE SENSING TECHNOLOGY CENTER OF JAPAN

ANNEX - 1 - (6).

LIST OF JAPANESE MISSION TO THE PROJECT>

「PROJECT FORMULATION SURVEY MISSION」(22.MAY.1988 - 1.JUN.1988)	
LEADER :KAZUO KIMURA	MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
COOPERATION PLANNING :MAMORU ISHIKAWA	〃
AGRICULTURAL DEVELOPMENT :SHINSUKE OTA	〃
NATURAL RESOURCES DEVELOPMENT :YASUHIKO NOGUCHI	MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY
NATURAL RESOURCES INQUIRY :HIROYA TUKADA	EARTH RESOURCES SATELLITE DATA ANALYSIS CENTER
REMOTE SENSING :TOSHIO MICHINO	REMOTE SENSING TECHNOLOGY CENTER OF JAPAN
COODINATOR :KAZUO NAGAI	JAPAN INTERNATIONAL COOPERATION AGENCY

「CONSULTATION SURVEY TEAM」(3.JUL.1989 - 15.JUL.1989)	
LEADER :KATUNOSUKE UENO	MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
AGRICULTURAL DEVELOPMENT :KEN-ICHIRO KAMIMURA	〃
SOFTWARE DEVELOPMENT :YUKIO MUKAI	REMOTE SENSING TECHNOLOGY CENTER OF JAPAN
COORDINATOR :HITOSHI GOTO	JAPAN INTERNATIONAL COOPERATION AGENCY

「TECHNICAL GUIDANCE TEAM」(18.NOV.1990 - 29.NOV.1990)	
LEADE :THUNEO MATHUTOMI	MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
AGRICULTURAL DEVELOPMENT :MASATOSHI HOSOKAWA	〃
SOFTWARE & SYSTEM DEVELOPMENT :YUKIO MUKAI	REMOTE SENSING TECHNOLOGY CENTER OF JAPAN
COORDINATOR :SHIRARA SHIOKAWA	JAPAN INTERNATIONL COOPERATION AGENCY

「TECHNICAL GUIDANCE TEAM」(19.NOV.1991 - 29.NOV.1991)	
LEADER :TAKASHI AOI	MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
GUIDELINE :MAMORU ISHIKAWA	〃
SYSTEM DEVELOPMENT :YUKIO MUKAI	REMOTE SENSING TECHNOLOGY CENTER OF JAPAN
COORDINATOR :SHIRARA SHIOKAWA	JAPAN INTERNATIONL COOPERATION AGENCY

「FINAL EVALUATION MISSION」(25.JAN.1993 - 5.FEB.1993)	
LEADER :NOBUYOSHI SAKINO	MINISTRY OF AGRICULTURE FORESTRY AND FISHERIES
AGRICULTURAL DEVELOPMENT :YOSHIO MATHUO	〃
SOFTWARE DEVELOPMENT :YUKIO MUKAI	REMOTE SENSING TECHNOLOGY CENTER OF JAPAN
COORDINATOR :MASAYOSHI INUZUKA	JAPAN INTERNATIONL COOPERATION AGENCY

ANNEX - 1 - (7).

<LIST OF EQUIPMENTS> -- 1

YEAR	NAME OF EQUIPMENT	QUANT-	AMOUNT	ARRIVE	GIVE/CARRIED
88	WORDPROCESSER(OASYS-LITE)	2 SET	¥ 896,000.	881115	CARRIED(ISHIDA)
	COPYMACHINE(XERO X-4790)	1 SET	Rp.17,820,000.	890327	GIVE
	SPEARE-PARTS(PHOTO QEUIPMENT)	1 LOT	¥ 2,016,000.	890329	GIVE
	AUTOMOBILE(TOYOTA KIJANG)	2 SET	Rp.41,640,000.	890411	GIVE
	VIDEO-CAMELA(SONY CCD-TR55)	1 SET	¥ 283,559.	890801	CARRIED(KITAMURA)
	WORDPROCESSER(BROTHR WP-1)	1 SET	¥ 438,660.	891027	CARRIED(UCHIDA)
	WORDPROCESSER(TOSHIBA JW-90B)	1 SET	¥ 282,100.	891027	CARRIED(NAGASAWA)
		TOTAL	Rp.59,460,000.		
			¥ 3,916,319.		
89	ERDAS	1 SET	¥ 7,500,000.	900410	GIVE
	ARC/INFO	1 SET	¥ 7,200,000.		
	P.C.ERDAS	2 SET	¥ 10,400,000.		
	P.C.ARC/INFO	2 SET	¥ 4,260,000.		
	dBASE-III	2 SET	¥ 400,000.		
	E.W.S.(SUN-4370-59)	1 SET	¥ 11,890,000.	900507	GIVE
	MEMORY MODULE(SN-014)	1 UNI	¥ 3,610,000.		
	MAGNETIC DISC DRIVE(SN-429)	1 UNI	¥ 3,253,000.		
	〃 (SN-427)	2 UNI	¥ 6,225,000.		
	PAGE PRINTER(SN-333)	1 UNI	¥ 750,000.		
	IMAGE PROCESSING BORD(UDC-3242-12C)	1 UNI	¥ 2,315,000.		
	20" MONITOR(HL-6915-SATGK)	1 UNI	¥ 810,000.		
	DIGITIZER-AO(DH-8503)	1 UNI	¥ 1,867,000.		
	ETHERNET CABLE CONNECTOR	1 SET	¥ 560,000.		
	COLOR PLOTTER(EP-4010)	1 UNI	¥ 17,300,000.		
	COLOR TONER, PAPER	1 SET	¥ 796,000.		
	UNINTERRUPTED POWER SUPPLY(5KVA)	2 UNI	¥ 3,784,000.		
	MAGNETIC TAPE DRIVE(SN-516)	1 UNI	¥ 3,420,000.		
	STABILIZER	2 UNI	¥ 855,000.		
	P. C(ACER-1133-341)	2 SET	¥ 6,956,000.		
	IMAGE PROCESSING BOARD(ATVISTA-4M)	2 UNI	¥ 3,220,000.		
	20" MONITOR(HC-30WEX)	2 UNI	¥ 1,288,000.		
	TRANSFORMER(YTC-100-5K)	2 UNI	¥ 804,000.		
	UNINTERRUPTED POWER SUPPLY(CONSIP2000HF)	2 UNI	¥ 1,544,000.		
	5"FLOPPY DISK DRIVE(LOGOTEC-LFD-582R)	1 UNI	¥ 392,000.		
	NEGATIVE FILM(KODACK 8" X 10")	100PC	¥ 1,150,000.		
	EXTENSION CORD	5 SET	¥ 21,000.	900513	CARRIED(OHASHI)
	FLOPPY DISK 5"	5 BOX	¥ 20,000.		
	〃 3.5"	5 BOX	¥ 12,000.		
	CARTRIDGE TAPE 3M	20PCS	¥ 114,000.		
	CABLE	40M	¥ 10,000.		
	MINI FLOPPY DISK UNIT(CRC FD3.5W)	1 SET	¥ 59,000.	901022	CARRIED(NAGASAWA)
	3.5" HARD DISK UNIT(CE40MARK II)	1 SET	¥ 97,000.		
		TOTAL	¥ 102,882,000.		

<LIST OF EQUIPMENTS>－2

YEAR	NAME OF EQUIPMENT	QUANT-	AMOUNT	ARRIVE	GIVE/CARRIED
90	P.C.(ACER-1133-341)	1 SET	¥ 3,478,000.	910204	GIVE
	IMAGE PROCESSING BOARD(ATVISTA-4M)	1 UNI	¥ 1,610,000.		
	DISPLAY MONITOR(HC-39WEX)	1 UNI	¥ 644,000.		
	DIGITIZER-AO(DH-8503)	2 UNI	¥ 3,678,000.		
	TRANSFORMER(220V-110V)	1 UNI	¥ 402,000.		
	P.C.ARC/INFO	1 SET	¥ 2,071,000.		
	P.C.ERDAS	1 SET	¥ 5,070,000.		
	dBASE-III	1 SET	¥ 193,000.		
	E.W.S.(SN-470)	1 SET	¥ 11,890,000.		
	MEMORY MODULE 24MB(SN-014)	1 UNI	¥ 3,610,000.		
	MAGNETIC DISC DRIVE(SN-427)	2 UNI	¥ 9,760,000.		
	〃	1 UNI	¥ 3,253,000.		
	IMAGE PROCESSING BOARD(UDC-3424-12C)	1 UNI	¥ 2,315,000.		
	20" MONITOR(HL-69159	1 SET	¥ 810,000.		
	UNITERRUPTED POWER SUPPLY(SFT-2K)	2 UNI	¥ 2,280,000.		
	SUN-OS	1 SET	¥ 271,000.		
	FORTRAN-77	1 SET	¥ 540,000.		
	C & ASSEMBLER	1 SET	¥ 664,000.		
	ERDAS(INC.3-D)	1 SET	¥ 9,500,000.		
	NETWORK	1 SET	¥ 3,100,000.		
	MAGNETIC TAPE DRIVE	1 UNI	¥ 3,420,000.		
	PAGE P NTER	1 UNI	¥ 750,000.		
	ETHERNI CABLE CONNECTOR	1 SET	¥ 560,000.		
	LASER PRINTER(3302-L)	1 SET	¥ 13,000,000.	910824	GIVE
	MT MEMORY UNIT(1305)	1 SET	¥ 12,750,000.		
		TOTAL	¥ 95,619,000.		
91	10 BASES LAN BOARD	1 PCE	¥ 40,000.	911114	CARRIED(KAMIMURA, SHIZUKUISHI)
	TRANCEVER CABLE 10M	1 PCE	¥ 7,900.		
	PAPER FOR EP-4010(EP-320)	3 BOX	¥ 108,000.		
	DEVELOPER FOR EP-4010	4 PCS	¥ 100,000.		
	CONK TONER FOR EP-4010	4 PCS	¥ 40,000.		
	CLEAR FOR EP-4010	4 PCS	¥ 28,000.		
	HEAD CLEANER FOR EP-4010	4 PCS	¥ 6,600.		
	MOS-1 DISK TAPE(D029-120E)	1 PCE	¥ 45,000.		
	HOOD 14"	1 PCE	¥ 11,500.		
	NEGA FILM(8" X 10")	9 BOX	¥ 101,700.	911210	CARRIED(YOSHINO)
	TRANCEVER CABLE 15M	3 PCS	¥ 142,500.		
	RIBBON CARTRIDGE(VP-4800RC)	60PCS	¥ 102,000.	911211	CARRIED(IZUMI)
	PRINTER CABLE (PC-PRCB1)	1 PCE	¥ 5,300.		
	PRINTER(XP-2000)	1 PCE	¥ 142,600.		
	P.C (PC-9801NS/E-14)	1 SET	¥ 264,600.		
	CRT PACK	1 PCE	¥ 18,800.		
	TRANSFORMER	1 PCE	¥ 5,600.		
	T-MOUNT	1 PCE	¥ 2,200.	920104	CARRIED(YOSHNO)
	LENS UNIT	1 PCE	¥ 61,500.		
	P. C. (ACER1131-431)	2 SET	¥ 6,956,000.	920225	GIVE
	IMAGE PROCESSING BOARD(ATVISTA-4M)	2 SET	¥ 3,220,000.		
	DISPLAY MONITOR(HC-39WEX)	2 SET	¥ 1,288,000.		
	DIGITIZER-AO(DH-8503)	2 SET	¥ 3,622,000.		
	TRANSFORMER(220V-100V)	2 SET	¥ 804,000.		
	UNINTERRUPTIED POWER SUPPLY(2KVA)	2 SET	¥ 1,400,000.		

<LIST OF EQUIPMENTS>--3

YEAR	NAME OF EQUIPMENT	QUANT-	AMOUNT	ARRIVE	GIVE/CARRIED
91	P.C.ARC/INFO	2SET	¥ 4,142,000.		
	P.C.ERDAS	2SET	¥ 10,140,000.		
	dBASE-III	2SET	¥ 386,000.		
	SWITCH BOX FOR RS-232C	5SET	¥ 80,000.		
	MAGNETIC OPTICAL DISK UNIT(300MB)	4SET	¥ 5,400,000.		
	PEN PLOTTER(MP-4300)	4SET	¥ 3,060,000.		
	MAGNETIC OPTICAL DISK MEDIA	4SET	¥ 740,000.		
	PAPER FOR EP-320	25BOX	¥ 1,090,000.		
	MAGNETIC TAPE DATA MSS	1PCE	¥ 10,000.	920410	CARRIED(SIZUKUISI)
	G.P.S(PYXIS IPS-360)	1SET	¥ 132,000.	920620	CARRIED(SUWABE)
	CANON BJ-10 AC ADAPTER(AD-150)	1PCE	¥ 3,850.		
	〃 CARTRIDGE(BC-01)	5PCS	¥ 14,000.		
	NEC BATTERY PACK(PC-9801N-11)	1PCE	¥ 7,220.		
	NEC AC ADAPTER(PC9801N-12)	1PCE	¥ 11,240.		
	CARTRIDGE TAPE(CMT) DC-6150 3M	20PCS	¥ 100,000.	921027	CARRIED(OKAJIMA)
	DISK 5"(AP-5M51)	4PCS	¥ 108,000.		
	PRINTER TONNER FOR M6000 M6002	1SET	¥ 26,280.		
	NEGA FILM 8" X 10"	5BOX	¥ 50,000.		
	MEMORY IBM 07G 1827	1SET	¥ 131,050.	921027	CARRIED(FURUYA)
	MOUSE IBM 07G 3159	1PCE	¥ 9,850.		
	PRINTER(CANON BJ-10V)	1SET	¥ 56,150.		
	CABLE IBM 81X 7875	1PCE	¥ 4,100.		
	BLACK RIBBON PACK(AP500RPT)	10PCS	¥ 24,500.		
	INK RIBBON(NEC PC PR101-01)	1PCS	¥ 5,750.		
	FLOPPY DISK(MF-2-256HD)	50PCS	¥ 13,250.		
	SPARE LAMP(LD-1748) FOR HOPE	40PCS	¥ 172,000.		
	BATTERY IBM 07G 1756	1PCE	¥ 28,700.		
		TOTAL	¥ 44,469,740.		
92	PERSONAL COMPUTER(ACER1133-341)	2SET	¥ 8,120,000.		
	IMAGE PROCESSING BOAD	2SET	¥ 3,860,000.		
	COLOR IMAGE DISPLAY MONITOR	2SET	¥ 1,425,000.		
	OPTICAL MAGNETIC DISK DRIVE	4SET	¥ 6,097,000.		
	OPTICAL MAGNETIC DISK MEDIA	4SET	¥ 1,218,000.		
	PEN PLOTTER WITH PAPER	4SET	¥ 3,452,000.		
	DATA CHANGE SWITCH	4SET	¥ 82,000.		
	UPS, CONSIP-2000AFR	2SET	¥ 1,764,000.		
	TRANS WITH CABLE	2SET	¥ 1,015,000.		
	PC ARC/INFO SOFTWARE MODULE	2SET	¥ 5,197,000.		
	PC ERDAS SOFTWARE MODULE	2SET	¥ 12,795,000.		
	D BASE IV SOFTWARE	2SET	¥ 487,000.		
	PC ERDAS TOPO,3D MODULE	7SET	¥ 10,346,000.		
	TRANCEIVER FOR NETWORK	1SET	¥ 253,000.		
	COLOR FILM KODAK VERICOLORIII 8*10	30BOX	¥ 366,000.		
	B/W FILM FUJI NEOPAN SS 10*12	4BOX	¥ 59,200.		
	B/W PHOTOPAPER GEKKO SP-MR4	10BOX	¥ 128,000.		
	DEVELOPER FOR COLOR E.STATIC PLOTTER	5SET	¥ 1,335,000.		
	PHOTO PRINT PROCESSER HOPE:RA-5240V4	1SET	¥ 10,730,000.		
	MIXING VALVE FOR RA-5240V4	1SET	¥ 183,600.		
	TRAY ASSY RACK SPLASH FOR RA-5240V4	1SET	¥ 140,700.		
	PROFILYZER KONIKA:BBS-1001	1SET	¥ 4,488,000.		
	HAND CONTROLL NUIT FOR LENS	1SET	¥ 252,100.		

<LIST OF EQUIPMENTS>-4

YEAR	NAME OF EQUIPMENT	QUANT-	AMOUNT	ARRIVE	GIVE/CARRIGE
92	HAND CONTROLL NUIT FOR HEAD	1 SET	¥ 252,100.		
	INSTALLATION TOOL FOR PRINT PROCESSER	1 SET	¥ 478,540.	940115	CARRIED(IGARI)
	PRINT PAPER CH860	5 BOX	¥ 34,000.	940429	CARRIED(OKUYAMA,
	INK SHEET CH710	5 BOX	¥ 210,000.		SHIONO)
		TOTAL	¥ 74,072,700.		
93	Photo developper liquid	4 SET	¥ 1,420,000.		
	Photo color paper FA-5HM 134cm X 30m	10 SET	¥ 1,115,000.		
	Magnet optical disk unit QMD-600	1 SET	¥ 400,000.		
	Magnet optical disk cartridge EMD-IDAI	50 SET	¥ 1,465,000.		
	Computer software Dext Ver. 1.03 3.5"	1 SET	¥ 56,000.		
	Pen plotter MP-5300 MICROPLOT	1 SET	¥ 194,000.		
	Plotter connecting cable RS-232C	1 SET	¥ 12,000.		
	Water type fiber pen 0.3mm 5pcs/SET	16 SET	¥ 32,000.		
	Tape cartridge	20 SET	¥ 596,000.		
		合計	¥ 5,290,000.		

ANNEX - 1 - (8).

<EQUIPMENT USING AND MAINTENANCE CONDITION> - 1

YEAR	NAME OF EQUIPMENT	QUANT-ITY	USING CONDITION	MAINTENANCE CONDITION	MAITENANCE CONT-RACT OR COMMENT
88	COPY-MACHINE(XERO X-4790)	1 SET	A	B	OFTEN TROUBLED
	AUTO MOBILE(TOYOTA KIJANG)	2 SET	A	A	
89	ERDAS	1 SET	A	A	NEED TOTAL MAITENANCE CONTRACT
	ARC/INFO	1 SET	A	A	
	P.C.ERDAS	2 SET	A	A	
	P.C.ARC/INFO	2 SET	A	A	
	dBASE-III	2 SET	C	A	
	E.W.S.(SUN-4370-59)	1 SET	A	A	
	MEMORY MODULE(SN-014)	1 UNI	A	A	
	MAGNETIC DISC DRIVE(SN-429)	1 UNI	A	A	
	// (SN-427)	2 UNI	A	A	
	PAGE PRINTER(SN-333)	1 UNI	A	A	
	IMAGE PROCESSING BORD(UDC-3242-12C)	1 UNI	A	A	
	20" MONITOR(HL-6915-SATGK)	1 UNI	A	A	
	DIGITIZER-AO(DH-8503)	1 UNI	B	A	
	COLOR PLOTTER(EP-4010)	1 UNI	C	B	
	UNINTERRUPTED POWER SUPPLY(5KVA)	2 UNI	A	A	
	MAGNETIC TAPE DRIVE(SN-516)	1 UNI	B	A	
	STABILIZER	2 UNI	A	A	
	P.C.(ACER-1133-341)	2 SET	A	A	
	IMAGE PROCESSING BOARD(ATVISTA-4M)	2 UNI	A	A	
	20" MONITOR(HC-30WEX)	2 UNI	A	A	
	TRANSFORMER(YTC-100-5K)	2 UNI	A	A	
90	P.C.(ACER-1133-341)	1 SET	A	A	NEED TOTAL MAITENANCE CONTRACT
	IMAGE PROCESSING BOARD(ATVISTA-4M)	1 UNI	A	A	
	DISPLAY MONITOR(HC-39WEX)	1 UNI	A	A	
	DIGITIZER-AO(DH-8503)	2 UNI	B	A	
	TRANSFORMER(220V-110V)	1 UNI	A	A	
	P.C.ARC/INFO	1 SET	A	A	
	P.C.ERDAS	1 SET	A	A	
	dBASE-III	1 SET	C	A	
	E.W.S.(SN-470)	1 SET	A	A	
	MEMORY MODULE 24MB(SN-014)	1 UNI	A	A	
	MAGNETIC DISC DRIVE(SN-427)	2 UNI	A	A	
	//	1 UNI	A	A	
	IMAGE PROCESSING BOARD(UDC-3424-12C)	1 UNI	A	A	
	20" MONITOR(HL-69159)	1 SET	A	A	
	UNITERRUPTED POWER SUPPLY(SFT-2K)	2 UNI	A	A	
	SUN-OS	1 SET	A	A	
	FORTRAN-77	1 SET	D	A	
	C & ASSEMBLER	1 SET	A	A	
	ERDAS(INC.3-D)	1 SET	C	A	
	NETWORK	1 SET	A	A	
	MAGNETIC TAPE DRIVE	1 UNI	B	A	
	PAGE PRINTER	1 UNI	A	A	
	LASER PRINTER(3302-L)	1 SET	B	A	
	MT MEMORY UNIT(1305)	1 SET	B	A	

<EQUIPMENT USING AND MAINTENANCE CONDITION> - 2

YEAR	NAME OF EQUIPMENT	QUANT-ITY	USING CONDITION	MAINTENANCE CONDITION	MAITENANNCE CONTRACT
91	HOOD 14"	1 PCE	D	A	
	LENS UNIT	1 PCE	D	A	
	P.C.(ACER1131-431)	2 SET	A	A	
	IMAGE PROCESSING BOARD(ATVISTA-4M)	2 SET	A	A	
	DISPLAY MONITOR(HC-39WEX)	2 SET	A	A	
	DIGITIZER-AO(DH-8503)	2 SET	B	A	NEED TOTAL MAINTENANCE CONTRACT
	TRANSFORMER(220V-100V)	2 SET	A	A	
	UNINTERRUPTIED POWER SUPPLY(2KVA)	2 SET	A	A	
	P.C.ARC/INFO	2 SET	A	A	
	P.C.ERDAS	2 SET	A	A	
	dBASE-III	2 SET	C	A	
	MAGNETIC OPTICAL DISK UNIT(300MB)	4 SET	B	A	
	PEN PLOTTER(MP-4300)	4 SET	C	A	
92	PERSONAL COMPUTER(ACER1133-341)	2 SET	A	A	
	IMAGE PROCESSING BOAD	2 SET	A	A	
	COLOR IMAGE DISPLAY MONITOR	2 SET	A	A	
	OPTICAL MAGNETIC DISK DRIVE	4 SET	B	A	
	PEN PLOTTER WITH PAPER	4 SET	C	A	
	DATA CHANGE SWITCH	4 SET	B	A	
	UPS, CONSIP-2000AFR	2 SET	A	A	
	TRANS WITH CABLE	2 SET	A	A	
	PC ARC/INFO SOFTWARE MODULE	2 SET	A	A	
	PC ERDAS SOFTWARE MODULE	2 SET	A	A	
	D BASE IV SOFTWARE	2 SET	C	A	
	PC ERDAS TOPO,3D MODULE	7 SET	C	A	
	TRANCEIVER FOR NETWORK	1 SET	A	A	
	PHOTO PRINT PROCESSER HOPE:RA-5240V4	1 SET	B	A	
	PROFILYZER KONIKA:BBS-1001	1 SET	B	A	
	HAND CONTROLL NUIT FOR LENS	1 SET	B	A	
	HAND CONTROLL NUIT FOR HEAD	1 SET	B	A	

USING CONDITION

A:Daily
B:Often(2-3 week)
C:Sometime(2-3 month)
D:Seldom(2-3 year)
E:Not used

MAINTENANCE CONDITION

A:Good
B:Almost good
C:Can be used
D:Not for used/Out of order

ANNEX - 2 - (1).

<RECORD OF TARINING PROGRAM> - 1

89/90

NAME OF TARINING	PERIOD	NUMBER OF TA-RAINEE	TRAINEES BILONG TO	
1ST R/S & GIS BASIC COURCE	90.7.16~90.8.25	21	MINISTRY OF PUBLIC WORKS	
			RIAU OFFICE	3
			BALI	2
			YOGYAKARTA	2
			EAST KALIMANTAN	2
			SOUTH SULAWESI	2
			AGENCY FOR RESEARCH & DEVELOPMENT	2
			D/G WATER RESOURSES DEVELOPMENT	2
			D/G HUMAN SETTLEMENT	6
2ND R/S & GIS BASIC COURCE	90.11.5~90.11.30	17	MINISTRY OF PUBLIC WORKS	
			RIAU OFFICE	1
			BALI	1
			SOUTH SULAWESI	1
			EAST KALIMANTAN	2
			AGENCY FOR RESEARCH & DEVELOPMENT	2
			D/G WATER RESOURSES DEVELOPMENT	1
			MINISTRY OF AGRICULTURE	2
			MINISTRY OF FORESTRY	2
			NATIONAL ANSTITUTE OF AERONAUTICS & SPACE	1
			ASSESSMENT & APPLICATION OF TECHNOLOGY	1
			INDONESIA UNIVERSITY	1
			BOGOR UNIVERSITY	1
			TURISAKUTI UNIVERSITY	1
ADVANCE COURCE	90.12.5~90.12.30	13	MINISTRY OF PUBLIC WORKS	
			RIAU OFFIC	2
			YOGYAKARTA	1
			BALI	1
			SOUTH SULAWESI	1
			EAST KALIMANTAN	1
			AGENCY FOR RESEARCH & DEVELOPMENT	2
			D/G WATER RESOURSES DEVELOPMENT	1
			D/G HUMAN SETTLEMENT	1
			NATIONAL ANSTITUTE OF AERONAUTICS & SPACE	1
			ASSESSMENT & APPLICATION OF TECHNOLOGY	1
			TURISAKUTI UNIVERSITY	1

<RECORD OF TARINING PROGRAM>－2

90/91

NAME OF TARINING	PERIOD	NUMBER OF TA-RAINEE	TRAINEES BILONG TO	
1ST R/S & GIS BASIC COURCE	91.2.25～91.3.15	10	MINISTRY OF PUBLIC WORKS	
			SOUTH SUMATERA OFFICE	1
			LAMPUNG	1
			EAST JAWA	1
			SOUTH KALIMANTAN	1
			MALUKU	1
			EAST NUSATENGGARA	1
			IRIAN JAYA	1
			RIAU	1
			PT.YOHADA KARYA	2
2ND R/S & GIS BASIC COURCE	91.7.1～91.7.27	20	MINISTRY OF PUBLIC WORKS	
			SOUTH SUMATERA OFFICE	1
			EAST NUSATENGGARA	1
			IRIAN JAYA	1
			BENGKULU	1
			YOGYAKARTA	1
			EAST JAWA	1
			WEST JAWA	1
			LAMPUNG	1
			BANDONG RESEARCH CENTER	1
			D/G WATER RESOURSES DEVELOPMENT	1
			D/G HUMAN SETTLEMENT	1
			PUSDATA	1
			ASSESSMENT & APPLICATION OF TECHNOLOGY	1
			MINISTRY OF TRANSMIGRATION	2
			NATIONAL ANSTITUTE OF AERONAUTICS & SPACE	1
			PT.TRIBINA MATRA KARYA	1
			PT.HARRISMA AGUNG	1
			PT.EXSA	1
			PT.ASRI BANGUN PRAJA	1
ADVANCE COURCE	91.10.7～91.1026	10	MINISTRY OF PUBLIC WORKS	
			SOUTH SUMATERA OFFICE	1
			LAMPUNG	1
			RIAU	1
			SOUTH KALIMANTAN	1
			EAST NUSATENGGARA	1
			EAST JAWA	1
			IRIAN JAYA	1
			D/G WATER RESOURSES DEVELOPMENT	1
			MINISTRY OF TRANSMIGRATION	2
			PT.HARRISMA AGUNG	1

<RECORD OF TARINING PROGRAM>－3

91/92

NAME OF TARINING	PERIOD	NUMBER OF TA-RAINEE	TRAINEES BILONG TO
1ST R/S & GIS BASIC COURCE	92.5.4～92.5.30	20	MINISTRY OF PUBLIC WORKS MALUKU OFFICE 1 IRIAN JAYA 1 EAST KALIMANTAN 1 NOUTH SUMATERA 1 YOGYAKARTA 1 BANDONG RESEARCE CENTER 3 D/G WATER RESOURSES DEVELOPMENT 1 D/G HUMAN SETTLEMENT 1 D/G HIGHWAYS 1 MINISTRY OF TRANSMIGRATION 2 MINISTRY OF FORESTRY 1 MINISTRY OF AGRICULTURE 1 HANKAM 1 MINISTRY MINES AND ENERGY 2 PT.GEOJAYA TEKNIK 1 PT.INDO CONSULT 1
2ND R/S & GIS BASIC COURCE	92.7.6～92.7.30	14	MINISTRY OF PUBLIC WORKS EAST NUSATENGGARA OFFICE 1 MALUKU 1 BALI 1 SOUTH SULAWESI 1 RIAU 2 NOUTH SUMATERA 1 SOUTH-EAST SULAWESI 1 D/G HIGHWAYS 1 MONISTRY OF TRANSMIGRATION 2 MINISTRY OF STATE FOR POPULATION AND ENVIRONMENT 1 JAKARTA CITY MAPPING CENTER 1 PT.COMPOSINDO 1
ADVENCE COURCE	92.8.24～92.9.15	13	MINISTRY OF PUBLIC WORKS RIAU OFFICE 1 MAKUKU 1 EAST NUSATENGGARA 1 YOGYAKARTA 1 BALI 1 SOUTH SUMATERA 1 D/G HUMAN SETTLEMENT 1 BANDONG RESEARCH CENTER 1 MINISTRY OF AGRICULTURE 1 MINISTRY OF TRANSMIGRATION 1 MINISTRY OF MINES AND ENERGY 1 PT.INDO CONSULT 1 PT. COMPOSINDO 1

<RECORD OF TARINING PROGRAM>－4

92/93

NAME OF TARINING	PERIOD	NUMBER OF TA-RAINEE	TRAINEES BILONG TO	
1ST R/S & GIS BASIC COURCE	92.12.21～93.1.9	13	MINISTRY OF PUBLIC WORKS	
			NOUTH SUMATERA OFFICE	1
			SOUTH SUMATERA	2
			LAMPUNG	2
			SOUTH KALIMANTAN	1
			EAST KALIMANTAN	1
			EAST JAWA	1
			D/G WATER RESOURSES DEVELOPMENT	1
			BUREAU OF PLANNING	1
			MINISTRY OF AGRICULTURE	1
			MINISTRY OF TRANSMAIGRATION	1
			MALAWARMAN UNIVERSITY	1
2ND R/S & GIS BASIC COURCE	93.1.11～93.1.30	15	MINISTRY OF PUBLIC WORKS	
			EAST NUSATENGGARA OFFICE	1
			IRIAN JAYA	1
			MALUKU	1
			SOUTH SULAWESI	1
			WEST SULAWESI	3
			EAST JAWA	1
			EAST KALIMANTAN	1
			JATILUHUR AUTHORITY	1
			JERATON SERNA AUTHORITY	1
			MINISTRY OF STATE FOR POPULATION AND ENVIRONMENT	1
			MINISTRY OF AGRICULTURE	1
			MINISTRY OF FORESTRY	1
			PT.GEOJAYA TEKNIK	1
ADVANCE COURCE	93.2.4～93.2.20	12	MINISTRY OF PUBLIC WORKS	
			EAST KALIMANTAN OFFICE	1
			IRIAN JAYA	1
			WEST SULAWESI	2
			MALUKU	1
			SOUTH KALIMANTAN	1
			SOUTH SUMATERA	1
			EAST JAWA	1
			JATILUHUR AUTHORITY	1
			MINISTRY OF TRANSMIGRATION	1
			MURAWARMAN UNIVERSITY	1
			PT. GEOJAYA	1

<RECORD OF TARINING PROGRAM>－5

93/94

NAME OF TARINING	PERIOD	NUMBER OF TA-RAINEE	TRAINEES BILONG TO
On The Site Training	94. 1.11～94. 1.12	56	MINISTRY OF PUBLIC WORKS BALI OFFICE 10 YOGYAKARTA OFFICE 14 BANJARMASIN OFFICE 6 SUMATERA SELATAN OFFICE 6 EAST JAWA OFFICE 2 NORTH SUMATERA OFFICE 7 CENTRAL SULAWESI OFFICE 7 IRIAN JAYA OFFICE 4

ANNEX - 2 - (2).

MIDDLE LEVEL TRAINEES TARAINING PROGRAM - 1

89/90年

TRAVEL COST	22, 056, 100.
MATERIALS	8, 901, 335.
CONSUMABLE	62, 840, 815.
FIELD PRAC,	2, 403, 000.
FIELD(INST)	19, 203, 750.
INST, FEE	6, 837, 000.
OTHER FEE	8, 000.
TOTAL	122, 250, 000.

1ST BASIC	90. 7.16~90. 8.25	21
2ND BASIC	90.11. 5~90.11.30	17
ADVANCE	90.12. 5~90.12.30	13
	TOTAL	51

90/91

TRAVEL COST	20, 097, 000.
MATERIALS	31, 509, 025.
CONSUMABLE	21, 991, 775.
FIELD PRAC,	8, 826, 000.
FIELD(INST)	3, 150, 000.
INST, FEE	10, 415, 200.
OTHER FEE	11, 000.
TOTAL	96, 000, 000.

1ST BASIC	91. 2.25~91. 3.15	10
1ND BASIC	91. 7. 1~91. 7.27	20
ADVANCE	91.10. 7~91.10.26	10
	TOTAL	40

MIDDLE LEVEL TRAINEES TARAINING PROGRAM - 2

91/92

TRAVEL COST	25, 263, 200.
MATERIALS	7, 335, 460.
CONSUMABLE	24, 949, 740.
FIELD PRAC,	10, 818, 000.
FIELD(INST)	3, 375, 000.
INST, FEE	12, 252, 600.
OTHER FEE	6, 000.
TOTAL	84, 000, 000.

1ST BASIC	92. 5. 4~92. 5.30	20
1ND BASIC	92. 7. 6~92. 7.30	14
ADVANCE	92. 8.24~92. 9.15	13
	TOTAL	47

92/93

TRAVEL COST	28, 823, 900.
MATERIALS	3, 892, 100.
CONSUMABLE	19, 734, 000.
FIELD PRAC,	8, 550, 000.
FIELD(INST)	0.
INST, FEE	0.
TOTAL	61, 000, 000.

1ST BASIC	92.12.12~93. 1. 9	13
1ND BASIC	93. 1.11~93. 1.30	15
ADVANCE	92. 2. 4~92. 9.15	12
	TOTAL	40

93/94

TRAVEL COST	0.
MATERIALS	4, 000, 000.
CONSUMABLE	9, 240, 000.
FIELD PRAC,	0.
FIELD(INST)	20, 760, 000.
INST, FEE	0.
TOTAL	34, 000, 000.

SITE TRAINING	94. 1.11~94. 2.12	56
	TOTAL	56

ANNEX - 2 - (3).

Presentation title at Seminar

1st Seminar :

1. Ministry of Agriculture
   : Agricultural Land Need during PELITA V and the Year 2000
2. Ministry of Transmigration
   : The Land Resources of Indonesia-A National Overview
3. Gajamada University
   : Remote Sensing for Composing GIS of Lowland
4. PUSDATA : The Role of Remote Sensing and GIS for Spatial Planning
5. BAKOSURTANAL : The Development of Remote Sensing and GIs at National and Provincial Level in Indonesia
6. Puroject : Establishment of Guideline for Agricultural Infrastructure
7. D/G Water Resources
   : The Role of Remote Sensing and GIS for Water Resourses Management
8. Project : Inter Band Analysis of SPOT Data for Spatial Assessement A Case Study of Parung Area
9. Project : Land Evaluation Analysis for Agricultural Purposes using Satelite Image and GIS, A Methodological Explorations
10. BAPPENAS : National Strategi for Spatial Pattern Development, Especialy for Physical Infrastructure
11. Ministry of Forest
    : Policy and Implementation of Forest Zoning in Relation with Water Resources and Land Conservation
12. Bogor University
    : Resional Concepts, An Inventory
13. D/G Human Settlement
    : The Role of Remote Sensing and GIS for Spatial Planning
14. D/G Highway : The Role of Remote Sensing and GIS for Spatial Planning of Road Infrastructure
15. Project : Analysis of Land Cover Changing Using Landsat Data for Spatial Planning in Case Study Area of Taluk Kuantan
16. Project : Contribution of Satelite Data and GIS for Irrigability and Water Availabilty Analysis

2nd Seminar

1. PUSDATA : Application of Remote Sensing and GIS Data
2. Project : Ground Surfaces Temperature Analysis Base on LANDSAT TM Data Band 6
3. Project : Monitoring of Forest Fire Site by using LANDSAT TM Data and MSS Data

4. BAKOSURTANAL : National Policy Toward Dtabase Networking, Spatial Data Communication and Standard Interchange Format

5. D/G Human Settlement
: Application of GIS in Human Settlements

6. D/G Water Resources
: Application of Remote Sensing Data and GIS in Irrigation

7. D/G Highway : Application of Remote Sensing Data and GIS in Highway

8. BPPT : Trend of Remote Sensing and GIS in the Era of Globalization to Achieve the Development of Information Technology

3rd Seminar

1. BALITBANG : Policy and Strategy of the Ministry of Public Works on the Informetion Issues to Support Planning and Spatial Utilization Monitoring to Anticipate the Long Term Development Plannng

2. LAPAN : Forthcoming Remote Sensing Products and Services

3. Project : A Prgress and Prospect of Remote Sensing and GIS in the M.O.P.W. in the Current Decade, A Review of the Technical Cooperation Between Indonesia and Japan

4. Project : A statistical and Spatial Informetion Integration, to Support the Spatial Planning, in the Second Long Term Development Planning(PJPT-II)

5. BAKOURTANAL : A Network on the GIS in the National and Regional Level It's prospect, Benefit, and Constraints

6. D/G Highway : Application of GIS for Road Pre-Feasibility Study

7. Project : Computer Aided System for Land Suitability Analysis of Agricultural Development, A Pilot Study in the Middle Part of Inderagiri River Basin

8. IPB : The Advantages and Constraints on the Application of Remote Sensed Data and GIS for Soil Investigation

9. D/G Human Settlement
: A Role of Remotely Sensed Data and GIS for Urban Development and It's Inpact Assessment, A Case Study in the JABOTABEK Area

10. PUSDATA : GIS of the Physical Infrastructure to Support the Decision Maker

4th Seminar

1.. BAKOSURTANAL : The Nation-wide integration spatial information through multi-sectral approach towards the desintralization process

2.. KANWIL RIAU : The assessment of potential developing area in the province of Riau with the aid of Remote Sensing technology and Geographical Information system

3. Ir. Pranoto Asmoro
:The creation of inter-sectoral integrated spatial data base as a basic to assess the potential developing area

4. Project :Application of Remote Sensing and Geographical Information System for geomorphological simulation on Kampar river basion Riau province

5. Project : Application of Remote Sensing and Geographical Information System for hydrological simulation on Kampar river basion Riau province

6. Project : Application of Remote Sensing and Geographical Information System for estimation of soil erosion and sediment on on Kampar river basion Riau province

7. Project : Application of Remote Sensing and Geographical Information System for detection of sifting field on Kampar river basion Riau province

8. D/G Highway :The role and function of Remote Sensing Technology and Geographical Information System for data integration and planning on road trace, A case study in the Souse East Sulawesi province

9. D/G Human Settlement :Application of Remote Sensing technology and Geographical Information System for planning on regional development on the potential developing area

10. D/G Highway :The integration of RGDAS equipment and satellite image in relation to heavy loaded road improvement project

12. LAPAN : Application of Remote Sensing technology for the assessment of physical macroscopic phenomena related to the earth surface behaveour

13. D/G Water Resources Swamp
:Application of Remote Sensing technology and Geographical Information System for study on planning of the swampy-land resources

ANNEX - 2 - (4).

COST FOR SEMINAR

1ST SEMINAR:90.12.17~18
TOTAL ATTENDANCE:151

TRAVEL	405, 000.
MATERIALS	3, 143, 800.
CONSUMABLE	2, 121, 350.
POSTEGE	45, 600.
ALLOWANCE	105, 000.
MEAL	0.
OTHER FEE	179, 250.
TOTAL	6, 000, 000.

2ND SEMINAR:92.2.26
TOTAL ATTENDANCE: 75

TRAVEL	400, 000.
MATERIALS	3, 000, 000.
CONSUMABLE	416, 500.
POSTEGE	44, 000.
ALLOWANCE	132, 000.
MEAL	1, 400, 000.
OTHER FEE	607, 500.
TOTAL	6, 000, 000.

3RD SEMINAR:93.2.12
TOTAL ATTENDANCE:125

TRAVEL	350, 000.
MATERIALS	3, 448, 000.
CONSUMABLE	502, 000.
POSTEGE	0.
ALLOWANCE	300, 000.
MEAL	2, 500, 000.
OTHER FEE	900, 000.
TOTAL	8, 000, 000.

4TH SEMINAR:943.3.29
TOTAL ATTENDANCE:150

TRAVEL	1, 800, 000.
MATERIALS	4, 600, 000.
CONSUMABLE	2, 186, 500.
POSTEGE	138, 000.
ALLOWANCE	300, 000.
MEAL	3, 200, 000.
OTHER FEE	1, 775, 000.
TOTAL	14, 000, 000.

ANNEX - 3.

APPLICATION OF REMOTE SENSING AND GIS TECHNIQUE FOR GEOMORPHOLOGICAL SIMULATION ON KAMPAR RIVER BASIN RIAU PROVINCE

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Center for Data Processing and Mapping (PUSDATA)
Ministry of Public Works
** Expert of Japan International Cooperation Agency (JICA)

ABSTRACT

This paper describes a simulation system of geomorphological analysis which is one of the forefront application in the Remote Sensing Project (R/S Project) activity in PUSDATA, Ministry of Public Works (MPW) under cooperation of JICA. Geomorphological analysis system consists of digital elevation and slope model which is designed to get match information (interpolated elevation and slope gradient in any point) from less data source (contour elevation data from topographical map). Geomorphological simulation system is quite attractive tool to strengthen the way of planning for development project.

The case study area is located in upper part of Kampar river basin, Riau province, where has 330,000ha catchment area.

Input data for this analysis is digitized contour elevation data from 1:50000 topographical map.

As the result, following outputs are produced by above input data.

1) interpolated elevation map
2) slope map

1. INTRODUCTION

Since 1980, The R/S Project has been implemented in PUSDATA, MPW which is cooperated with Japan International Cooperation Agency (JICA). Through R/S Project activity, fundamental and advanced Remote Sensing and GIS technology has been introduced in PUSDATA. Recently, R/S Project developed several unique systems to analyze the wide area ofphysical land condition. Geomorphological simulation system is one of important part of these systems to provide basic data for following advanced application systems.

The case study area is located in upper part of Kampar river basin, Riau province, from longitude 100° 08′ E to 100° 54′ E (86 Km width) and from latitude 0° 31′ N to 0° 05′ S (66 Km width). Where, now Kotopanjang power generation dam is constructing. The Kotopanjang dam has 330,000ha catchment area. (see Fig- 0)

This study is an application of that system to produce digital elevation and slope map in upper Kampar river basin.

2. MATERIALS

2-1. Preparation of Input Data

The fundamental input data in this study is contour elevation data obtained from 1:50,000 topographical maps. To cover study area, twelve(12) sheets of that topographical maps are prepared.

2-2. Equipments

1) Hardware

Computer SUN-04 work station Main memory : 32 Mb
Disk memory : 2 Gb

2) Software

A series of own developed software

Common package program for minor role

2-3. Input and output file dimension

number of pixel : 9.5 M(million)

number of row : 3400

number of column : 3800

pixel size : 30m * 30m

3. METHODOLOGY

Fig- 1 shows general flow for processing of this Geomorphological simulation. The analysis of this study consists of following three(3) functions.

1) Input data conversion.
2) Elevation interpolation.
3) Slope gradient estimation.

3-1. Data conversion

1) Analogue - digital conversion

The contour lines of topographical maps are digitized manually. Analogue topographic contour information converted to digital contour elevation data (line type) which can be treated in computer. (see Fig- 2)

2) Line - polygon conversion

Line type contour data should convert to polygon type contour data. In this study,twice conversion as follows are applied.

Vector line contour → Raster line contour → Raster polygon contour

3-2. Elevation interpolation

The fundamentals of applied interpolation method is to take ratio between the distances from interpolation point to each lower and upper contour lines. It is named as "Each Minimum Distance method" (EMD method.)

Therefore, the equation for elevation interpolation is quite simple style. (see Fig– 3)

However, there are two(2) excellent points of this method.

The first is that it's designed to take the distance between interpolation point and contour line not only straight line but folded line (or curve) also. By this function, everypart of input data, even blind part behind the complicated contour line, can be applied single equation (except peak and sink point). It assures to keep continuation of whole area in output.

The second is that all input data (all pixels on contour line) are effectively examined when decide the minimum distance. "No information loss" of this method enables to get high fidelity of output.

The result make us feel natural owing to both definition and smoothness of it. (see Fig– 4)

3–3. Slope gradient estimation

The equation for slope gradient (in Fig– 3) also quite simple.

A merit of this method is direct slope calculation of every point without involving "smoothing function" by taking average of surrounding elevation as usual method. Therefore result keeps high definition. (see Fig– 5)

4. COMPARISON WITH OTHER METHODS

There are several other elevation interpolation methods tried in Project activity. Following are examples of them for comparison with EMD method.

4–1. H – V (horizontal and vertical) crosswise average method (see Fig– 6)

This method takes average of horizontal order interpolation and vertical direction interpolation.

Limitations of this method are as follows.

1) Difficult to keep continuation even within visible area of both upper and lower contour lines because of much information loss (only 4 points are

effectively referred).

2) Difficult to treat blind part behind complicated contour line.

3) Unsatisfactory quality unless ideal data condition (enough high density andsimple contour pattern).

The example of result is shown in (Fig– 7).

4–2. Multi direction average method (see Fig– 8)

This method is similar as H – V crosswise method but applies more fine direction angle pitch (every 1 degree against 90 degree of H – V crosswise method), and calculate many interpolated elevation of every direction. Then taking average of them.

The merit of this method is to improve the effective use of input data by taking many direction. "Information loss" of this method is far more less than H – V crosswise method.

However, still has following limitations

1) Definition is not good because of taking average of many direction data. Some direction interpolation gives stupid data and mixture of them cause "out of focus" effect which spoil the definition.

2) Difficult to treat blind part behind complicated contour line.

The example of result is shown in (Fig– 9).

4–3. Steepest slope direction method (see Fig 10)

This method examines multi direction (every 1 degree) similar as previous "multi direction average method", but adopt only one direction which is steepest slope direction. Steepest slope direction is considered as optimum direction of every straight line for elevation interpolation.

The merit of this method is more definition of output by selection of most reliable data, even the grade of "effective use of input data" or "Information loss" is same as "multi direction average method".

However still has following limitation

1) Difficult to treat blind part behind complicated contour line, and high definition of this method enhance this fault.

The example of result is shown in (Fig-- 11).

4--4. TIN method

TIN (Triangulated Irregular Network) method is rather popular package program for geomorphological analysis. However when apply TIN method for elevation interpolation from contour line, it has following limitations.

1) Only skipped pixels of contour line are effectively used when forming "triangle network", therefore many information loss is unavoidable.
2) Self contour connection occurs when forming "triangle network". As the result "flat zone" appear along complicated contour line.

As the experience in Project, overall quality of TIN method for elevation interpolation from contour line is unsatisfactory.

5. RESULT AND DISCUSSION

Newly developed EMD method is powerful and attractive tool for creation of geomorphological models. Thinking about that contour line from topographical map is still main and economy source of elevation data, EMD method has possibility to become a standard for production of digital elevation model.

Following are recommendations regarding with this EMD method.

1) Effective application of EMD method in every director generals in MPW or related organizations on their physical planning (small scale up to big scale).
2) Preparation of nationwide elevation database as the common fundamental information for many field in any organization (small scale).
3) To realize above 1) -- 2), faultless digital contour data and smooth data supply system are earnestly expected to be arranged as national primary data base.

5. REFERENCES

1) David J Maguire Geographical Information System. Principles and Applications. Longman Scientific & Technical Vol. 1 Principles
2) T. IKEDA (1993) Geomorphology based on homotopy model. Journal of the Japan Society of Photogrammetry and Remote Sensing Vol. 32, No.1, 1993
3) M. Roekaerts (1988) An integrated remote sensing approach for regional agro-statistics and land monitoring. IGARSS' 88 Remote Sensing: Moving towards the 21st century 12-16 September 1988, Edinburgh, UK
4) Study report on remote sensing analysis for central sumatera forest rehabilitation (Upper Kampar Watershed) project Des,1993
Center for Data Processing And Mapping (PUSDATA)
Ministry og Public works Indonesia

Fig– 0 Location of study area

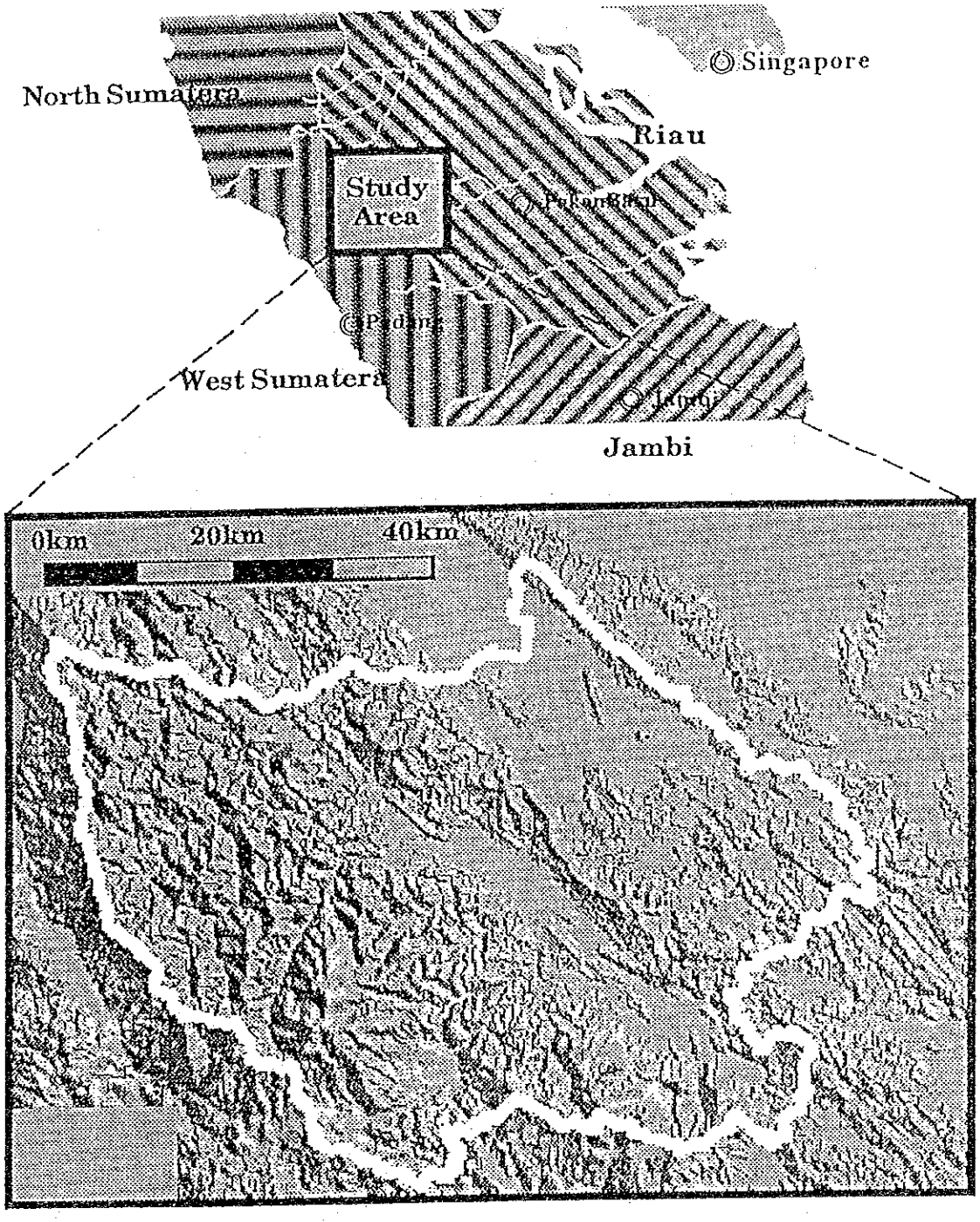
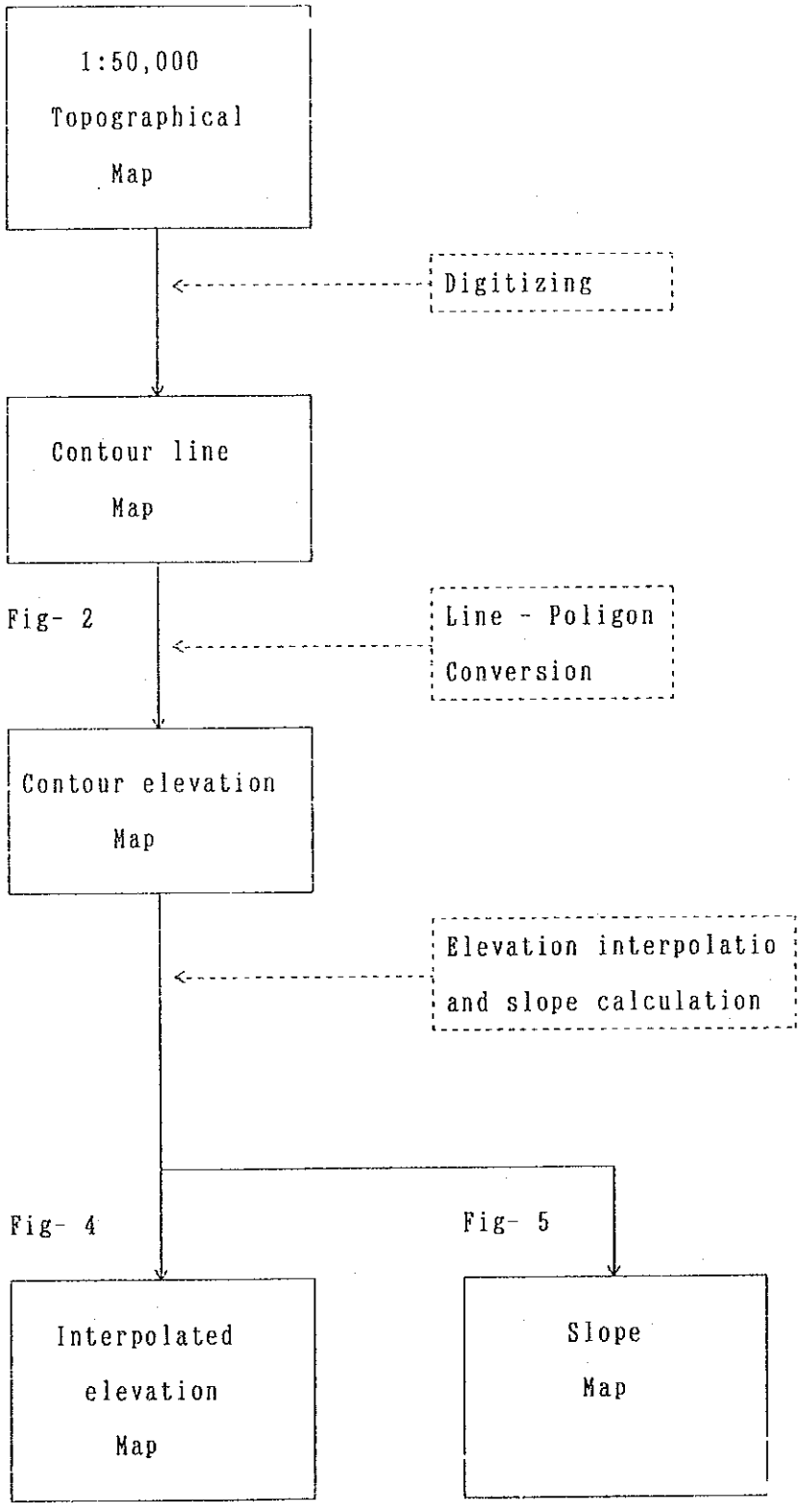
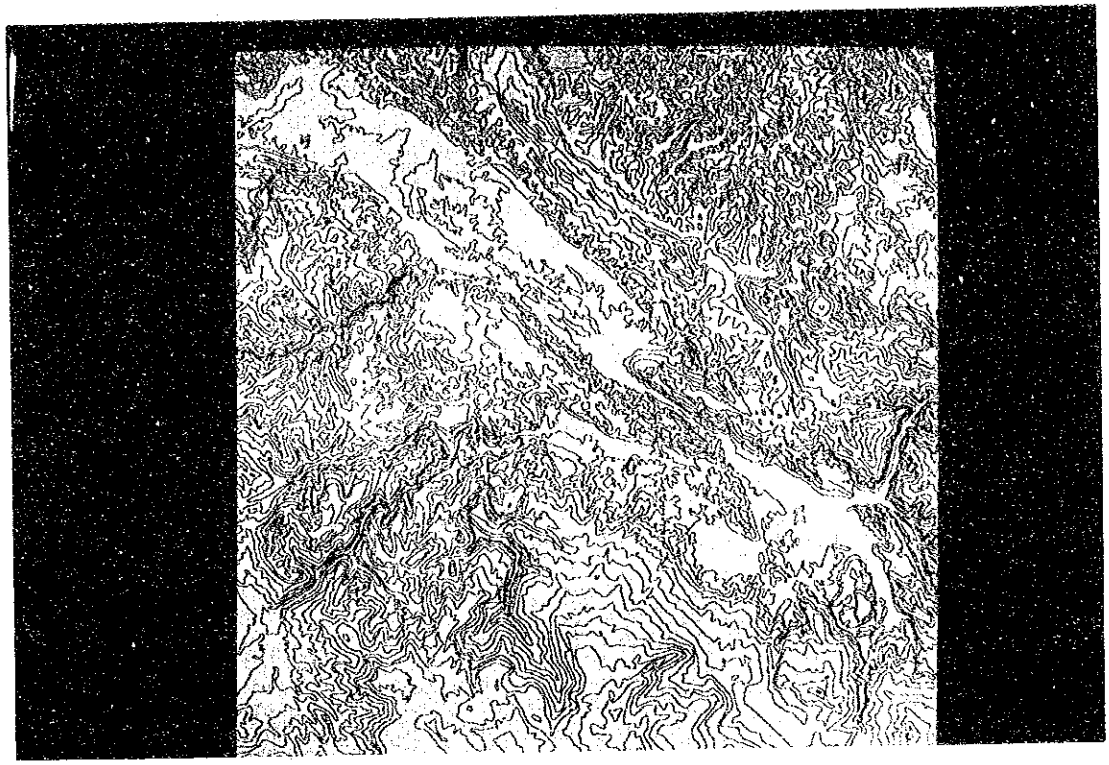
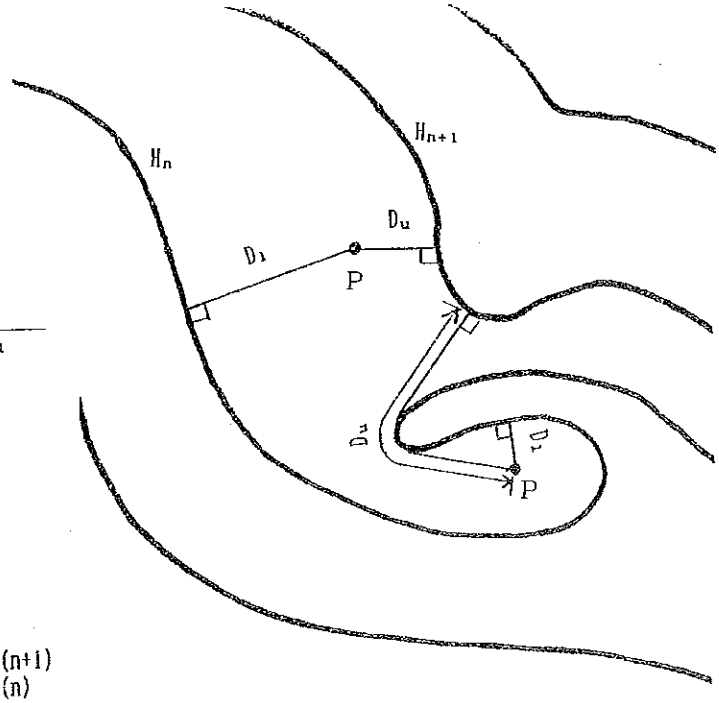


Fig- 1 FLOWCHART of GEOMOPHOLOGICAL SIMULATION





Fig– 2 Digitized contour line



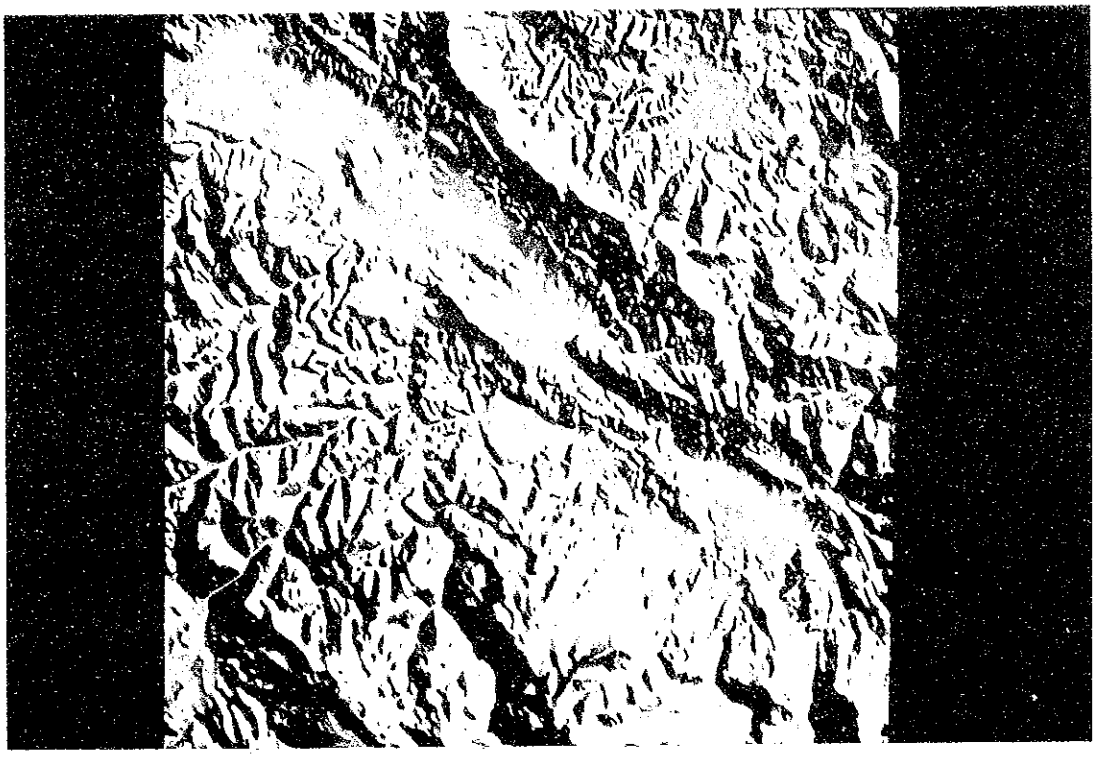
$$E_p = H_n + (H_{n+1} - H_n) * \frac{D_1}{D_u + D_1}$$

$$S_p = \frac{H_{n+1} - H_n}{D_u + D_1}$$

where,

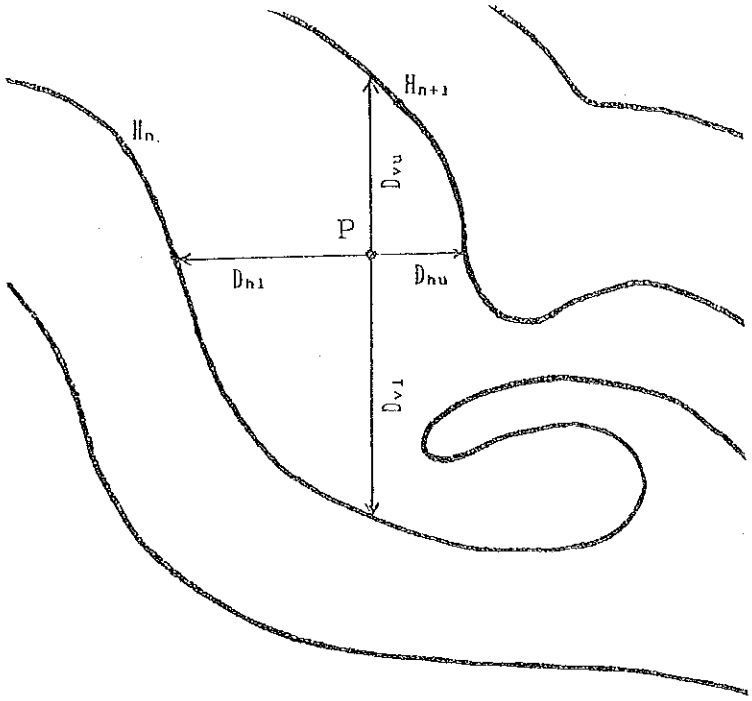
E_p : Elevation of point P
S_p : Slope gradient of point P
H_n : Elevation of Contour (n)
H_{n+1} : Elevation of Contour (n+1)
D_u : Distance between P & Contour (n+1)
D_1 : Distance between P & Contour (n)

Fig– 3 Each minimum distance (EMD) method



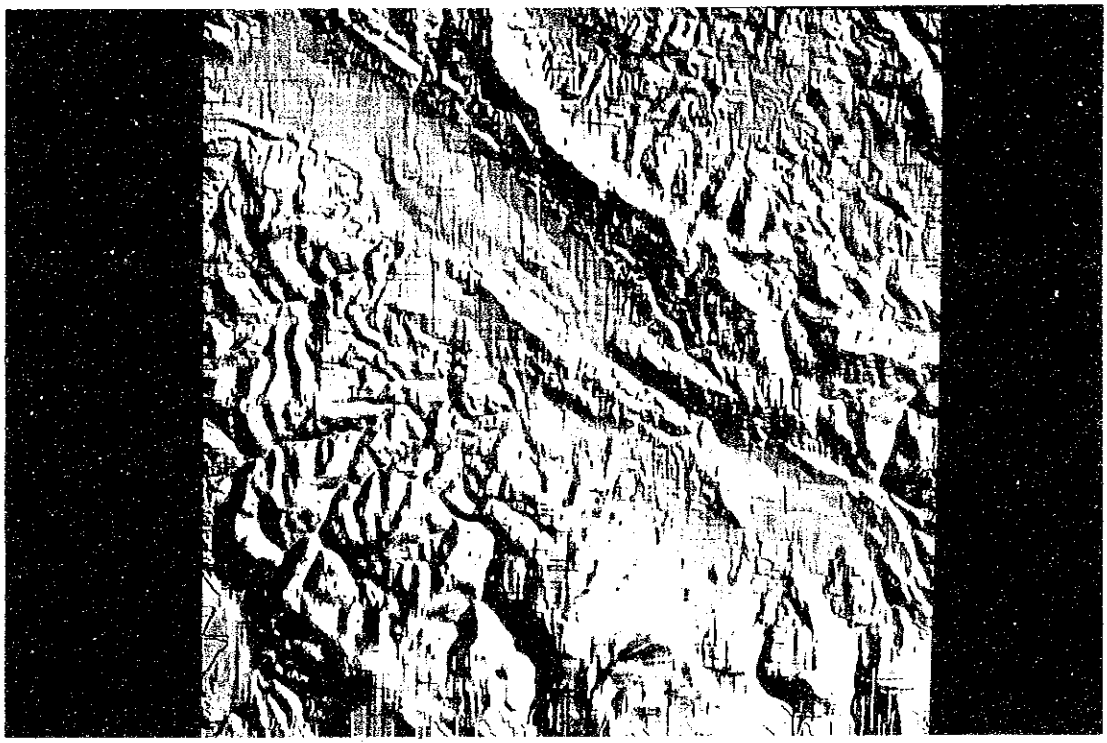
Fig– 4 Elevation map by EMD method

Fig– 5 Slope map by EMD method

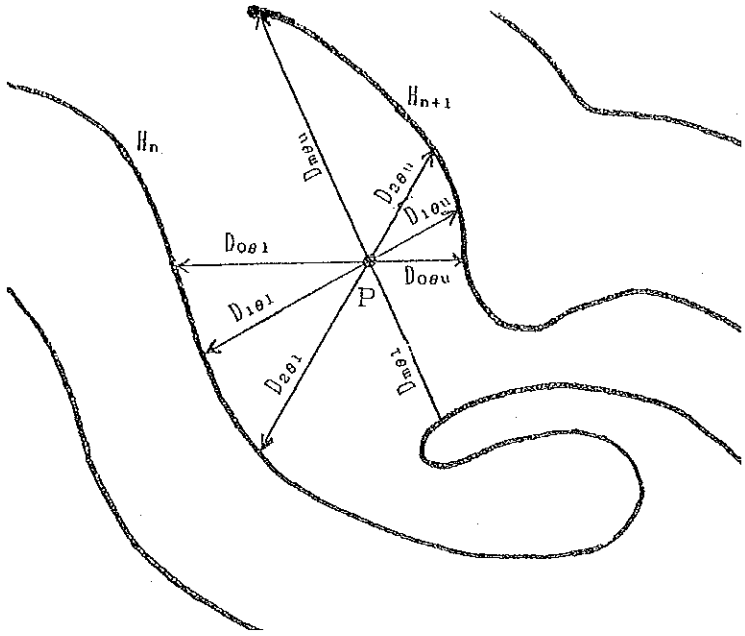


$$E_p = H_n + \frac{1}{2}\left(\frac{D_{hl}}{D_{hu} + D_{hl}} + \frac{D_{vl}}{D_{vu} + D_{vl}}\right) * (H_{n+1} - H_n)$$

Fig– 6 V – H crosswise method



Fig– 7 Elevation map by V–H crosswise method



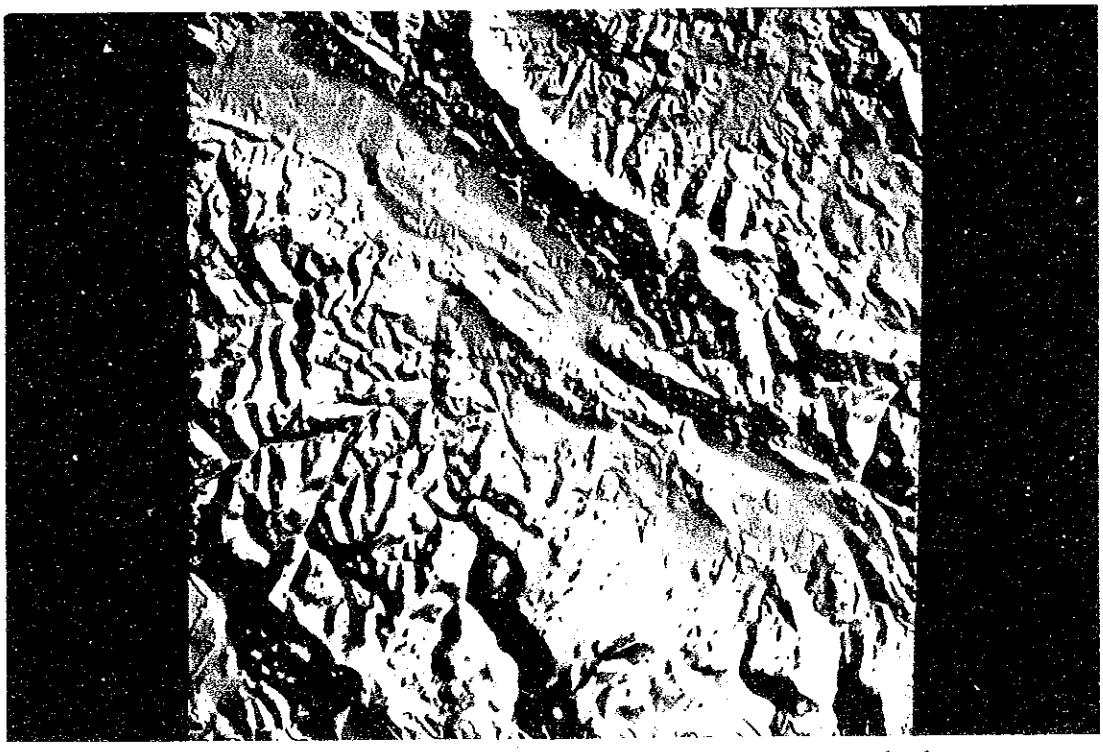
$$E_P = H_n + \frac{1}{m}\left(\frac{D_{0\theta 1}}{D_{0\theta u} + D_{0\theta 1}} + \frac{D_{1\theta 1}}{D_{1\theta u} + D_{1\theta 1}} + \frac{D_{2\theta 1}}{D_{2\theta u} + D_{2\theta 1}} + \cdots \right.$$

$$\left. \cdots + \frac{D_{m\theta 1}}{D_{m\theta u} + D_{m\theta 1}}\right) * (H_{n+1} - H_n)$$

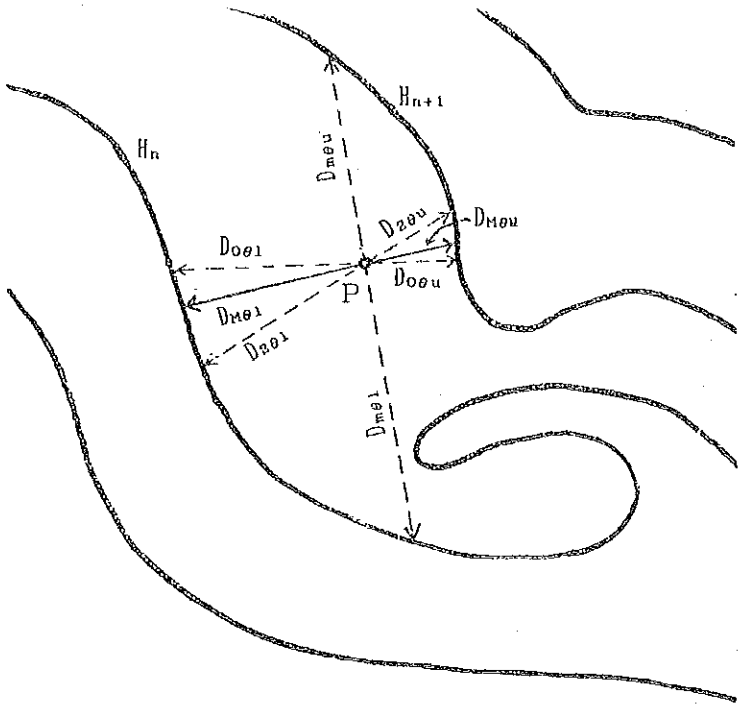
$$m = \frac{180}{\theta}$$

θ : scan angle pitch

Fig– 8 Multi direction average method



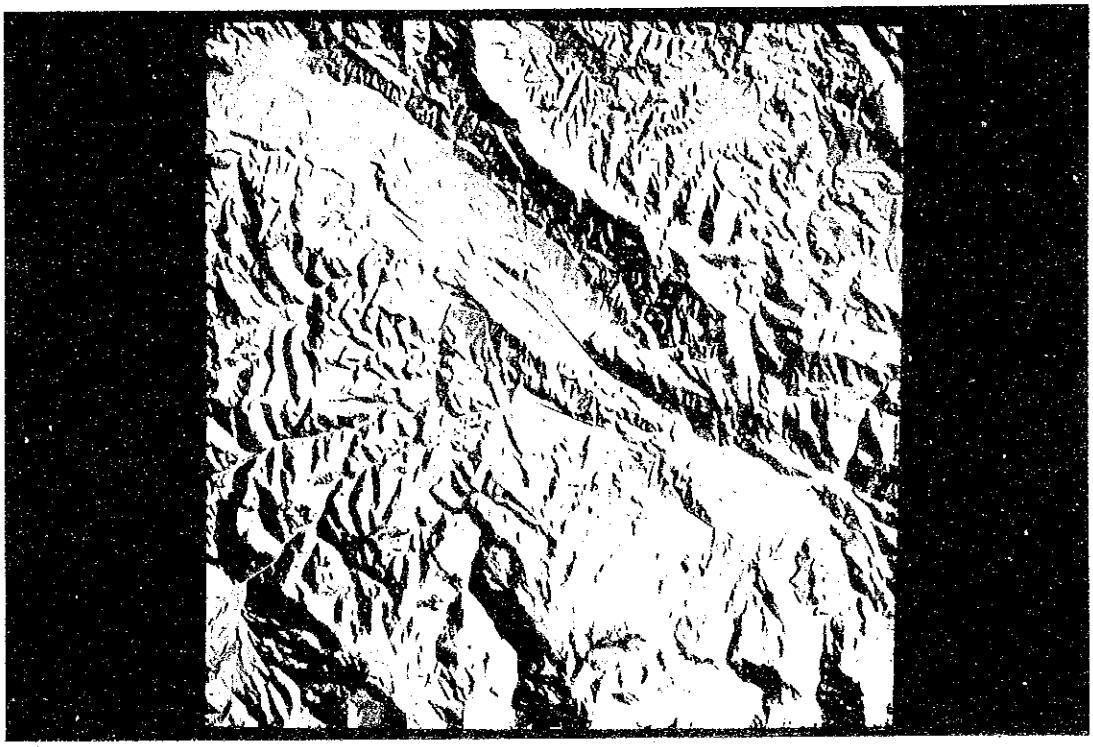
Fig– 9 Elevation map by Multi direction average method



$$E_p = H_n + \left(\frac{D_{Me1} * (H_{n+1} + H_n)}{MIN\{(D_{0eu}+D_{0e1}),(D_{1eu}+D_{1e1}),(D_{2eu}+D_{2e1}), \cdots ,(D_{meu}+D_{me1})\}} \right)$$

D_{Me1} : D_{ie1} when $(D_{ieu} + D_{ie1})$ is minimum

Fig– 10 Steepest slope direction method



Fig– 11 Elevation map by Steepest slope direction method

ANNEX - 4.

APPLICATION OF REMOTE SENSING AND GIS TECHNIQUE FOR HYDROLOGICAL SIMULATION ON KAMPAR RIVER BASIN RIAU PROVINCE

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** Expert of Japan International Cooperation Agency (JICA)

ABSTRACT

This paper describes a simulation system of hydrological analysis which is one of forefront application in the Remote Sensing Project (R/S Project)activity in PUSDATA, Ministry of Public Works under cooperation of JICA.

Hydrological analysis system consists on

1) Water flow direction analysis using digital elevation map and river pattern map.
2) Estimation of full and sub catchment area.
3) Estimation of annual average discharge using rainfall distribution map, discharge coefficient map (set up by landcover map and slope map) and water flow direction map.

Hydrological simulation system is quite attractive tool to strengthen the way of planning for development project.

The case study area is located in upper part of Kampar river basin, Riau province, where has 330,000ha catchment area.

Input data for this analysis is as follows.

1) Digital elevation map
2) River pattern map (option)
3) Landcover map
4) Slope map
5) Rainfall distribution map

As the result, following outputs are produced using above input data.

1) Catchment area map
2) Catchment area zoning map
3) Discharge map

1. INTRODUCTION

Since 1980, The R/S Project has been implemented in PUSDATA, Ministry of Public Works which is cooperated with Japan International Cooperation Agency (JICA). Though R/S Project activity, fundamentals and advanced Remote Sensing and GIS technology has been introduced in PUSDATA.

Recently, R/S Project developed several unique systems to analyze the wide area physical land condition. Hydrological simulation system is one of important part of these systems to provide fundamental data for integrated water management in river basin unit or another advanced application systems.

The case study area is located in upper part of Kampar river basin, Riau province, from longitude 100° 08′ E to 100° 54′ E (86 Km width) and from latitude 0° 31′ N to 0° 05′ S (66 Km width). Where, now Kotopanjang power generation dam is constructing. The Kotopanjang dam has 330,000ha catchment area. (see Fig- 0)

This study is an application of that system to produce catchment area map, catchment area zoning map and discharge map in upper Kampar river basin.

2. MATERIALS

2-1. Preparation of Input Data

1) Digital elevation map

Digital elevation map is prepared by elevation interpolation from contour data of 1:50000 topographical map. For this perpose, Geomorphological simulation system which also be developed in Remote Sensing Project is applied. (see Fig- 2)

2) River pattern map

River pattern map is prepared by manual digitizing the 1:5000 topographical map. This data make the output water flow sure to trace the existing river pattern. If requirement of analysis is not need to just trace the existing river pattern butrequirement is only macroscopic analysis, this river pattern map can be omissible in process. (see Fig- 3)

3) Landcover map

Land cover map is prepared by recent (June 1992) satellite image. General imageprocessing package program has this function as a fundamental menu. (see Fig- 4)

4) Slope map

Slope map is prepared by Geomorphological simulation system same as Digital elevation map above mentioned. (see Fig- 5)

5) Rainfall distribution map

Rainfall distribution map is prepared from yearly rainfall data obtained in observatories around study area. Numerical rainfall data is converted to map style data applying thiessen method. (see Fig- 6)

2-2. Equipments

1) Hardware

Computer SUN-04 work station Main memory : 32 Mb
Disk memory : 2 Gb

2) Software

A series of own developed software

Common package program for minor role

2-3. Input and output file dimension

number of pixel : 9.5 M(million)

number of row : 3400

number of column : 3800

pixel size : 30m * 30m

3. METHODOLOGY

Fig- 1 shows general flow for processing of this Hydrological simulation. The analysis of this study consists on following three(3) functions.

1) Water flow direction analysis using digital elevation map and river pattern map.
2) Estimation of full and sub catchment area.
3) Estimation of annual average discharge using rainfall distribution map, dischargecoefficient map (set up by landcover map and slope map) and water flow direction map.

Hydrological simulation system is quite attractive tool to strengthen the way of planning for development project.

3-1. Water flow direction analysis

The fundamental rule to determine water flow direction from "center" is that watergo into lowest elevation pixel of surrounding eight(8) pixels.

If all surrounding eight(8) pixels are not lower than "center" and cannot determineflow direction, expand examination area until find out lower elevation pixel than previous neighbor where is considered as "exit". During finding out "exit", all connection order among examined pixels are

memorized. After find out "exit", water flow direction from initiate "center" until "exit" is set up according to memorized connection order.

When river pattern map data available, above process is applied to river pattern first. Then applied to whole land area under priority of river water flow. However, if river pattern map data is not available, whole land area is processed directly without river pattern reference.

3-2. Estimation of catchment area

Catchment area estimation is done by accumulation of all pixels which gathers to "water shed outlet" according to water flow direction map. Water shed outlet point can be specified at will. When specify main outlet only, whole one watershed will be estimated. If specify every sub outlet, every sub watersheds will be estimated (classified) in one time.

The feature of catchment area map looks like river pattern, but express accumulated catchment area scale in every pixel. (see Fig- 7)

Catchment area zoning map is boundary or polygon map which is classified according to watershed number where pixel belongs.

(see Fig- 8)

3-3. Estimation of discharge

1) Preparation of discharge coefficient

For estimation of discharge, the runoff coefficient of every pixel is determined by it's land cover condition and slope gradient. (see Table- 1)

This coefficient system is quite simplified model as the ratio of annual rainfall andoverall annual average discharge at watershed outlet.

2) Calculation of annual average discharge

The annual average discharge (Qa) of objective catchment area(A) is calculated as a accumulation of the average annual unit discharge which is expressed as rainfall multiplied by runoff coefficient at every pixel in the catchment area.

The equation for estimation of discharge is as follows.

$$Qa = \sum_{i=1}^{n} (Fi \cdot Ri \cdot P)$$

where

n : number of pixels in catchment area A

Fi : runoff coefficient at pixel i

Ri : average annual rainfall at pixel i

P ; unit area of a pixel

Table– 1 Annual average discharge runoff coefficient

Slope Gradient \ LandCover Type	High Dence Vegitation Forest	Mid.Dence Vagitation Forest	Mix Garden	Bush & Shulab	Grassland & Uplandfield	Paddy Field	Bare Land	Water Body
0 - 8	0.30	0.33	0.35	0.37	0.40	0.50	0.50	1.00
8 - 15	0.40	0.43	0.45	0.47	0.50	0.60	0.60	1.00
15 - 25	0.50	0.53	0.55	0.57	0.60	0.70	0.70	1.00
25 - (%)	0.60	0.63	0.65	0.67	0.70	0.80	0.80	1.00

The result of discharge map is shown in (Fig– 9).

4. RESULT AND DISCUSSION

Newly developed hydrological simulation system is quite attractive tool for estimation of hydrological characteristic in a river basin. In this time, estimated amount of annual discharge in outlet of study area (Kotopanjang dam construction site) is 145 m3/sec without calibration. Threre is another manualy observed data (184 m3/sec). There is 27% defference. If manualy observed data is more relaiable, using it as calibration data, possible to arrange unification between them. Inprovement of runoff coefficient is important matter. Both treatment of additional

elements (such as soil condition or geological condition) and accumulation of study example are considerable. Nevertheless, this system is enough hopeful to apply for many field such as water balance analysis, irrigation planning, integrated water management, environment simulation, natural disaster forecasting and so on.

Following are recommendations regarding with this system.

1) Effective application of this hydrological simulation system in every director generals in MPW or related organizations on their physical planning.
2) Preparation of nationwide river basin summary as the common fundamental information for any organization.

5. REFERENCES

1) Study report on remote sensing analysis for central sumatera forest rehabilitation (Upper Kampar Watershed) project Des,1993
Center for Data Processing And Mapping (PUSDATA)
Ministry og Public works Indonesia

Fig– 0 Location of study area

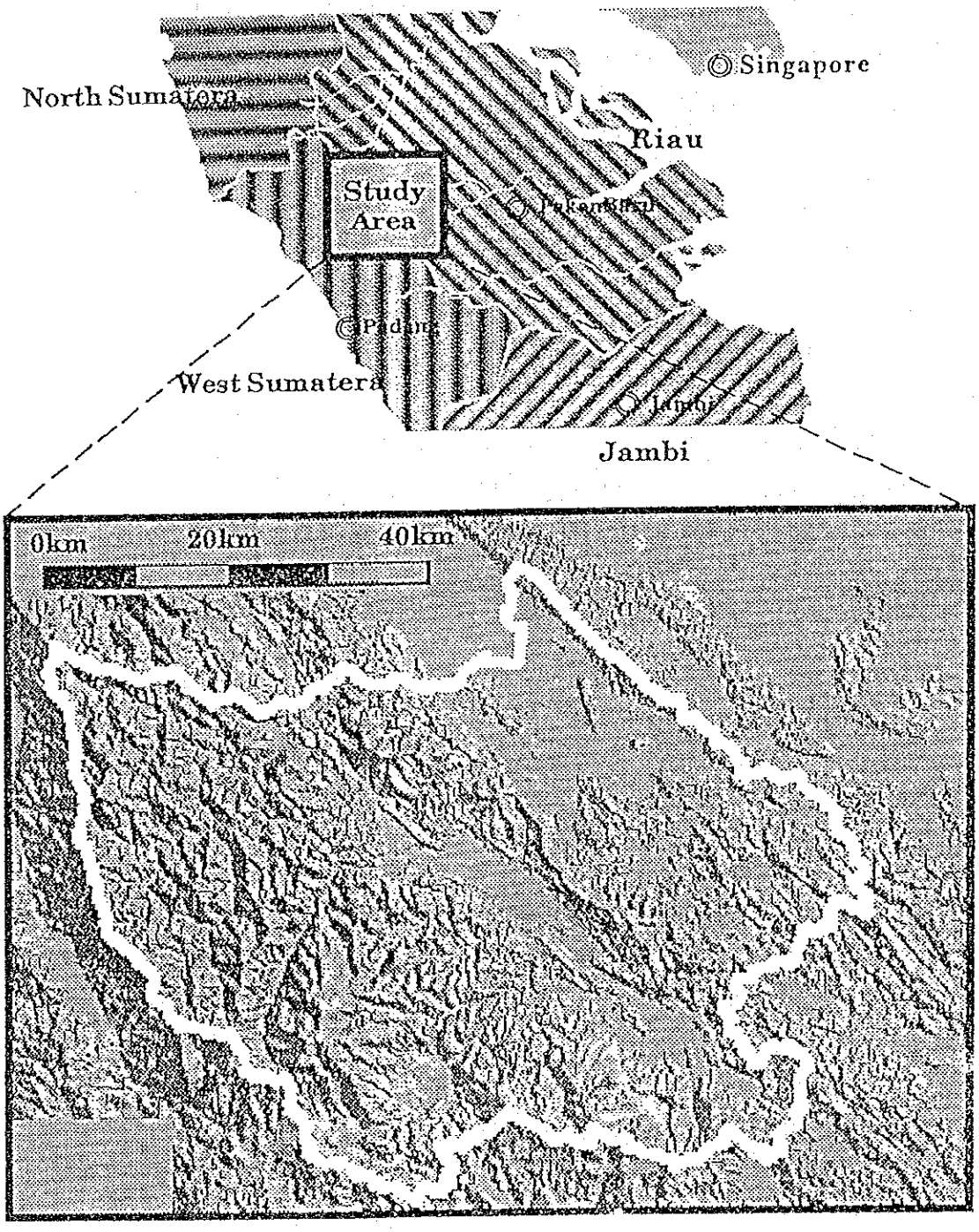
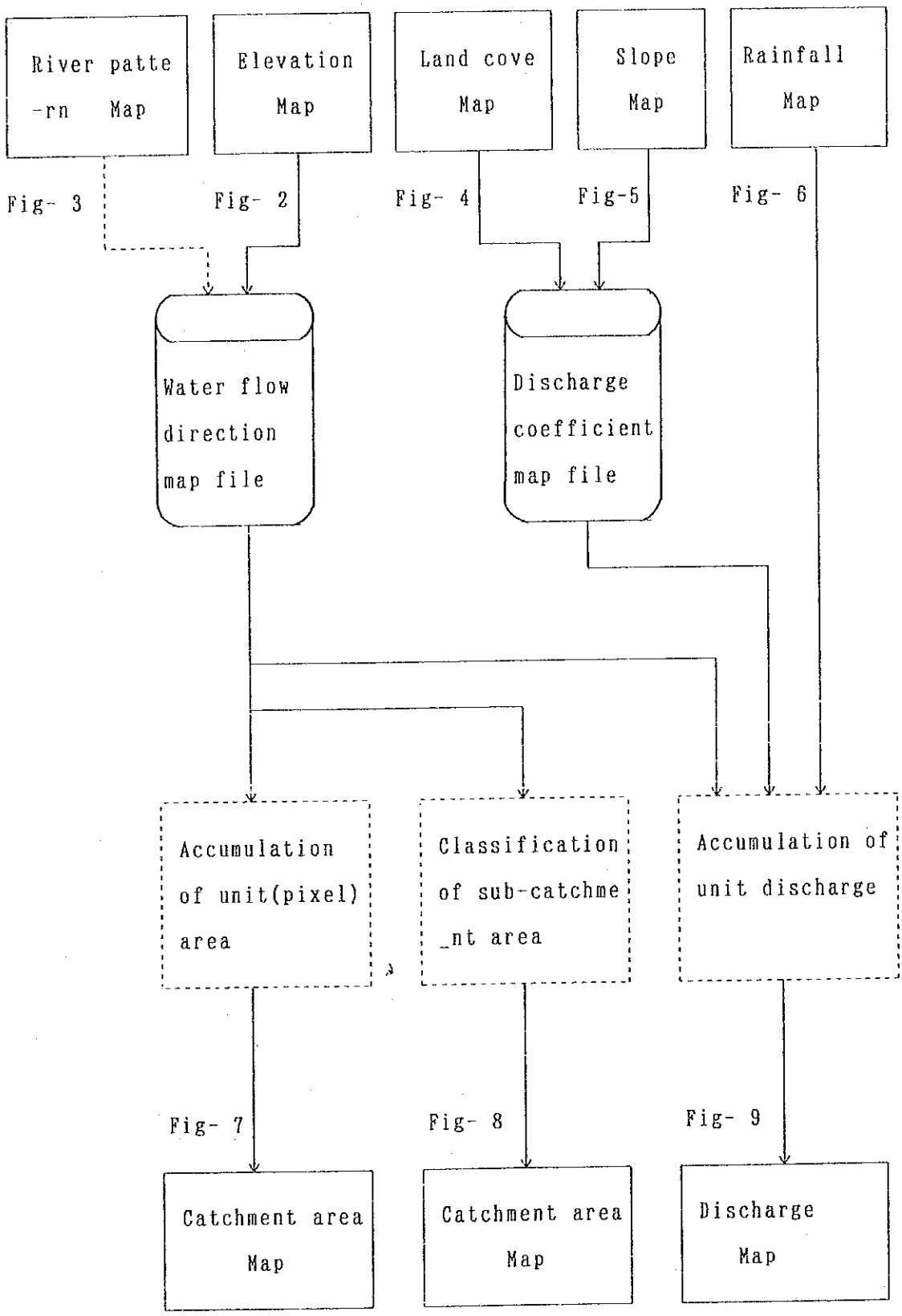
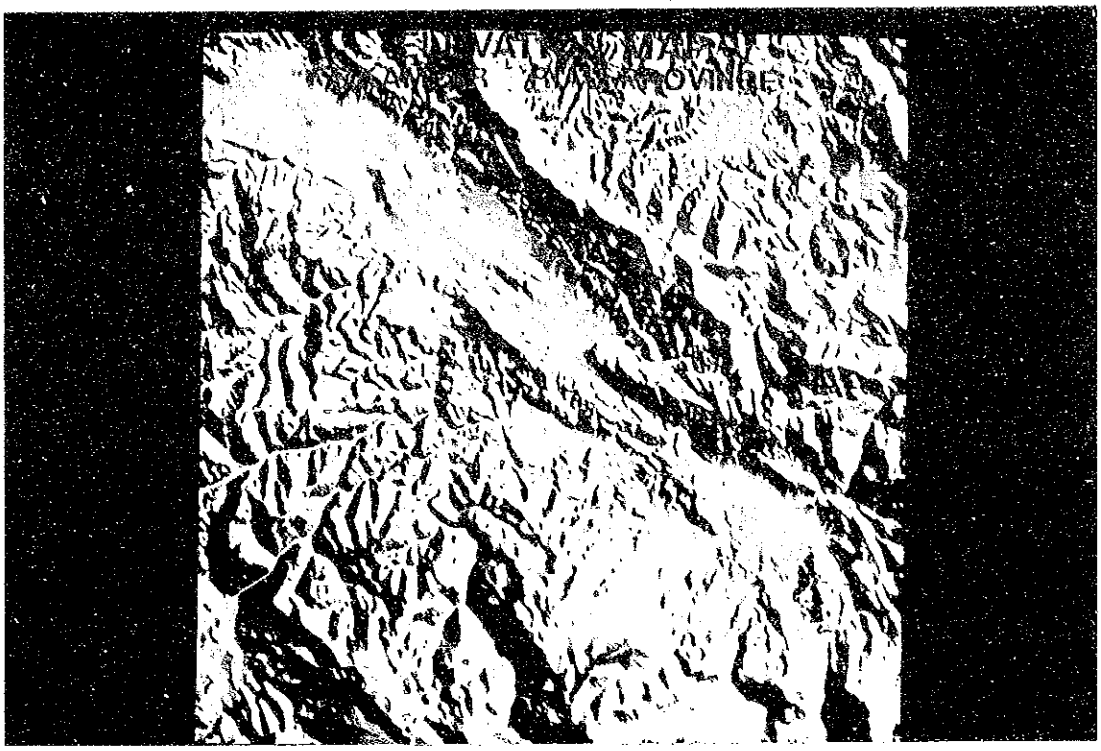
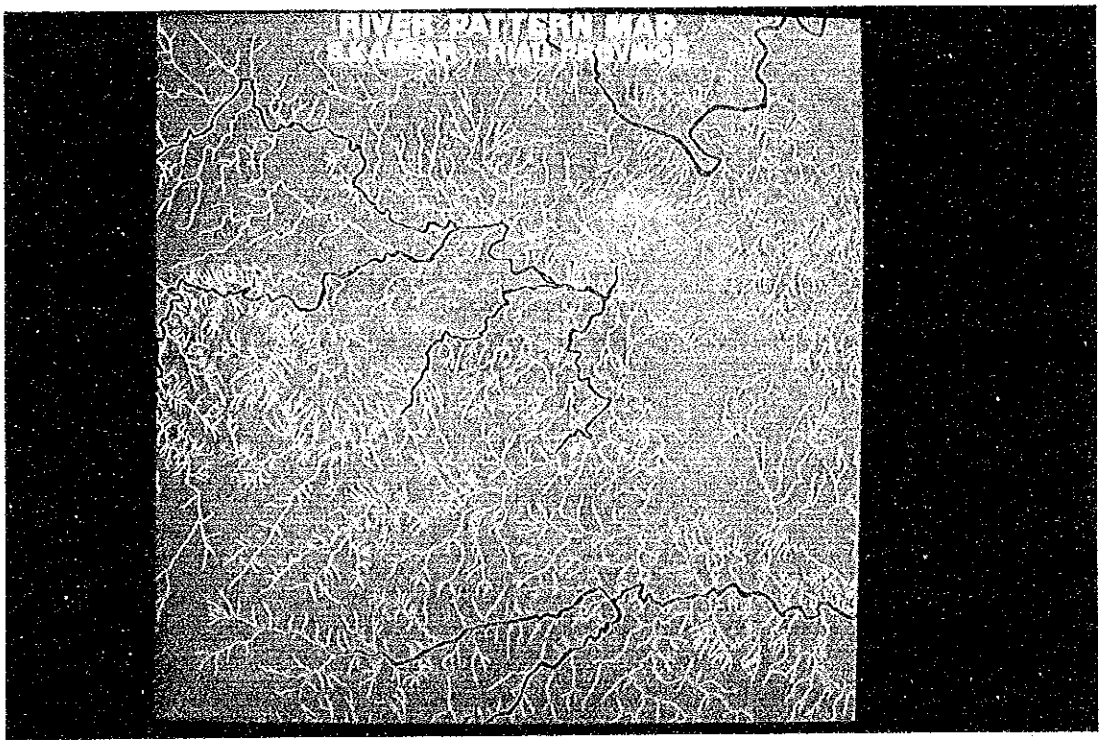


Fig- 1 FLOWCHART of HYDROLOGICAL SIMULATION



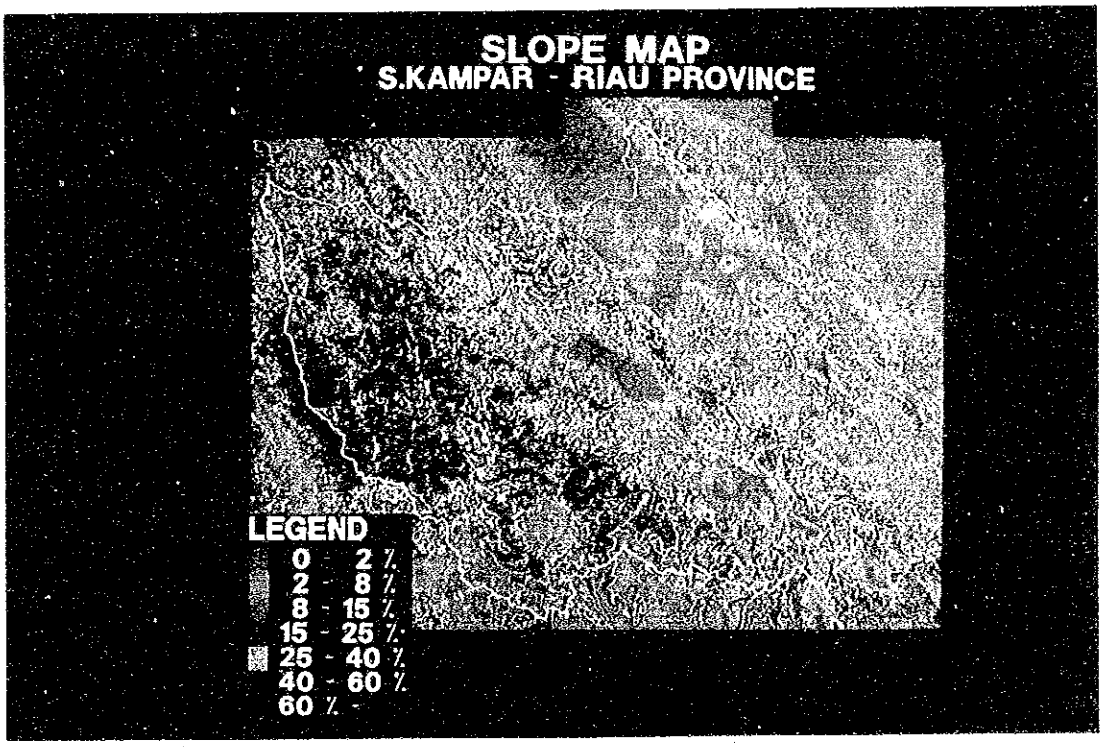


Fig– 2 Digital elevation map (input)



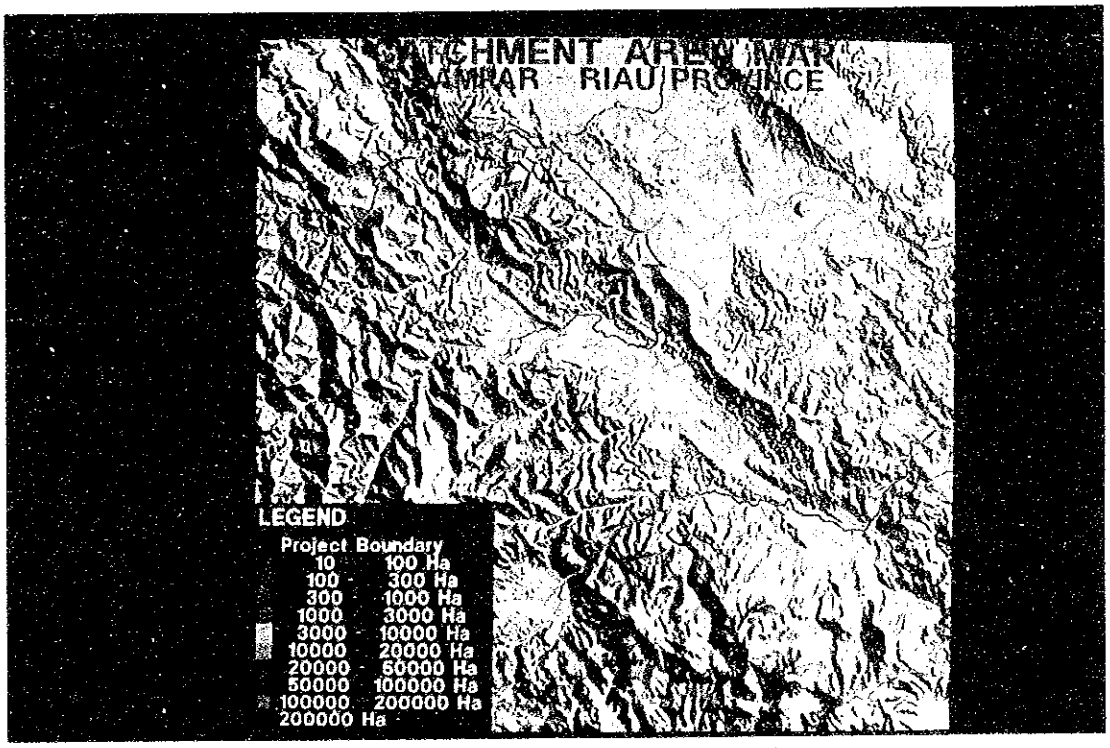
Fig– 3 River pattern map (input)

Fig– 4 Land cover map (input)

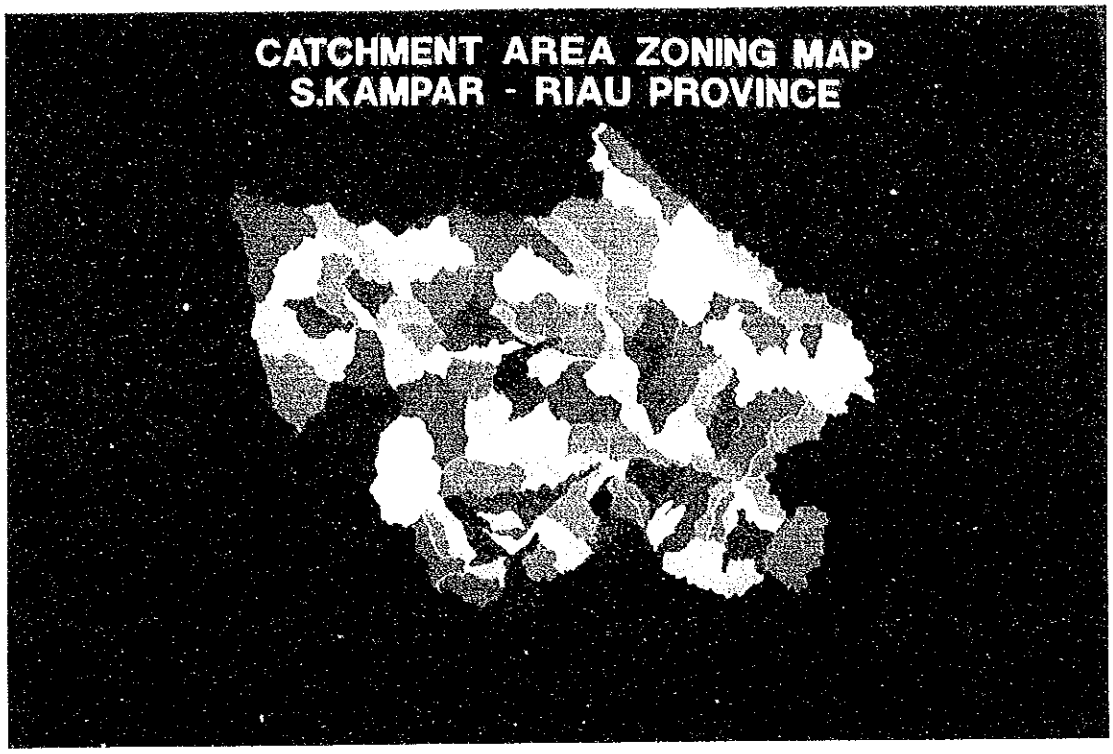


Fig– 5 Slope map (input)

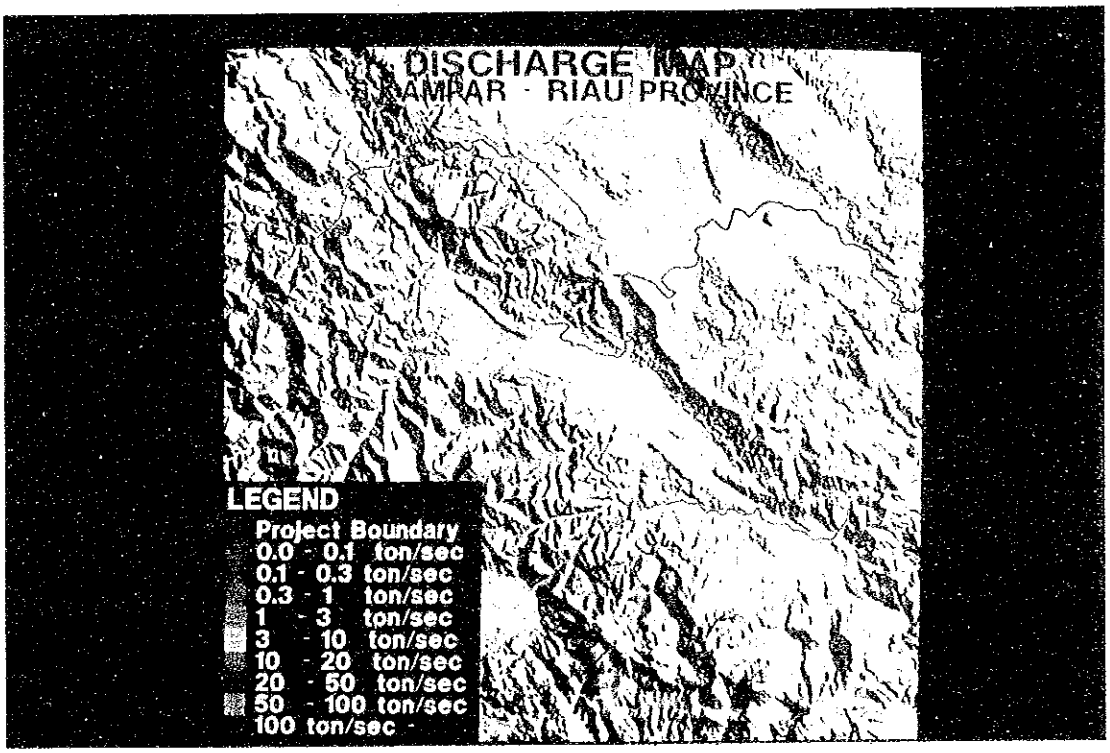
Fig– 6 Rainfall distrbution map (input)



Fig– 7 Catchment area map (output)



Fig– 8 Catchment area zoning map (output)



Fig– 9 Discharge map (output)