The Feasibility of Upland Irrigation and Land Development Project at Citarik Sub-Watershed in the Republic of Indonesia

Executive Report

THE FEASIBILITY STUDY ON UPLAND PLANTATION AND LAND DEVELOPMENT PROJECT AT CITARIK SUB-WATERSHED IN THE REPUBLIC OF INDONESIA

SUPPORTING REPORT

OCTOBER, 1993

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

CONTENTS

A1 S/W and M/M

SCOPE OF WORK

FOR

THE FEASIBILITY STUDY ON UPLAND PLANTATION AND LAND DEVELOPMENT PROJECT

AT

CITARIK SUB-WATERSHED

IN

THE REPUBLIC OF INDONESIA

AGREED UPON

THE MINISTRY OF FORESTRY

AND

THE JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA, SEPTEMBER 25, 1991

IR. ARMANA DARSIDI
DIRECTOR GENERAL OF
REFORESTATION AND
LAND REHABILITATION
MINISTRY OF FORESTRY

MR. NAOTO MAEDA
LEADER OF THE PROJECT
PREPARATORY SYUDY TEAM
THE JAPAN INTERNATIONAL
COOPERATION AGENCY

I INTRODUCTION

In response to the request of the Government of the Republic of Indonesia, the Government of Japan has decided to conduct the Feasibility Study of Upland Plantation and Land Development Project (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan. Accordingly, the Japan International Coorperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programmes of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of the Republic of Indonesia.

The present document sets forth the scope of work with regard to the above mentioned study.

II OBJECTIVES OF THE STUDY

The objectives of the Study are to formulate an upland plantation and land development plan at Citarik Sub-Watershed in northwestern Java and to study its feasibility, expecting the contribution to the watershed management and rural development in Indonesia.

III STUDY AREA

The study area will cover a total area of approximately 50,000ha at Citarik Sub-Watershed in Java. (See Appendix I)

IV OUTLINE OF THE STUDY

In order to achieve the objectives mentioned above, the Study will cover the following works:

1. Field survey and collection of the existing data for mapping
   (1) Land use
   (2) Vegetation
   (3) Soil
   (4) Others

2. Preparation of topographic maps (scale; 1:10,000), soil maps (scale; 1:10,000) and land use-vegetation maps (scale; 1:10,000) by the existing orthophoto maps (scale; 1:5,000) and aerial photographs (scale; 1:20,000) and field survey

3. Formulation of an upland plantation and land development plan

The upland plantation is a reforestation and management of unproductive land and existing forest area, including some erosion control measures. The land development aims at proper management of farmland in order to prevent the degradation and erosion of soil sustaining the life of inhabitants of the area.

The plan consists of:

a. Watershed conservation and forest management
b. Land development with social forestry
c. Infrastructure
d. Organization to implement the plan

Necessary works are:

(1) Collection and analysis of the data
(2) Planning
(3) Financial and economic analysis

V WORK SCHEDULE

The Study will be carried out in accordance with the attached tentative schedule (see appendix II).

VI REPORTS

JICA will prepare and submit the following reports in English to the Government of the Republic of Indonesia.

1. Inception Report:

   Thirty(30) copies at beginning of the Study in the Republic of Indonesia.

2. Progress Report:

   Thirty (30) copies within eight(8) months after the beginning of the Study.

3. Interim Report:

   Thirty (30) copies within sixteen(16) months after the beginning of the Study.

4. Draft Final Report:

   Thirty (30) copies within twenty(20) months after the beginning of the Study, The Government of Indonesia will provide JICA with comments within one (1) month after the reception of the Draft Final Report.

5. Final Report:

   Thirty(30) copies within one(1) month after JICA's reception of the said comments on the Draft Final Report.

VII UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF INDONESIA

1. To facilitate smooth conduct of the Study, the Government of the Republic of Indonesia will take necessary measures:

(1) to secure the safety of the Japanese study teams,

(2) to permit the members of the Japanese study teams to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

(3) to exempt the members of the Japanese study teams from taxes, duties, fees and any other charges on equipment, machinery and other materials brought into and out of Indonesia for the conduct of the Study,

(4) to exempt the members of the Japanese study teams from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study teams for their services in connection with the implementation of the Study,

(5) to provide necessary facilities to the Japanese study teams for the remittance as well as the utilization of funds introduced into Indonesia from Japan in connection with the implementation of the Study,

(6) to secure permission for entering into private properties or restricted areas and, if necessary, for felling trees, in order to conduct the study.

(7) to secure permission to take all data and documents related to the Study out of Indonesia to Japan by the Japanese study teams,

(8) to arrange medical services as needed under the condition that its expenses are chargeable on the members of the Japanese study teams, and

(9) to secure clearance for the use of communication facilities including transceivers.

2. The Government of the Republic of Indonesia will bear claims, if any arises, against the members of the Japanese study teams resulting from, occurring in the course of or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study teams.

3. The Ministry of Forestry will act as the counterpart agency to the Japanese study teams and also as the coordinating body in relation to other governmental and non-governmental organizations concerning for the smooth implementation of the Study.

4. The Ministry of Forestry will, at its own expense, provide the Japanese study teams with the following, in cooperation with other agencies concerned, if necessary:

(1) necessary data, information and materials, including the aerial photographs (scale; 1:20,000) and the orthophoto maps (scale; 1:5,000) related to the Study

(2) counterpart personnel

(3) suitable office with necessary equipment in Jakarta and Bandung

(4) credentials or identification cards

(5) vehicles with drivers, typists and labors necessary for the implementation of the Study

Ⅷ UNDERTAKING OF JICA

For the implementation of the Study, JICA will take necessary measures:

(1) to dispatch at its own expense, study teams to Indonesia,

(2) to pursue technology transfer to the Indonesian counterpart personnel in the course of the Study.

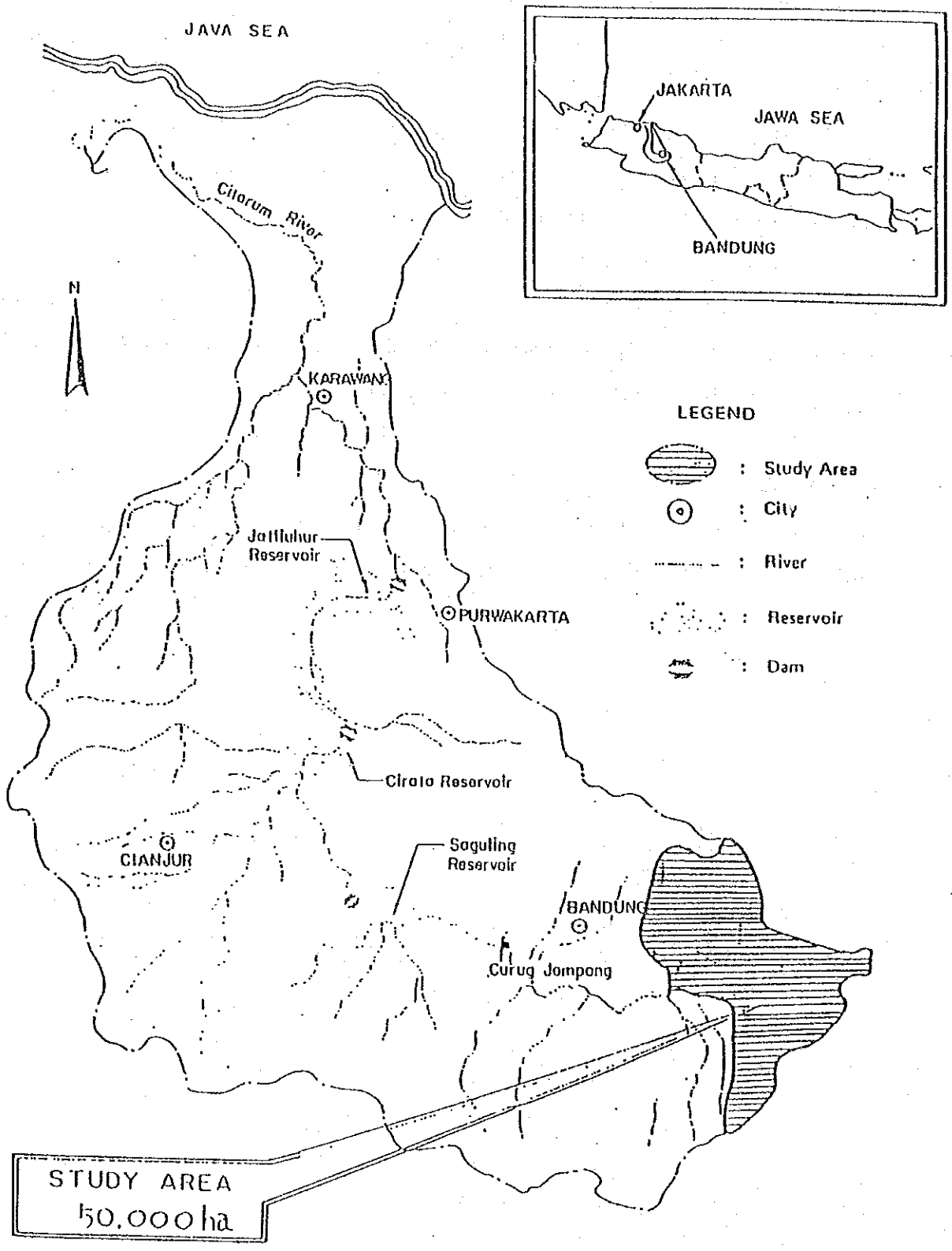
(3) to accept the training of counterpart personnel in Japan.

(4) to provide necessary equipment and machinery for the implementation of the Study, which will remain the property of the Government of Japan unless otherwise agreed upon.

Ⅸ CONSULTATION

JICA and The Ministry of Forestry will consult with each other in respect of any matter that may arise from or in connection with the Study.

APPENDIX ; I



LOCATION OF STUDY AREA

APPENDIX : II

TENTATIVE SCHEDULE

WORKS \ MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Field survey and collection of the existing data for mapping	▨	▨	▨	▨		▨	▨	▨	▨													
Preparation of topographic maps		▨	▨	▨	▨	▨	▨	▨														
Preparation of soil maps and land use-vegetation maps								▨	▨													
Formulation of an upland plantation and land development plan — Collection and analysis of the data	▨	▨	▨	▨		▨	▨	▨	▨	▨	▨											
Formulation of an upland plantation and land development plan — Planning											▨	▨	▨	▨								
Formulation of an upland plantation and land development plan — Financial and economic analysis																	▨	▨	▨	▨	▨	▨
Submission of the reports				IC/R						P/R						IT/R				DF/R		F/R

Remarks : IC/R Inception Report
P/R Progress Report
IT/R Interim Report
DF/R Draft Final Report
F/R Final Report
▨ Work in Indonesia
▭ Work in Japan

MINUTES OF MEETING ON THE DRAFT FINAL REPORT OF THE FEASIBILITY STUDY ON UPLAND PLANTATION AND LAND DEVELOPMENT PROJECT AT CITARIK SUB-WATERSHED IN THE REPUBLIC OF INDONESIA

In accordance with the Scope of Work for the Feasibility Study on Upland Plantation and Land Development Project at Citarik Sub-Watershed in the Republic of Indonesia (hereinafter referred to as "the Study") signed by the Government of the Republic of Indonesia (hereinafter referred to as "the Government") and Japan International Cooperation Agency (hereinafter referred to as "JICA"), the Japanese Study Team headed by Dr.Kinji Hachiya conducted the Study starting in February 1992. As a result of the Study the Draft Final Report has been prepared for the consideration and analysis by the Government.

The Study Team submitted the Draft Final Report and held a series of discussion with the Government authorities headed by Mr. Husodo Sudarisman, Director of Programming, Directorate General of Reforestation and Land Rehabilitation, Ministry of Forestry.

The salient results of the discussions are as follows :

1. The Government received from the Study Team thirty (30) copies of the Draft Final Report.
2. The Government has agreed with the contents of the Draft Final Report.
3. The Government will send comments of the Report within one (1) month from the reception of the Report.

Jakarta, September 4, 1993.

Dr. Kinji Hachiya
Leader of JICA Study Team

Husodo Sudarisman
Director of Programming
Directorate General of
Reforestation and Land
Rehabilitation, Ministry
of Forestry.

Witnessed by,

Dr. Takashi Kato
JICA Advisory Team

A2 List of Study Team Members and Main Interviewees on Indonesian Side

1. List of Study Team Members

The following study team members were sent to the Study Area in the 3 financial years to conduct the relevant surveys or work.

(1) Study Team Members

Area of Assignment	Name	Field Survey Period
Team Leader	Kinji Hachiya	Feb. 23 - Mar. 8, 1992 (15 days) Aug. 24 - Sep. 12, 1992 (20 days) Nov. 16 - Dec. 5, 1992 (20 days) May 25 - June 6, 1993 (13 days) Aug. 26 - Sep. 6, 1993 (12 days)
Assistant Team Leader and Upland Plantation Development	Kazuaki Fushimi	Feb. 23 - Apr. 2, 1992 (40 days) Aug. 24 - Nov. 21, 1992 (90 days) May 25 - June 21, 1993 (28 days) Aug. 26 - Sep. 6, 1993 (12 days)
Soil	Tetsushige Kubo	Mar. 9 - Apr. 2, 1992 (25 days) Sep. 7 - Nov. 5, 1992 (60 days)
Agroforestry	Sumio Ichikawa	Sep. 7 - Nov. 25, 1992 (80 days) May 25 - June 21, 1993 (28 days)
Social Forestry and Its Diffusion	Atsushi Hisamichi	Mar. 4 - Apr. 2, 1992 (30 days) Sep. 7 - Dec. 5, 1992 (90 days) May 25 - June 21, 1993 (28 days) Aug. 26 - Sep. 6, 1993 (12 days)
Land Use and Vegetation	Kozo Kato	Sep. 7 - Nov. 15, 1992 (70 days)
Watershed Conservation	Jun Kajigaki	Feb. 23 - Apr. 2, 1992 (40 days) Aug. 24 - Nov. 21, 1992 (90 days) May 25 - June 21, 1993 (28 days) Aug. 26 - Sep. 6, 1993 (12 days)
Financial and Economic Analyses	Tomoo Mochida	Oct. 7 - Dec. 5, 1992 (60 days) May 25 - June 21, 1993 (28 days) Aug. 26 - Sep. 6, 1993 (12 days)
Local Agriculture and Forestry, Marketing and Distribution	Shu Mizushina	Mar. 9 - Apr. 2, 1992 (25 days) Aug. 24 - Sep. 22, 1992 (30 days)
Environmental Assessment	Shuichi Miyabe	Mar. 9 - Apr. 2, 1992 (25 days) Aug. 24 - Nov. 1, 1992 (70 days) May 25 - June 21, 1993 (28 days)
Surveying	Seiji Nagaoka	Mar. 2 - Apr. 5, 1992 (35 days)
Mapping	Kozo Sanya	Apr. 13 - May 12, 1992 (30 days) May 27 - June 25, 1992 (30 days)

(2) Advisory Team Members

Area of Assignment	Name	Field Survey Period
(Team Leader) Administration	Takao Isobe	Feb. 23 - Mar. 3, 1991 (10 days)
Watershed Management	Michinobu Onishi	May 25 - June 3, 1993 (10 days)
Social Forestry and Its Diffusion	Takashi Kato	Aug. 26 - Sep. 6, 1993 (12 days)
Local Development	Seihei Misawa	May 25 - June 3, 1993 (10 days)
Study Supervision	Hiroaki Endo	Feb. 23 - Feb. 29, 1991 (7 days)
	Masayoshi Nishikawa	Aug. 27 - Sep. 4, 1992 (9 days) May 25 - June 3, 1993 (10 days) Aug. 26 - Sep. 6, 1993 (12 days)

2. List of Main Interviewees on Indonesian Side

(1) Bureau for International Technical Cooperation in Cabinet Secretariat (SEKKAB)

Mr. D. Burhanudin Head of Colombo Plan Sub-Division

(2) Department of Forestry (Departemen Kehutanan: DEPHUT)

[Overseas Cooperation and Investment Bureau]

Mr. Bambang Soekartiko	Staff Member
Mr. Widji Santosa	Staff Member
Mr. P. Marinus	Staff Member
Mr. H. Sudarto	Staff Member

[Directorate General of Reforestation and Land Rehabilitation: RRL]

Mr. Armana Darsidi	Director General
Mr. Sumarsono Hardiyanto	Secretary
Mr. Dwiatmo Siswomartono	Director of Soil Conservation
Mr. Widarya Noer	Chief of Planning and Programme Division, Secretariat Directorate General
Mr. Momong Imron Rosyadi	Chief of Watershed Management Division, Directorate of Soil Conservation
Mr. Sukardi Siswo Kusmo	Chief of Reforestation and Afforestation Division
Mr. Asep Suwarna	Secretariat Directorate General
Mr. Yudi Soetrisno	Secretariat Directorate General

Mr. Billy Hendra	Secretariat Directorate General
Mr. Kasmiran	Directorate of Soil Conservation
Mr. Sutadi Sastrowihardjo	Directorate of Soil Conservation
Mr. Etti Nurwanti	Directorate of Reforestation and Afforestation
Mr. Sudjarno	Directorate of Reforestation and Afforestation
Mr. Wartam	Directorate of Reforestation and Afforestation
Mr. Ruspandi	Directorate of Reforestation and Afforestation

(3) West Java Provincial Office of DEPHUT (Kantor Wilayah Departemen Kehutanan Propinsi Jawa Barat: KANWIL JABAR)

Mr. Hardjito Haknjosoebroto	Former Director
Mr. Soedjadi Martodiwiryo	Present Director
Mr. Undang Iskandar	Staff Member
Mr. R. Adang	Staff Member

(4) Land Rehabilitation and Soil Conservation Centre Region IV (Balai Rehabilitasi Lahan dan Konservasi Tanah Wilayah IV: BRLKT IV)

Mr. Dodo S. Maman	Former Director
Mr. Komara	Staff Member
Mr. Sularso	Staff Member
Mr. Sanusi Edarmaji	Staff Member
Mr. Soewarno Boedianto	Director, Citarum Land Rehabilitation and Soil Conservation Sub-Centre (SBRLKT Citarum)
Mr. Yuliarto Joko Putranto	SBRLKT Citarum
Mr. Achmad Wratsongko	SBRLKT Citarum
Mr. Hartono	SBRLKT Citarum
Mr. Amim	SBRLKT Citarum
Mr. Deddy Hadian	SBRLKT Citarum
Mr. Achadiat Wirapradja	SBRLKT Citarum
Mr. Aryan Rukman Sukma	SBRLKT Citarum
Mr. Oman Supratman	SBRLKT Citarum

Mr. Irawan Iman	SBRLKT Citarum
Mr. Deddy Soetardi	SBRLKT Citarum
Mr. Dudung	SBRLKT Citarum
Mr. Djoko Winarno	Cimanuk Land Rehabilitation and Soil Conservation Sub-Centre (SERLKT Cimanuk)
Mr. Dede Hermansyah	SBRLKT Cimanuk
Mr. Widiasmoro Sigit	SBRLKT Cimanuk

(5) Land Rehabilitation and Soil Conservation Centre Region V (Balai Rehabilitasi Lahan dan Konservasi Tanah Wilayah V: BRLKT V)

Mr. Tri Usodo	Solo Land Rehabilitation and Soil Conservation Sub-Centre (SBRLKT Solo)
Mr. Karno	SBRLKT Solo

(6) Centre for Watershed Management Technology (Balai Teknologi Pengelolaan Daerah Aliran Sungai: BTP-DAS)

Mr. Paimin	Land Resources Adviser
Mr. Sukresno	Soil Conservation Expert

(7) Solo River Upstream (Wonogiri) Conservation Project (Proyek Penghijauan /Perlindungan DAS Solo Hulu (Wonogiri))

Mr. A. Kristanto Adiputranto	Chief of Project Office

(8) State Forestry Authority Unit III (Perum Perhutani Unit III)

Mr. Soetomo	Chief of the Unit III
Mr. Samad Sidik	Staff Member
Mr. M. Udju Surianatakusmah	Chief of North Bandung Forestry Office

(9) Planning Board (Badan Perencanaan Pembangunan Daerah: BAPPEDA)

Mr. Muslim	BAPPEDA Tk. I, West Java Province
Mr. Dodi Yuhandar	BAPPEDA Tk. I, West Java Province
Mr. Sadudin	BAPPEDA Tk. II, Bandung District

Mr. Edi Suhaedi	BAPPEDA Tk. II, Sumedan District
Mr. Endang Komarudin	BAPPEDA Tk. II, Sumedang District

(10) University of Padjadjaran (Dept. Pendidikan dan Kebusayaan, Universitas Padjadjaran)

Mr. Supriyo Ambar

(11) Bank of Indonesia (Bank Indonesia)

Mr. Caolid Kusnadi

(12) National Land Agency (Badan Pertanahan Nasional: BPN)

Mr. Sugiarto Sargo	West Java Office

A3 Formulation of Thematic Maps

(1) Soil Map

i) Method of soil profile description

The places of examination pits were first selected taking into account the elevation, the topography and the actual situation of land use, and then soil profile survey was carried out. The description of soil profiles was based on FAO's "Guidelines for Soil Profile Description (the second edition)". The value measured by means of Yamanaka's soil hardness meter was indicated as "hardness." The allophane test with 1M·NaF was also carried out as an auxiliary measure to detect the volcanic ash soils.

ii) Physical and chemical analyses of soil samples

The pH value, the organic carbon content, the total nitrogen content, the mechanical composition, the bulk density, the porosity, and the permeability of the soil samples collected from the representative soil profiles were clarified. For the determination of the permeability, the particle size class and the soil texture class, the USDA system was applied.

The above-mentioned analyses and measurements were entrusted to the Institute of Soil and Agro-Climate belonging to the Ministry of Agriculture (DEP. PERTANIAN, PUSAT PENELITIAN TANAH dan AGROKLIMAT).

iii) Soil grouping

For soil grouping, the soil units of FAO/Unesco were used. The adaptive subdivision of the soil units was limited to the required minimum, taking into consideration the purpose of this study.

iv) Method of soil mapping

In addition to the survey results of the examination pits, the observation results of the cuttings of roads and quarries were used to examine the distribution tendency of various types of soils. The results of this examination were put on topographic maps on the scale of 1:10,000.

As a mapping unit, "Soil Complex" was applied. "Soil Complex" indicates that

more than two types of soils are mixed regularly depending on the micro-topograhy.

The final maps have been traced by PT. AEROKARTO INDONESIA under the instruction and supervision of a member of the Study Team.

(2) Land use/Vegetation Maps

It was decided to draw land use/vegetation maps based on topographic maps on the scale of 1:10,000 drawn in the 1992 survey. The drawing works were also entrusted to the Indonesian consultant company and carried out under the instruction and supervision of a member of the Study Team who assisted the mapping works.

i) Field survey and determination of interpretation criteria

Field survey was performed to study the actual situation of land use and vegetation, and to confirm and check the preliminary interpretation of aerial photographs.

Based on the results of the survey of actual situation and the preliminary interpretation, discussions were held with the Indonesians concerned including the couterparts. In these discussions, the interpretation criteria and the minimum plot units were fixed.

Main classification items for interpretation are indicated in Table A3-1. Other items set are fish pond, industrial facilities cemetery/park and swamp. In addition, it was decided to classify roads, railways and rivers if they can be identified.

The minimum plot unit was decided as 5mm x 5mm (about 0.25ha) on a double-enlarged photograph, taking into account the condition of the image on the photograph, and the current condition of land use.

Table A3-1 Main Interpretation Classes

Class		Symbol	Class		Symbol
Wet paddy field	Irrigated	Si	Shrub		Be
	Rain-fed	Sh			
			Bamboo		Bb
Dry crop field	With terraces	Lt	forest		
	Without terraces	Lg	Grassland		Gr
			Bare land	Quarry	Ba
Mixed garden	Crown density ≥71%	Ac		Landslide	Bn
	Crown density ≤70%	Ao			
			Settle-ments		Pm
Estates	Classified by kind of crops	Pc, u, q, l,			
Forest	Natural secondary	Hn			
	Man-made	Hp			

The following points were studied in fixing the interpretation criteria.

a. The terraces of dry crop fields are very important for soil conservation. As the terraces kept in a good condition are interpretable, it was decided to distinguish dry crop fields with terraces from dry crop fields without terraces.

b. Small-sized forests in the neighborhood of houses are to be included in settlements because most of small-sized forests are not as large as the minimum plot unit.

c. Fields dotted with trees are regarded as fields without trees when the density of trees is very low, because fields with the low density of trees

are scarcely effective for soil conservation. When the tree density exceeds a certain degree, such fields are regarded as mixed gardens.

d. Man-made bare land such as quarries is distinguished from natural bare land because man-made bare land is interpretable and because business proprietors have the responsibility to restore the land.

e. There are lands where estate crops are planted even though the area of the lands is comparatively small. There are also considerably vast bamboo forests. It is necessary to distinguish these lands and forests from ordinary forests in view of soil conservation because of their present conditions. It was, therefore, decided to distinguish the lands where estate crops are planted and bamboo forests from ordinary forests.

ii) Preparation of land use/vegetation maps

By comparing the situation of land use and vegetation confirmed by the field survey and the image on the aerial photograph and according to the interpretation criteria, demarcation lines were put on the double-enlarged photograph. The lined photograph was then inspected on the sites and modified if necessary.

The demarcation lines were transferred on topographic maps on the scale of 1:10,000. The draft maps so made was traced on a polyester base after the inspection and checking by the member of the Study Team to prepare original maps (scale 1:10,000) by fair drawing. After the final inspection by the member of the Study Team, the land use/vegetation mapping works were completed.

A4 Soil Erosion Test [1)]

Item		Dry Field Test Plot	Bare Land Test Plot	Bamboo Forest Test Plot	Forest Test Plot
Location	Kebupaten/Kodya	Kod. Bandung	Kod. Bandung	Kab. Bandung	Kab. Bandung
	Kecamatan	Cibiru	Cibiru	Cilengkrang	Cilengkrang
	Desa	Palasari	Palasari	Cilengkrang	Cilengkrang
Annual Rainfall (mm)		2,000 - 2,100	2,000 - 2,100	2,100 - 2,200	2,100 - 2,200
Elevation (m)		850 - 900	850 - 900	950 - 1,000	1,000 - 1,050
Scope of Slope		N65°E	S30°W	S40°E	N55°W
Gradient (%)		25	27	33	38
Soil Type		Cambisols Complex III	Cambisols Complex III	Cambisols Complex III	Cambisols Complex III
Land Use (Land conditions at commencement of observations)		Crop: maize Height: 80 - 150 cm	No vegetation	Bamboo of ave. hight 6m (Awi tali/Gigantochloa apus), mixed with broadleaf trees (8 - 10m high), little undergrowth, many fallen leaves and branches on ground surface	Tree species: Pinus merkusii Average height: 25m Density: 570 trees/ha Undergrowth: densely grown herbs (20 - 150cm high)
Conservation Work		Contour Cropping	–	–	–
Observed Values [2)]	Soil Discharge [3)] ($kg/88m^2$)	1,760.8	5,636.9	17.1	0.35
	Soil Loss per Ha (tons/ha)	200.10	640.56	1.94	0.04
	Soil Loss Index with Soil Loss at Bare Land of 1	0.31	1.0	0.003	0.00006
Estimated Value	Estimated Soil Loss (tons/ha/year) using USLE Method	405.8	728.3	11.5	1.4

Notes: 1) Test Plot Size: 4m x 22m = $88m^2$
2) Observation Period: 1992 Nov. ~ 1993 Apr. (6 months)
3) Dry Weight (absolute dry weight)

A5 Conditions of Check Dams in Study Area

No.	Name of dam	Location			Dam items				Average sediment amount	Average sediment amount	Slope of sedimentation	Present condition of catchment areas									Mean gradient	Forest ratio	Dry crop field ratio
		SW No.	City/ District	Sub-district	L. (m)	W. (m)	H. (m)	Year of execution	(m³/yr)	(m³/ha/yr)	(%)	Catchment area (ha)	Length of main stream (m)	Slope of main stream (%)	Length of whole valley (m)	Valley density (m/ha)	Valley density (Number/ha)	Elongation rate	Road lenght (m)	Road density (m/ha)	%	%	%
1	Cikaso	1	Kab. Bandung	Cimenyan	50	4	6	86/87	117	6.5		18	200	5	200	11.11	5.56	2.39	700	38.9	20	0	67
2	Cisebel Selatan	1	"	"	50	4	8	83/84	2,025	84.4	1	24	800	16	800	33.33	4.17	0.69	0	0	30	0	80
3	Cisebel Timur	1	"	"	46	4	9	82/83	3,320	22.1	0	150	2,000	13	5,400	36.00	4.67	0.69	1,000	6.7	40	51	18
4	Sekemujai	1	"	"	64	4	10	83/84	3,413	13.5	1	253	3,000	14	10,700	42.29	5.14	0.60	5,600	22.1	40	60	16
5	Cikawari	1	"	"	46	5	6	83/84	2,550	106.3	1	24	800	14	800	33.33	4.17	0.69	1,200	50	35	8	25
6	Cilalareun	2	"	Cilengkrang	42	4	7	84/85	1,333	43.0	1	31	600	17	800	25.81	6.45	1.05	0	0	30	0	86
7	Pasir Angin	2	"	"	50	4	9	83/84	222	1.8		125	2,800	16	3,100	24.80	2.40	0.45	0	0	40	87	3
8	Cigagak	2	Kod. Bandung	Cibiru	57	4	8	84/85	563	43.3	2	13	200	18	200	15.38	7.69	2.03	1,200	92.3	20	0	100
9	Garung 2	3	"	"	50	4	6	84/85	513	10.1	4	51	1,600	12	1,800	35.29	3.92	0.50	800	15.7	25	0	77
10	Garung 1	3	Kab. Bandung	Cileunyi	42	3	10	81/82	345	4.6	5	75	1,600	23	2,800	37.33	4.00	0.61	1,400	18.7	40	50	33
11	Cicau	3	"	"	56		8	80/81	350	5.9		59	1,500	15	2,000	33.90	3.39	0.58	400	6.8	40	53	41
12	Ps Cikeuyeup	4	Kab. Sumedang	Cikeruh	50	4	7	85/86	1,429	27.5	2	52	800	10	1,000	19.23	3.85	1.02	2,400	46.2	20	0	100
13	Lebakkaso	5	"	Cimanggung	61	4	7	81/82	867	51.0	3	17	600	14	600	35.29	5.88	0.78	0	0	35	0	100
14	Kebak Lewang	5	"	"	46	4	6	82/83	660	6.0	1	110	1,200	10	1,200	10.91	0.91	0.99	1,200	10.9	20	0	63
15	Nusa	7	kab. Bandung	Cicalengka	30	4	5	84/85	700	15.6	1	45	1,000	22	1,000	22.22	2.22	0.76	0	0	40	15	15
16	Pesang Garahan	7	"	"	74	4	7	79/80	46	1.8	2	26	60	17	60	2.31	3.85	3.59	0	0	40	17	17
17	Sumurugul	7	"	"	60	4	6	83/84	422	7.0		60	1,000	10	2,200	36.67	6.67	0.87	0	0	25	0	100
18	Naravika Sampalan	8	"	"	40	3	6	80/81	900	112.5	3	8	200	13	200	8.00	12.50	1.60	500	62.5	20	0	100
19	Naravika Baros	8	"	"	32	3	6	82/83	414	59.1	2	7	200	18	200	5.71	14.29	1.49	0	0	25	0	100
20	Cipulus	8	"	Cikancung	56	4	6	84/85	1,575	14.6	0	108	1,600	24	3,000	27.78	3.70	0.73	0	0	40	38	31
21	Cipariuk	8	"	"	38	5	8	82/83	928	25.8		36	1,000	14	1,000	27.78	2.78	0.68	0	0			
22	Batubalai	9	"	"	46	4	7	85/86	540	9.6		56	1,800	16	1,800	32.14	1.79	0.47	0	0	40	0	89
23	Cibuntu	9	"	"	65	4	6	83/84	613	23.6		26	800	18	800	30.77	3.85	0.72	0	0	40	0	100
24	Jaringao	9	"	"	35		6	86/87	300	10.7		28	600	13	600	21.43	3.57	1.00	0	0	35	0	100
25	Ciastawa	9	"	"	49	4	7	83/84	1,322	22.4	1	59	1,300	10	1,600	27.12	3.39	0.67	1,000	16.9	40	0	100
26	Carik	9	"	"	35	4	5	80/81	754	29.0	1	26	500	5	500	19.23	3.85	1.15	400	15.4	25	0	87
27	Kegok bagong	9	"	"	50	4	8	83/84	500	8.2	7	61	1,500	8	2,300	37.70	4.92	0.59	400	6.6	20	0	100
28	Neglasari	11	"	Paseh	40	4	6	83/84	138	5.5		43	1,200	22	1,900	44.19	6.98	0.62	200	4.7	25	0	73
																					35	45	27

Note: SW: Sub-watershed,
L: Length of crest,
W: Width,
H: Height

A6 USLE Method to Estimate Soil Loss

Soil loss in the Study Area was analysed using the Universal Soil Loss Equation (USLE) method. In preparation for the analysis, the Study Area was divided in compartment squares of 200m by 200m (equivalent to 2cm by 2cm on a topographical map with a scale of 1: 10,000). The decision on the size of the squares took into consideration the scale of the available topographical maps, conditions of the local topography, distribution of land use and vegetation types, distribution of soil types, planned precision of the survey and work efficiency, etc. The following equation to express soil loss was used.

$$A = R \cdot K \cdot LS \cdot C \cdot P$$

where,

A : annual soil loss/unit area (tons/ha/year)

R : rainfall and runoff factor (megajoule•mm/ha/hr/year)

K : soil erodibility factor (tons•hr/megajoule/mm)

LS : topographic factor

C : cover and management (vegetation) factor

P : support practice factor

The values of the rainfall and runoff factor, soil erodibility factor, topographic factor, cover and management (vegetation) factor and support practice factor were calculated for each square to estimate the soil loss volume.

(1) Rainfall and Runoff Factor (R)

The value of the rainfall and runoff factor was determined based on the rain erosivity index.

1) Rainfall data were collected from meteorological stations located in the Study Area and surrounding areas to establish the rain erosion index. The isohyetal maps included in the "Study on Flood Control Plan of Upper Citarum Basin" (JICA, 1989) and "West Jawa Provincial Water Sources Master Plan for Water Supply" (Department of Public Works, Indonesia) were used for reference purposes.

2) The following equation of the DEPHUT was used to calculate the rain erosivity index (See A7 for the base data).

$$R_E = 2.21 \times \sum_{i=1}^{12} R_i^{1.36}$$

where,

R_E : rain erosivity index

Ri : monthly rainfall (cm)

i : month (January - December)

The resulting rain erosivity indices and corresponding values of the rainfall and runoff factor are shown in Table A6-1.

Table A6-1 Rain Erosivity Index and Rinfall and Runoff Factor

Rain Erosion Index	Rainfall and Runoff Factor
1,000 - 1,100	1,050
1,100 - 1,200	1,150
1,200 - 1,300	1,250
1,300 - 1,400	1,350
1,400 - 1,500	1,450
1,500 - 1,600	1,550
1,600 - 1,700	1,650
1,700 - 1,800	1,750
1,800 - 1,900	1,850
1,900 - 2,000	1,950

(2) Soil Erodibility Factor (K)

1) Erosion Factor of Soil Units

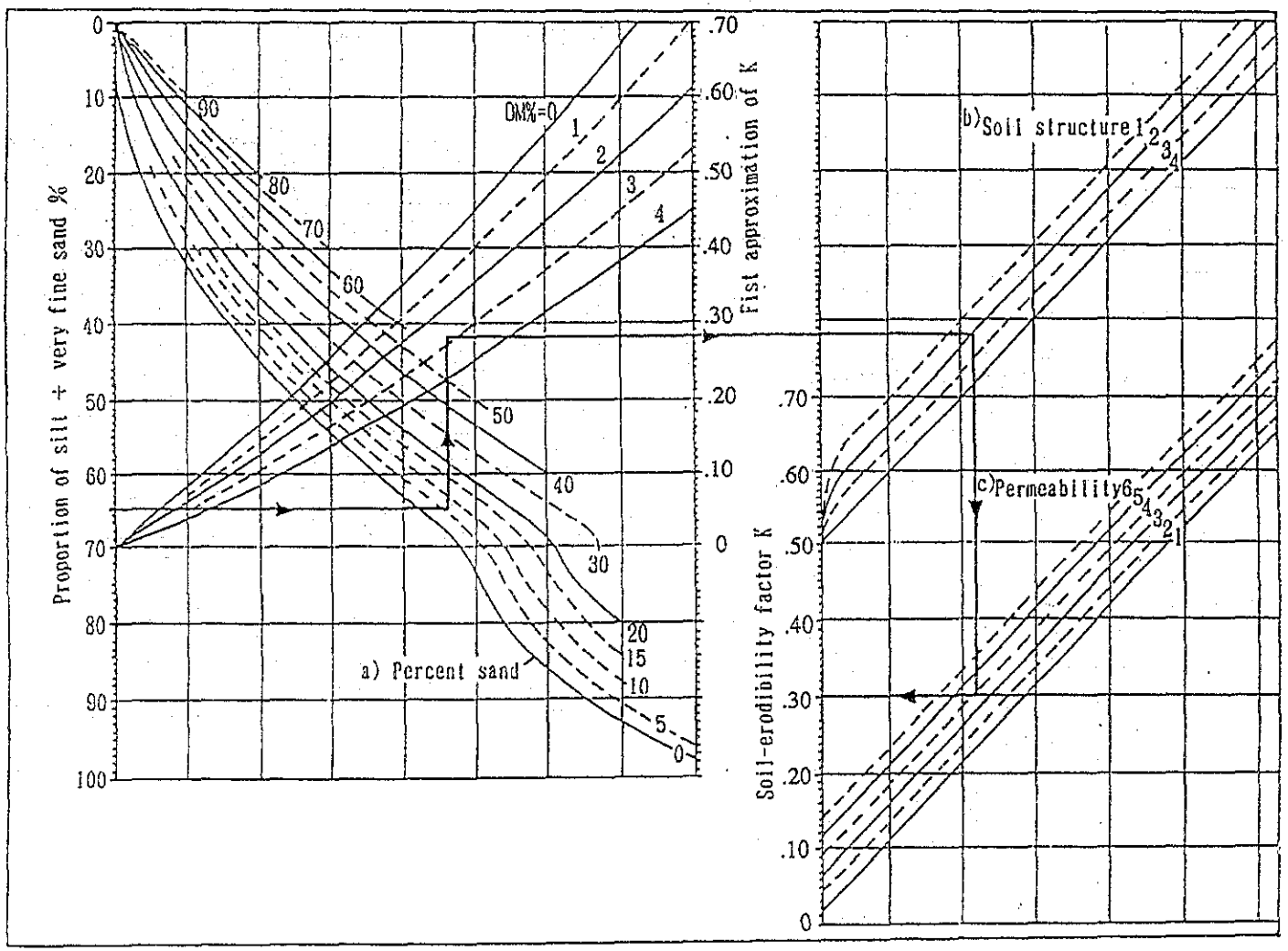
The soil erodibility factor (K) was established using the calculation graph shown in Fig. A6-1 based on the physical and chemical properties and soil structure of the representative soil profiles. The base data to calculate the K value of each representative soil profile and the established K values are given in Table A6-2.

The K values of those soil units with more than one representative profile were established as average values. As a result, the established K value is 0.28 for high humus-type humic cambisols, 0.10 for normal humic cambisols, 0.32 for andosols and 0.11 for man-made immature soils.

2) Erodibility Factor of Mapping Units (See Table A6-3)

The K value of the cambisols-andosols complex was established as the weighted average based on the relative ratios of these 2 types of soil units. In the case of cambisols complex I, II and III, as the properties of the lithosol top soil were judged to little differ from those of the predominant humic cambisols, the K value of predominant soil was used. The K value of cambisols complex III was used as the K value of paddy field soil in mountain areas in view of the fact that the properties of the top soil are similar to those of humic cambisols.

Fig. A6-1 Calculation Graph of Soil Erodibility Factor (K)



Notes :

a. Sand taken as particles with diameter 0.1 to 2.0 mm

b. Key to structural classes

1. Very the granular
2. Fine granular
3. Medium or coarse granular
4. Blocky platy or massive

c. Key to permeability classes

1. Rapid
2. Moderate to rapid
3. Moderate
4. Slow to moderate
5. Slow
6. Very slow

Source : Wischmeier et.al. (1978)

Table A6-2 Soil Erodibility Factor (K) of Representative Soil Profiles

Profile No.	Soil Unit [1]	Silt and Very Fine Sand (0.002-0.1mm) (%)	Sand (0.1 - 2.0mm) (%)	Organic Matter (%)	Soil Structure		Permeability			Soil Erodibility Index (K)
					Type [2]	Class	(cm/h)		Class	
							Top Soil	Sub-Soil		
1	Bh (h)	61.3	13.7	4.68	F, M, Cr	3	5.13	5.20	4	0.28
6	Bh	19.7	6.0	3.56	C, SA	3	2.98	4.52	4	0.10
7	Bh	23.4	4.7	3.92	C, SA	3	11.34	9.96	4	0.10
8	Bh	30.2	12.7	3.58	C, SA	3	10.54	0.08	4	0.12
10	Bh	32.4	10.3	5.38	F, A	2	6.68	3.84	4	0.09
5	Bh	24.0	5.4	3.72	F, SA	2	6.68	5.75	4	0.09
2	Th	60.6	25.5	11.32	M, Gr	3	10.74	9.37	4	0.32
4	Th	56.9	31.2	6.48	F, M, Cr	3	3.59	6.77	4	0.30
3	Th	65.1	9.9	5.02	F, SA	2	12.75	2.23	4	0.34
9	Im	13.2	1.6	0.38	massive	4	8.01	-	4	0.11

Notes
1) Bh (h) : humic cambisols (high humic type)
Bh : humic cambisols
Th : humic andosols
Im : man-made immature soil
2) F : fine, M: medium, C: coarse, Cr: crumb, A: angular blocky, SA: sub-angular blocky, Gr: granular

Table A6-3 Soil Erodibility Factor of the Soil Mapping Units

Mapping Unit	Soil Erodibility Factor (K)
Cambisols Complex I	0.28
Cambisols Complex II	0.28
Cambisols Complex III	0.10
Cambisols-Andosols Complex	0.29
Andosols	0.32
Paddy Soils	0.10
Man-made Immature Soils	0.11
Housing & Factory Land*	0.066
River, Pond & Road	-

Note: * The value of "Housing & Factory Land" assumes that the buildings cover 40% of the land.

(3) Topographic Factor (LS)

The topographic factor was calculated using the following equation.

$$LS = \sqrt{\lambda/22.1} \cdot (65.41 \sin^2 \emptyset + 4.56 \sin \emptyset + 0.065)$$

where,

LS : topographic factor

λ : slope length (m)

$\emptyset$: slope angle (°)

An inscribed circle was drawn in each square of 2cm by 2cm on the topographical map (scale: 1/10,000) and the number of contour lines (elevation difference between neighbouring contour lines: 10m) in each circle to establish the slope length and slope angle of each square. The value of LS corresponding to the number of contour lines is given in Table A6-4.

Table A6-4 Slope Gradient and Topographic Factor (LS) Values

Number of Topographical Lines	Topographic Factor (LS) Value
0 - 1	1.37
2	3.52
3	6.60
4	10.56
5	15.33
6	20.83
7	26.97
8	33.66
9	40.80
10-	48.31

(4) Cover and Management Factor (C)

The value of the cover and management factor (C) for each category (class) used on the land use and vegetation map (scale: 1/10,000) for the Study was established based on the relevant C values given by Soil Research Institute in Indonesia and is given in Table A6-5.

Table A6-5 Cover and Management Factor (C) Corresponding to Land Use and Vegetation Category (Class)

Land Use and Vegetation Class	Cover and Management Factor C
Irrigated paddy field	0.01
Rain-fed paddy field	0.26
Dry crop field : Sub-watersheds 1	0.31
2	0.25
3	0.34
4	0.27
5	0.51
6	0.25
7	0.25
8	0.26
9	0.27
10	0.4
11	0.4
12	0.26
Mixed garden closed with crown density; >70%	0.1
Mixed garden closed with crown density; 20-70%	0.5
Coconut estate	0.01
Mulberry estate	0.01
Quinine estate	0.01
Clove estate	0.01
Natural/Secondary forest	
Height class ≦10m : Crown density class ≦20%	0.01
Crown density class 21-70%	0.005
Crown density class ≧71	0.001
Height class 11-20m: Crown density class ≦20%	0.005
Crown density class 21-70%	0.001
Crown density class ≧71	0.0005
Height class ≧21m : Crown density class ≦20%	0.001
Crown density class 21-70%	0.0005
Crown density class ≧71	0.0001
Man-made forest	
Height class ≦10m : Crown density class ≦20%	0.01
Crown density class 21-70%	0.005
Crown density class ≧71	0.001
Height class 11-20m: Crown density class ≦20%	0.01
Crown density class 21-70%	0.005
Crown density class ≧71	0.001
Height class ≧21m : Crown density class ≦20%	0.01
Crown density class 21-70%	0.005
Crown density class ≧71	0.001
Shrub (Belukar)	0.01
Bamboo	0.01
Grass land	0.02
Quarry	0.95
Landslide	0.95
Settlement	0.5
Fish pond	0.01
Industrial facilities	0.5
Cemetery	0.02

(5) Support Practice Factor (P)

The value of the support practice factor (P) for each category (class) on the land use and vegetation map (scale: 1/10,000) for the Study was established based on the relevant P values given by the said Institute and is given in Table A6-6.

Table A6-6 Support Practice Factor (P) Corresponding to Land Use and Vegetation Category (Class)

Land Use and Vegetation Category (Class)	Value of P
Paddy Field	0.04
Dry Crop Field with Terraces	0.15
Dry Crop Field without Terraces	
Gradient: 0 - 8%	0.50
Gradient: 9 - 20%	0.75
Gradient: >20%	0.90
Mixed Garden	0.40
Estate	
Coconut	0.40
Mulberry	0.40
Quinine	0.40
Clove	0.40
Forest	1.00
Shrub	1.00
Bamboo	1.00
Grassland	1.00
Quarry	1.00
Landslide Site	1.00
Settlement	1.00
Fish Pond	1.00
Industrial Facilities	1.00
Graveyard	1.00

A7 Rainfall Data (Source : BMG)

STATION: NO.160; PAKAR/DAGO

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	293	165	207	213	174	100	41	6	154	320	444	198	2,315
1976	123	57	154	284	194	39	2	57	5	160	330	271	1,676
1977	221	243	234	163	197	170	8	0	44	8	250	267	1,805
1978	253	109	269	140	179	135	92	78	134	138	250	305	2,082
1979	129	-	148	567	244	24	7	102	278	230	173	491	2,393
1980	-	-	276	194	66	115	-	33	119	221	337	233	-
1981	26	66	436	292	146	47	130	-	-	-	-	156	-
1982	166	39	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	44	33	76	218	154	212	167	-
1985	385	291	194	274	-	-	-	-	-	314	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	109	-	270	-	41	-	-	-	-	367	245	-
AVG	199.5	134.9	239.8	266.3	171.4	79.4	44.7	50.3	136.0	193.1	295.4	259.2	2,070
REI	129.5	76.1	166.3	191.8	105.4	37.0	16.9	19.9	76.9	123.9	220.9	184.9	1,350

STATION:NO.160; PAKAR/DAGO

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1975	23	13	19	19	18	7	7	3	14	26	22	19	190
1976	16	8	18	14	10	4	1	5	1	15	23	19	135
1977	21	21	21	16	13	16	1	0	4	1	14	22	150
1978	21	10	27	10	17	15	14	9	13	16	21	20	193
1979	12	-	19	27	21	8	2	11	14	9	20	25	-
1980	-	-	18	19	5	7	-	7	8	19	24	22	-
1981	7	9	22	18	11	11	19	-	-	-	-	13	-
1982	17	11	-	-	-	-	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	5	3	5	18	16	17	12	-
1985	19	20	14	17	-	-	-	-	-	17	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	13	-	15	-	6	-	-	-	-	21	19	-
AVG	17	13	20	17	14	9	7	6	10	15	20	19	167

STATION: NO.170; PASEH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	330	244	320	249	29	15	0	12	187	589	282	65	2,322
1976	162	161	206	201	42	0	0	9	43	188	367	316	1,695
1977	232	257	268	116	178	274	25	8	54	54	271	293	2,030
1978	149	207	276	195	90	188	164	62	119	189	299	343	2,281
1979	219	319	239	364	244	34	0	23	176	36	222	257	2,133
1980	341	36	546	444	10	4	24	151	139	169	354	398	2,616
1981	114	139	288	316	189	119	153	153	23	137	256	154	2,041
1982	570	284	447	674	-	62	31	12	0	12	14	741	2,847
1983	388	125	474	631	360	-	0	0	-	247	676	421	3,322
1984	771	511	551	324	234	62	3	235	543	553	214	466	4,467
1985	711	290	-	179	-	-	-	-	-	-	-	-	-
1986	406	342	549	428	53	214	72	77	232	202	404	581	3,560
1987	-	179	-	-	236	124	-	-	-	-	-	-	-
AVG	366.1	238.0	378.5	343.4	151.4	99.6	42.9	67.5	151.6	216.0	305.4	366.8	2,727
REI	295.7	164.6	309.4	271.1	89.0	50.4	16.0	29.7	89.2	144.3	231.1	296.5	1,987

STATION:NO.170; PASEH

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1975	17	14	11	8	1	1	0	1	6	15	12	3	89
1976	5	3	9	7	2	0	0	1	2	9	18	14	70
1977	16	20	18	14	10	12	1	1	3	3	10	23	131
1978	15	14	15	13	9	16	10	4	9	8	11	19	143
1979	14	16	13	22	10	1	0	3	5	4	15	18	121
1980	26	6	17	16	1	1	1	3	2	8	17	15	113
1981	17	10	22	12	11	6	5	5	2	4	21	10	125
1982	15	15	21	17	-	3	2	1	0	1	2	26	-
1983	21	1	19	20	15	-	0	0	-	9	25	12	-
1984	25	27	18	15	15	2	1	9	16	19	10	17	174
1985	26	13	-	3	-	-	-	-	-	-	-	-	-
1986	27	20	20	21	8	12	5	6	12	12	23	19	185
1987	-	19	-	-	16	9	-	-	-	-	-	-	-
AVG	19	14	17	14	9	6	2	3	6	8	15	16	129

STATION: NO.195d TANJUNGSARI

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	375	231	574	298	82	82	38	41	278	468	420	296	3,184
1976	304	224	170	204	52	21	0	46	64	209	592	377	2,263
1977	292	381	339	339	154	144	0	17	12	12	215	389	2,294
1978	259	206	310	86	216	169	332	128	107	153	352	604	2,922
1979	247	512	93	341	339	127	0	12	139	89	239	637	2,775
1980	227	83	280	363	73	24	196	107	111	265	443	229	2,401
1981	148	186	267	168	197	68	84	42	86	86	-	157	1,489
1982	284	-	-	-	6	0	7	-	-	-	-	-	-
1983	252	265	316	258	166	0	56	0	0	151	127	339	1,930
1984	-	-	143	85	20	-	-	-	282	-	-	-	-
1985	-	-	-	-	35	-	-	12	-	107	-	163	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	265.3	261.0	276.9	238.0	121.8	70.6	79.2	45.0	119.9	171.2	341.1	354.6	2,345
REI	190.8	186.6	202.3	164.6	66.2	31.5	36.9	17.1	64.8	105.2	268.6	283.2	1,618

STATION:NO.195d TANJUNGSARI

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1975	23	14	17	14	8	4	4	2	8	25	24	15	158
1976	13	14	23	7	8	3	0	2	3	10	20	18	121
1977	24	13	15	14	10	13	0	1	2	1	13	19	125
1978	13	10	17	8	16	15	18	10	8	11	11	20	157
1979	13	21	10	19	19	4	0	2	6	4	14	22	134
1980	14	8	19	17	4	1	9	6	4	11	15	21	129
1981	11	8	20	11	18	7	10	5	5	7	-	15	-
1982	22	-	-	-	1	0	2	-	-	-	-	-	-
1983	9	16	22	9	12	0	3	0	0	8	13	8	100
1984	-	-	4	6	2	-	-	-	13	-	-	-	-
1985	-	-	-	-	12	-	-	3	-	12	-	15	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	16	13	16	12	10	5	5	3	5	10	16	17	128

STATION: NO.196a CICALENGKA

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	340	206	253	189	69	65	33	10	106	408	186	161	2,026
1976	102	90	216	114	72	15	4	0	21	268	390	241	1,533
1977	320	479	239	90	102	161	0	5	40	4	146	278	1,864
1978	175	185	346	138	108	183	93	70	59	49	93	344	1,843
1979	-	295	87	233	232	46	-	-	-	-	83	355	-
1980	139	295	87	233	232	46	0	16	87	50	190	173	1,548
1981	46	48	203	97	91	86	-	5	42	22	132	149	-
1982	153	137	219	-	0	65	0	0	-	-	-	500	-
1983	299	265	134	201	195	0	-	-	-	189	-	-	-
1984	-	-	-	-	-	-	-	219	-	-	-	-	-
1985	124	144	-	237	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	189.8	214.4	198.2	170.2	122.3	74.1	21.7	40.6	59.2	141.4	174.3	275.1	1,681
REI	121.0	142.8	128.4	104.4	66.6	33.7	6.3	14.9	24.8	81.1	107.8	200.5	1,032

STATION:NO.196a CICALENGKA

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1975	21	10	13	13	5	5	3	1	6	20	11	10	118
1976	9	9	16	6	5	1	1	0	1	11	13	14	86
1977	16	18	16	9	6	9	0	1	3	1	10	13	102
1978	15	13	18	12	11	12	8	5	6	9	10	18	137
1979	-	19	9	15	11	2	-	-	-	-	6	23	-
1980	11	19	9	15	11	2	0	1	4	6	8	13	99
1981	7	8	14	7	5	4	-	1	2	4	14	12	-
1982	11	10	17	-	0	2	0	0	-	-	-	20	-
1983	15	15	12	12	16	0	-	-	-	5	-	-	-
1984	-	-	-	-	-	-	-	5	-	14	9	13	-
1985	15	12	-	9	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	13	13	14	11	8	4	2	2	4	9	10	15	105

STATION: NO.168 ARJASARI

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1975	541	320	266	372	185	61	51	58	160	448	377	203	3,042
1976	255	141	297	283	185	31	0	137	104	210	357	203	2,203
1977	388	311	340	386	277	307	18	30	113	9	260	246	2,685
1978	360	227	485	260	339	352	308	102	101	246	304	385	3,469
1979	262	275	140	417	207	107	31	63	108	172	246	390	2,423
1980	225	73	205	395	60	54	82	101	125	244	308	360	2,232
1981	212	228	389	194	178	121	127	177	193	140	279	185	2,423
1982	344	160	326	481	44	67	71	44	63	6	192	274	2,072
1983	326	403	337	301	402	18	58	-	0	409	651	399	-
1984	-	375	416	-	203	48	-	225	-	382	212	-	-
1985	281	141	-	215	-	-	-	-	105	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	319.4	241.3	320.1	330.4	208.0	116.6	82.9	104.7	107.2	226.6	318.6	293.9	2,670
REI	245.6	167.8	246.4	257.2	137.1	62.4	39.2	53.9	55.6	154.0	244.8	219.4	1,883

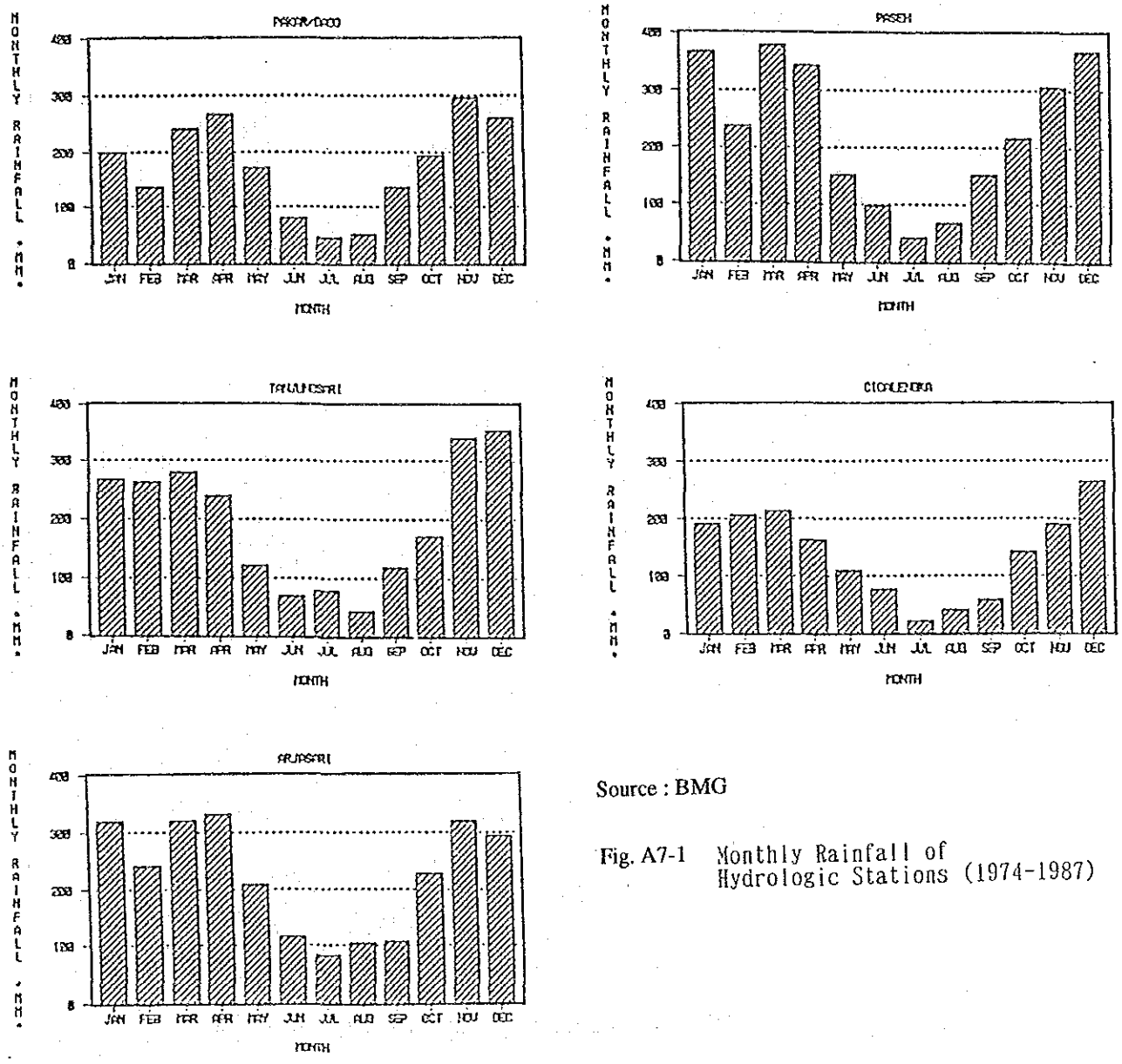
STATION:NO.168 ARJASARI

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1975	27	22	20	21	15	4	5	3	10	26	23	14	190
1976	26	16	21	16	7	3	0	7	7	15	23	20	161
1977	25	24	25	18	11	15	1	4	8	3	17	18	169
1978	22	18	26	12	14	14	16	7	7	16	17	24	193
1979	18	21	17	23	14	6	2	4	10	8	20	25	168
1980	25	4	16	19	3	3	7	4	10	15	18	24	148
1981	30	18	24	13	15	6	9	8	9	9	22	16	179
1982	23	15	21	20	2	3	3	3	5	2	8	20	125
1983	20	17	16	16	14	2	2	-	0	11	24	14	-
1984	-	19	12	-	12	3	-	12	-	18	14	-	-
1985	19	13	-	11	-	-	-	-	5	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	24	17	20	17	11	6	5	6	7	12	19	19	163

A7-1 Rainfall Data of Hydrologic Stations (1974-1987)

No.	Name of Station	Altitude (m)	Average Annual Rainfall (mm)	Rain Erosivity
1	PAKAR/DAGO	770	2,070	1,350
2	PASEH	910	2,727	1,987
3	TANJUNGSARI	855	2,345	1,618
4	CICALENGKA	705	1,681	1,032
5	ARJASARI	920	2,670	1,883

Source : BMG



Source : BMG

Fig. A7-1 Monthly Rainfall of Hydrologic Stations (1974-1987)

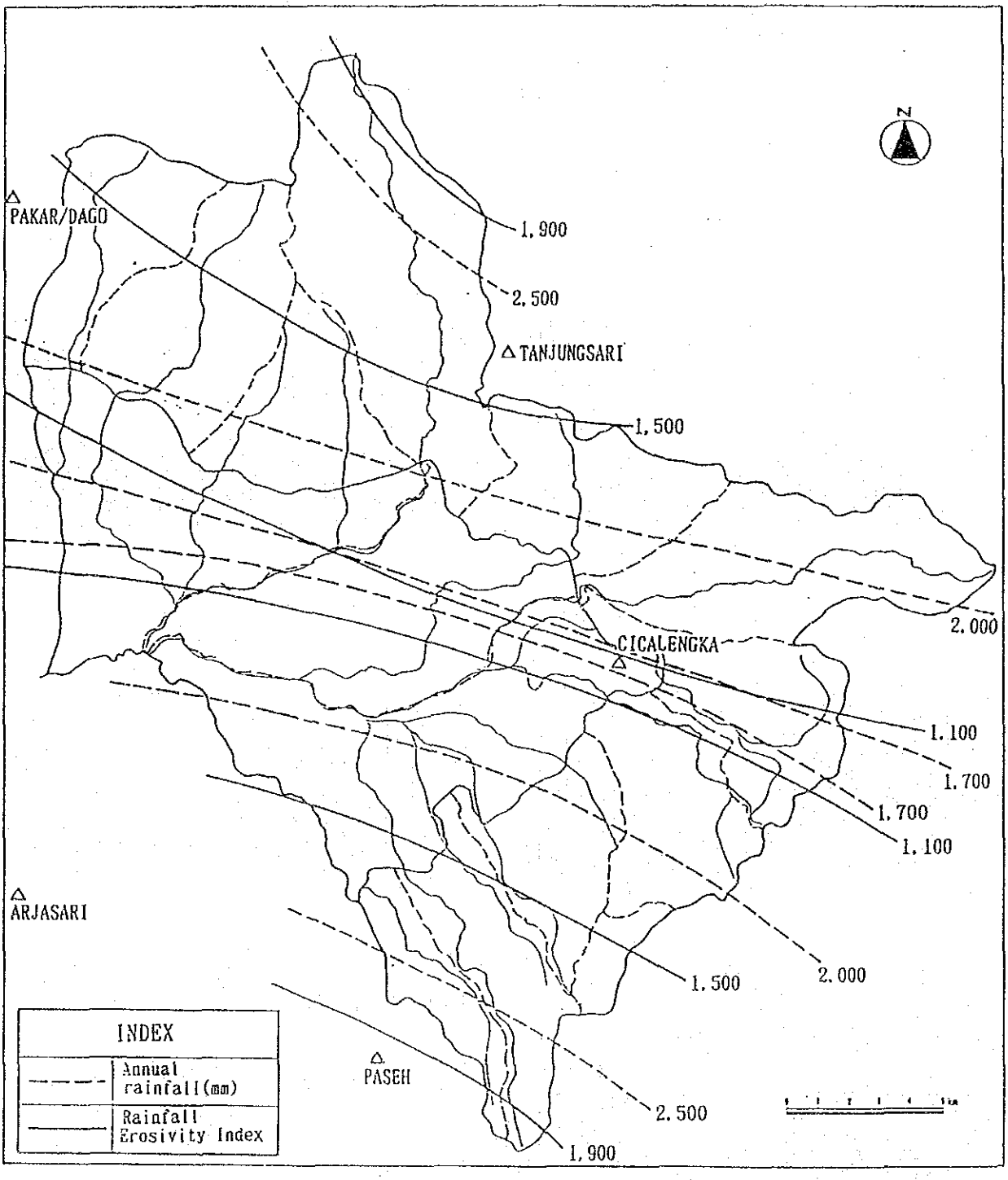


Fig. A7-2 Isohyetal Lines and Rainfall Erosivity Index Lines

A8 Survey on Torrent Devastation

(Survey Date: October, 1992)

Survey spot No.	No. of sub-water-shed	* Location	Name of River	Stream bed Width (m)	** WLTM (m)	Water Depth (m)	Stream Bank Slope (°)	Water Color	Stream Bed Slope (%)	Gravel Condition			Land Use of Surrounding Area	Remarks
										Diameter (cm)	Shape	Coverage Ratio (%)		
1-1-8	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh	4	4	0.3	-	Transparent and colorless	2	5-200 / 20	Sub-angular gravel Round gravel	90	Natural secondary forest H: 3 - 20 m	-Slightly eroded but stable Bank -Height 0.5m
1-1-2	4	Kec. Tanjungsari Kec. Cikeruh	Cikeruh	9	5	0.4	30	Yellow brown	2	3-500 / 10	Sub-angular gravel Round gravel	90	Bamboo forest	-Slightly eroded but stable Bank -Height 2m -Flood water level 3m
1-2-1	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh Branch	12	5	0.2	-	Brown	4	3-200 / 15	Sub-angular gravel Round gravel	80	Paddy field	-Slightly eroded bank with numerous gravel -height 2m
1-1-4	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh	5	4	0.2	70-80	Yellow brown	2	5-150 / 20	Sub-angular gravel Round gravel	90	Paddy field	-Slightly eroded bank -Height 1.5m
1-1-6	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh Branch	20	5.5	0.4	-	Transparent and somewhat grayish green-brown	4	5-200 / 20	Sub-angular gravel Round gravel	90	Secondary forest	-No bank erosion
1-1-5	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh	4	4	0.2	60-70	Grayish green-brown	2	2-150 / 20	Sub-angular gravel Round gravel	90	Paddy field	-Slightly eroded bank -Height 1.5m
1-2-3	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh Branch	6	2.5	0.05	60-70	Grayish green-brown and somewhat Transparent	7	5-150 / 10	Sub-angular gravel	80	Paddy field	-Heavily eroded bank -Height 2m
1-3-1	4	Kab. Sumedang Kec. Tanjungsari	Cikeruh Branch	5	3.5	0.2	60-70	Grayish Yellow-brown	6	5-200 / 20	Sub-angular gravel	90	Paddy field	-Flood destroyed 14 houses in 1970 -Flood water level 3m
2-1-10	6	Kab. Sumedang Kec. Cimanggung	Cimulu	3.5	2	0.05	-	Transparent and colorless	1	5-30 / 10	Sub-angular gravel	30	Man-made forest H : 25m Pinus merkusii	-No bank erosion
2-1-9	6	Kec. Cimanggung Kec. Cicalengka	Cimulu	3	2.5	0.15	50-70	Transparent and somewhat grayish green-brown	2	5-100 / 10	Angular gravel Sub-angular gravel	90	Hunting park	-No bank erosion
2-1-2	6	Kec. Cimanggung Kec. Cicalengka	Citarik	18	13	0.2	60	Yellow brown	2	2-200 / 20	Sub-angular gravel Round gravel	80	Paddy field and Dry crop field	-Heavily eroded erosion -Deposition on riverbed -Flood water level 2 - 3m
2-1-3	6	Kec. Cimanggung Kec. Cicalengka	Citarik	11	8	0.4	70-80	Yellow brown	3	2-150 / 20	Sub-angular gravel Round gravel	80	Paddy field	-Heavily eroded bank
3-1-2	10	Kab. Bandung Kec. paseh	Ciung-gala	9	3.5	0.2	50-70	Grayish green-brown	5	4-200 / 50	Sub-angular gravel Round gravel	80	Paddy field	-Heavily eroded bank with numerous gravel -Flood destroyed a bridge in 1978

Notes: * Kab : District, Kec: Sub-District
** Water Level Width at the Time of Measurment

A9 Production of Principal Crops in 1991

Kind of crop	Bandung Dist.		Sumedang Dist.		Total	
	Product. (t)	%**	Product. (t)	%**	Product. (t)	%**
Common crops						
Paddy rice	150,524	21.1	33,785	9.2	184,309	17.0
Upland rice	8,886	26.0	2,649	11.2	11,535	19.9
Maize	23,395	27.0	8,206	23.4	31,601	26.0
Cassava	40,741	29.7	35,409	25.7	76,150	27,7
Sweet Potato	3,970	8.4	2,964	29.2	6,934	12.1
Ground nut	656	15.6	137	4.2	793	10.6
Vegetables						
Red bean	50,017	41.5	947	89.4	50,964	41.9
Chili	1,537	13.9	324	33.1	1,861	15.4
Potato	3,411	5.8	1,154	72.4	4,565	7.5
Garlic	-	-	426	90.8	426	9.4
Tomato	3,254	3.6	1,667	75.2	3,254	7.0
Estate crops*						
Coconut palm	295	23.5	444	7.1	739	9.8
Coffee	23	30.6	60	6.6	83	8.5
Clove	32	57.1	129	4.9	161	5.9
Tobacco	91	82.0	470	34.5	561	38.1
Fruits						
Avocado	1,882	30.4	436	59.5	2,318	33.5
Papaya	1,361	45.8	116	9.6	1,477	35.3
Banana	17,126	50.5	915	2.2	18,041	24.2

Source: LAPORAN TAHUNAN 1991 - DINAS PERTANIAN KAB. BANDUNG and DINAS PERTANIAN KAB. SUMEDANG
* FORMAT ISIAN PERENCANAAN PEMBANGUNAN - BAPPEDA KAB. BANDUNG
Note :** Proportion to the whole District

A10 Interview Survey

1. Soil Conservation Activities

Community leaders, the leaders of farmers' groups, the members of farmers' groups, and regreening extension workers in the Study Area were surveyed on their views of the present circumstances of soil conservation, soil conservation activities. The purpose of the questionnaire was to obtain base materials to be used in creating the Upland Plantation and Land Development Plan at Citarik Sub-Watershed.

Using questionnaires of a certain style, the survey was carried out at 4 Agricultural Extension Centers located in the Study Area.

The survey spots and the number of persons questioned are indicated in Table A10-1.

Table A10-1 Survey Spots and Number of Persons Questioned in Interview Survey on Soil Conservation Activities

(unit: number of persons)

Name of Extension Centers/ Sub-District(Village) \ Persons Questioned	Community Leaders			Leaders of Farmers' Groups	Members of Farmers' Groups	Regreening Extension Workers
	Chief of village	Planning officer (LKMD)	Non-formal (LSM)			
I. Cilengkrang						5
1. Cimenyan (Mekarmanik)	1	1	1	3	6	
2. Cilengkrang (Girimekar)	1	1	1	3	6	
3. Cileunyi (Cileunyi wetan)	1	1	1	3	6	
II. Ujung Berung						-
1. Cibiru (Cisurupan)	1	1	1	2	4	
III. Tanjungsari						7
1. Tanjungsari (Raharja)	1	0	1	3	6	
2. Cikeruh (Jatiroke)	1	1	0	3	6	
3. Cimanggung (Sindang Pakuon)	1	1	1	3	6	
IV. Cicalengka						11
1. Cicalengka (Dampit)	1	1	1	3	4	
2. Cikancung (Srirahayu)	1	1	1	3	6	
3. Paseh (Sindangsari)	1	1	1	3	6	
Total	10	9	9	29	56	23

1.1 Community Leaders and Leaders of Farmers' Group

(1) Soil Conservation

The results of the questionnaire are as follows.

i) Soil erosion

Soil erosion of every Sub-District is significant. Soil erosion of Cimenyan, Cimanggung, Cicalengka, and Cikancung Sub-District is especially significant.

ii) Measures against soil erosion

Every Sub-District takes some measures against soil erosion.

iii) Decrease of soil productivity

In every Sub-District, soil productivity is very decreased. Some farmers of Tanjungsari replied, however, that soil productivity is scarcely decreased there.

iv) Measures against decrease of soil productivity

Every Sub-District takes some measures against decrease of soil productivity; for the most part terracing is introduced and fertilizer is used. In general, both chemical fertilizer and organic fertilizer are used.

v) Effects of measures against soil erosion and decrease of soil productivity

The respondents of every Sub-District said the measures would be effective.

vi) Conservation works

Responses are diverse regarding with the cooperation to the conservation works: some replied "all cooperate" and others replied "some cooperate." In respect to the responsibility of work cost, the respondents of most Sub-Districts replied "we beared the cost."

(2) Utilization of Trees

i) Home fuel

Both firewood and kerosene are used as home fuel. In Cibiru, Cikeruh, Cicalengka and Paseh Sub-District, firewood is mainly used. Some respondents of Cimenyan Sub-District replied they have experienced firewood shortage. Other Sub-Districts have not become short of firewood.

ii) Experience of afforestation

The respondents of all Sub-Districts replied they had experience of afforestation. Albizia, maesopsis, surian, caliandra, bamboo, jack-fruit tree, petai and avocado were planted mainly on farmland. The purposes of afforestation are to obtain construction materials, fuel, and fruit for their own use and for sale; and in some parts, for the soil conservation.

iii) Nurseries

The respondents of Cibiru, Cikeruh, Cimanggung and Cikancung Sub-District replied that they had no nursery. A very small number of the other Sub-Districts replied that they have nurseries. The seed procurement depends on BRLKT's distribution and home seed-raising.

iv) Afforestation plan

Every Sub-District has a plan of afforestation.

(3) Extension

i) Demonstration plots

The respondents of every Sub-District replied that they knew about demonstration plots. Their requests in connection with demonstration plots are terracing, water way works, check dams, grass cultivation, nurseries, and planting.

ii) Training courses in soil conservation

The responses relating to the experience of taking training courses in soil conservation diverse in every Sub-District, but many replied they do have the experience of taking the training courses.

iii) Views on extension

The requests of the respondents for extension measures are: the improvement of quality,· knowledge about soil and water conservation and technical improvement, culvitation of forests, extension to the farmers in the neighborhood, and visual extension.

(4) Others

i) Land tenure of the members of communities and farmers' groups

The rate of tenant farmers and agricultural workers is highamong the members of communities, and the rate of owner farmers and land owners is

high among the members of farmers' groups in every Sub-District excluding Paseh.

ii) Main crops

The common crops are ordinary crops.

iii) Crops that respondents want to cultivate in the future

The respondents want to cultivate upland rice (of high yield species), maize (hybrid), red bean, ground nut, soy bean, cassava, chili, tobacco, tomato, ginger, pepper, fruit trees and forest trees. They also want to cultivate forest trees which are profitable, have high productivity, and can be harvested in a short period such as albizia, maesopsis, mahogany, durian, jack-fruit tree, mango, melinjo, petai, citrus fruits, and those which can be used as fodder and firewood.

iv) Animal husbandry

In general, goat, sheep and fowl are fed in every Sub-District. Other livestocks fed are cows, buffaloes, horses, rabbits and ducks. These animals are fed in confinement rearing. The fodder of cows and sheep is mainly meadow and unhulled rice.

v) Subscription rate to KUD of the members of communities and farmers' groups

Most leaders replied that the members of their communities and groups subscribe to KUD in every Sub-District.

vi) Request for the development of villages

Requests are ; access, water supply, and electric service for the improvement of village environment; schools, sports facilities and extension facilities as social facilities; terraces, water way works, check dams, gully plugs, establishment of demonstration plots and nurseries, regreening and grouping of farmers as soil conservation activities; and reinforcement of dry land culture by application of technical standards and enrichment of agriculture and stockbreeding assisting systems for the technical improvement of agricultural management.

1.2 Members of Farmers' Group

The results of the questionnaire are summarized as follows.

(1) Agriculture in General

i) Land ownership

In every Sub-District, most members are owner farmers. The cultivated area ranges from 0.19 ha to 1.26 ha.

ii) Main crops

Common crops are ordinary crops. In Cilengkrang and Tanjungsari, tomato is the main product; in Cileunyi, ginger; and in Cikeruh, tobacco. The cropping period is mainly in the rainy season. Introduction of dry-season crops is significant for the balanced distribution of annual labor days.

iii) Decrease of the productivity of farmland

The respondents of all Sub-Districts excluding Cilengkrang, Tanjungsari and Paseh, noticed that the land productivity is decreased. Every respondent introduces soil conservation techniques and fertilizing the soil.

iv) Side lines

The most common side line is livestock breeding. Other side lines are wage works and trading. In Cileunyi, the main side line is bee keeping; and in Cimanggung, household industry.

(2) Utilization of Trees

i) Firewood

In Cilengkrang and Tanjungsari, both firewood and kerosene are used as fuel. In the other Sub-Districts, firewood is mainly used. The consumption of firewood ranges from 1.5 to 25.0kg/day. Firewood is usually collected around houses, but in Cicalengka and Cikancung in private forests.

ii) Experience of tree planting

There are many who have the experience of tree planting in every Sub-District. The responses of the members about tree planting places, tree species and purposes are the same as those of the leaders. Seedlings are obtained in various ways: supplied, purchased, or self-grown.

(3) Soil Conservation Activities

i) Understanding of soil conservation activities

Most members understand these activities, and the participation rate in the establishment of demonstration plots is high. The inhabitants of the Study Area are very interested in soil conservation activities.

ii) Requests about soil conservation measures

The respondents' requests are terraces, water way works, check dams, and establishment, maintenance and management of nurseries, planting, and grass cultivation.

When these measures prove effective for the soil conservation, the farmers will be well motivated, which will raise the agricultural level and consequently increase income.

1.3 Regreening Extension Workers

The results of the questionnaire are summarized as follows.

(1) Participation of Farmers

i) Farmers' groups' understanding of soil conservation

All the regreening extension workers of all Agricultural Extension Centers replied that the farmers' groups understand the importance of soil conservation. However, women do not have a sufficient understanding of soil conservation because they are not directly concerned in soil conservation and promotion activities.

The reason for the insufficient understanding is, the workers replied, that extension facilities and instruments are in short supply. According to the workers, education of farmers, construction of extension facilities and clarification of advantages, are required to have farmers understand soil conservation.

As farmers' groups were selected as the respondents of this questionnaire, their understanding of soil conservation was fairly high. It is, however, presumed that there are many who do not understand the meaning of soil conservation among the farmers who do not belong to groups. It is necessary to educate the farmers and women who do not have a sufficient

understanding of soil conservation, and further extend soil conservation activities.

ii) Demonstration plots

In general, the participation rate in demonstration plots is high. The effects of demonstration plots that the respondents pointed out are:

- conservation techniques such as UPSA are propagated effectively to the surrounding areas of demonstration plots
- understanding of measures to improve soil conservation such as terraces, cropping patterns and SPA
- ease of giving information to farmers
- improvement of conservation knowledge and technologies
- increase in the income of farmers in the neighborhood brought about by demonstration plots
- demonstration plots function as practice and training facilities

These responses prove the establishment of demonstration plots is an appropriate measure to promote soil conservation.

iii) Meetings with farmers' groups

In the Cilengkrang and Tanjungsari Agricultural Extension Centers, meetings with farmers' groups are held more than four times a month; and in the Cicalengka Agricultural Extension Center, twice a month. The themes of the meetings are:

- explanation of conservation works such as terraces, water way works and planting; and the establishment of nurseries
- guidance for the grouping of farmers
- information on new agricultural technologies
- solving of farmers' problems

The transportation means of the workers are motorcyles, buses or walking. The regreening extension workers are involved in desirable activities.

(2) Watershed Conservation Measures of Agricultural Extension Centers

i) Main measures

Every Center takes measures of implementing terraces, water way works, check dams, UPSA, agroforestry, establishment of nurseries and Hutan Rakyat, planting and grass cultivation.

ii) Effects of measures

The workers replied that soil erosion, floods and landslides are

decreased and prevented; that soil fertility has become sustainable; and that productivity and income have increased.

iii) Measures planned for the future

The measures planned are terraces, water way works, check dams, UPSA, agroforestry, gully plugs, establishment of nurseries and Hutan Rakyat, and planting.

iv) Introduction of agroforestry

Most regreening extension workers replied that they introduce agroforestry.

(3) Extension Education

i) Years of experience

Most regreening extension workers have the experience of 1 - 15 years in each Extension Centre. In the Cicalengka, the Center, however, some have more than 16 years experience.

ii) Experience of training

All have this experience.

iii) Place of training

Most of the workers had training in the Kadipaten, Bogorand Cilampuyang Training Centers.

iv) Requests for the training

The requests the respondents made for the training are:

- knowledge and technique of agriculture and forestry
- technology transfer to farmers
- improvement and continuation of training courses
- field work methods
- exchange of informations with other regreening extension workers
- problem solving forums

(4) Others

i) Future extension activities

The respondents emphasized continued establishment of demonstration plots, utilization of textbooks, and comprehensive future extension. The

extension measures they expect are: construction of extension facilities and installation of extension instruments, and improvement of transportation measures to maintain extension activities.

2. Questionnaire on Farm Household Management / Farming Plans and Farmers' Group

As the project operations are to be implemented on farmer-owned lands or farmer-lent lands for farming, these operations will affect the agricultural income and expenditure of farmers. Moreover, to smoothly implement these operations and to bring about lasting effects, it is essential to invite a wide-ranged participation of farmers. Therefore, the purpose of the questionnaire was to check the actual agricultural income and expenditure of farmers and to obtain a grasp on how to induce farmers to participate in these operations energetically.

The survey was carried out by distributing questionnaires of a certain type and visiting farm houses and farmers' groups.

Because the Planning Area is very wide, and because the survey period is limited, the questionnaires were disbributed through regreening extension workers (and some agricultural extension workers). The questionnaires were distributed in the area generally important for soil conservation. Three farmers' groups were selected from each village in the area, and the questionnaires were distributed to the farm households of the leaders and four other members of each group. The results are summarzied as follows:

Number of Farm Households	150
Average Age of Respondents	49.3
Average Number of Family Members	5.2 (including 1.4 children of school age)
Average Area of Farmland	0.54ha (cultivated area: 0.53ha) (Of which owned land is 0.48ha, terrace 0.34ha) (Of which rented land is 0.05ha, terrace 0.04ha)

2.1 Farm Household Management / Farming Plans

(1) Agricultural Income and Expenditure

It is considered very difficult to check all the receipts of farmers including the income out of the owned farmland. This questionnaire was, consequently, focused on the income and expenditure related with the farmland that farmers cultivate themselves. (The cost to purchase farming tools such as hoes and sickles and their depreciation cost, and the depreciation cost of constructed terraces are not included in the expenditure.)

Of the responses about the annual crop income from farmland, 131 responses which were considered analyzable, were selected. And the responses are put in the order of income amount below.

i) Crop income

Crop income class	(Number of Respondents)
more than 3,000,000Rp	5 (3.8%)
between 2,000,000Rp and 2,990,000Rp	3 (2.3%)
between 1,500,000Rp and 1,990,000Rp	4 (3.1%)
between 1,000,000Rp and 1,490,000Rp	17 (13.0%)
between 800,000Rp and 990,000Rp	11 (8.4%)
between 600,000Rp and 790,000Rp	20 (15.3%)
between 400,000Rp and 590,000Rp	19 (14.5%)
between 200,000Rp and 390,000Rp	24 (18.3%)
less than 200,000Rp	28 (21.4%)
total	131 (100.0%)

ii) Cost composition for agricultural production

Average cost composition for agricultural production is indicated below. The cost varies depending on the crop and area, but generally the labor cost of farmers accounts for 40 - 50% of the whole cost. The cost of seeds, chemical fertilizer and pesticide accounts for about 40%.

Items	Allocation rate
Seeds	16.8%
Fertilizer (the rate of organic fertilizer)	29.3% (11.4%)
Pesticide	4.8%
Labor (the rate of household labor)	38.9% (25.5%)
Others	10.3%
Total	100.0%

The rent of land and the transportation cost of crops to the market are included in the item "Others".

The depreciation cost of farming tools is not included in the above composition. The purchase cost of farming tools per farmer (total amount of all farming tools) is average of 83,800Rp. These tools include tools which must be purchased every year like mowing sickles, and tools which can be used for 4 or 5 years like hoes and forks. The durable period of a farming tool varies depending on the country of manufacture, however.

iii) Comparison of crop income and cost by region

To compare the yield and cost by region, income and cost per ha were calculated. The obtained values are indicated in Table A10-2. The table shows that there are great differences among the areas.

The results of the interviewed survey made in Agricultural Extension Centers on cost is indicated in Table A10-3.

Table A10-2 Crop Income and Average cost (unit: 1,000 Rp)

Region*	Average Crop Income (per ha)	Average Cost (per ha)	
		(Including wages)	(Excluding wages)
A	738	967	315
B	1,468	1,093	593
C	2,557	1,715	849
D	372	408	183
E	2,850	2,266	1,635
F	1,370	683	583
G	2,080	1,590	1,153
H	811	722	390
I	1,327	1,688	948
J	3,004	1,333	793
Average	1,748	1,252	765

Note * :

Region	Village	Sub-District
A	Dampit	Cicalengka
B	Srirahayu	Cikancung
C	Sindangsari	Paseh
D	Cisurupan	Cibiru
E	Cilowa Wetan	Cileunyi
F	Girimukar	Cilengkrang
G	Mekarmanik	Cimenyan
H	Sindang Pakuon	Cimanggung
I	Hegak Manah	Cikeruh
J	Raharja	Tanjungsari

The income of farm households includes, except for the crop income from farmland, the income from livestock (mainly sheep and fowl), day labor in the Bandung City (especially in the dry season), commercial activities like retail sale, production and sale of brooms and handicrafts, and the crops supplied and distributed. These sources of income vary depending on the individual case and area.

Table A10-3 Production Cost of Crops

(unit: per ha)

Crops	Production Materials (Rp)			Wages (Rp)	Working days (man-day)	Total (Rp)
	Seeds	Fertilizer	Pesticide			
Paddy rice	15,000	90,000 ~ 122,000	18,000 ~ 42,000	260,000 ~ 691,500	120 ~ 290	383,000 ~ 870,500
Upland rice	15,000 ~ 25,000	73,000 ~ 83,000	15,000 ~ 18,000	326,000 ~ 430,000	180 ~ 217	429,000 ~ 556,000
Maize	12,000 ~ 90,000	71,000 ~ 82,200	24,000 ~ 25,000	258,500 ~ 410,000	155 ~ 180	365,500 ~ 607,200
Red bean	145,000	150,000	-	305,000	-	600,000
Ground nut	70,000 ~ 100,000	43,000	10,000	298,000 ~ 440,000	200	421,000 ~ 643,000
Soy bean	50,000	127,500	25,000	462,500	215	665,000
Cassava	50,000 ~ 100,000	67,250	-	269,000 ~ 410,000	180	386,250 ~ 577,250
Sweet potato	40,000 ~ 50,000	53,600 ~ 87,500	-	252,500 ~ 445,000	113 ~ 190	346,100 ~ 582,500
Potato	1,000,000	470,000	450,000	490,000	220	2,410,000
Tomato	30,000	267,000	152,000	597,500	263	1,046,500
Cabbage	150,000	281,500	132,000	662,500	275	1,226,000

Note: Averages of the values obtained through the interviewed survey at three Agricultural Extension Centers in the study area (1992).

(2) Kind of Crops

The kinds of crops and the number of respondents who cultivate respective items are indicated below. The price indicated is the retail price per Kg obtained in a market (Pasar Induk Gedebage) in the suburbs of Bandung City at the end of October 1992. (The price of maize is for the grains only. The price of upland rice is that of the standard undried and unhulled rice cultivated in the Study Area.) The results of interviewing in Agricultural Extension Centers is shown in Table A10-4.

	Number of respondents		(Rp)
· Maize (Jagung)	130	(87%)	375
· Red bean(Kecang Merah)	93	(62%)	775
· Upland rice (Pady Gogo)	79	(53%)	310
· Cassava (Ketela Pohon)	75	(50%)	225
· Ground nut (Kacang Tanah)	27	(18%)	1,400
· Chili I (Cabe Cengeh)	15	(10%)	1,100
· Chili II (Cabe Kriting)	10	(7%)	1,500
· Tomatos (Tomato)	10	(7%)	450
· Red onion (Bawang Merah)	9	(6%)	1,200
· A kind of cassavas (Ubi Kayu)	8	(5%)	-

In the interview with farmers, farmers pointed out the following problems in cultivating the vegetables considered to be of high value as an article of trade:

- The price fluctuates sharply in the market.
- Cultivation in comparatively large scale is required to put the vegetable on the market.
- Some kinds of such vegetables require high cultivation cost, and much labor for maintenance and management.
- It is technically difficult to cultivate such vegetables, and the cultivation requires much experience.

Table A10-4 Price of Crops at Farm-yard

Crops	Price at Farm-yard (Rp/kg)
Upland rice	300
Maize	200 ~ 250
Red bean	300 ~ 400
Ground nut	300 ~ 500
Cassava	50 ~ 100
Sweet potato	200
Potato	250
Chili	500 ~ 600
Tomato	300
Cabbage	150

Note : Average of the values obtained through the interviewed survey at three Agricultural Extension Centers in the Study Area (1992).

The following is the kinds of crops the respondents cultivate presently (no special order):

Tobacco, eggplant, scallion, banana, clove tree, sweet potato, potato, cabbage, ginger, paddy rice, red bean II, soybean and coffee.

(3) Livestock Holdings

The actual situation livestock holdings is indicated in Table A10-5

Table A10-5 Livestock and the Number of Heads

* Region	Livestock (Number of Heads)						Average Crop Income per Region (1,000 Rp)
	Cattle	Goat	Sheep	Chicken (Fowl)	Water Buffalo	Others	
A	0	0	62	112	3	24	374
B	0	0	59	81	0	-	795
C	0	3	87	297	0	-	878
D	2	0	87	87	0	-	156
E	10	0	117	70	0	-	956
F	2	0	72	119	1	-	777
G	0	3	46	132	0	-	1,955
H	0	1	62	30	0	-	378
I	0	0	26	10,228	2	-	540
J	24	12	84	166	0	-	2,317
Total /Mean	38	19	702	11,322	6	24	913

Notes: Only the livestocks whose number of heads were given is entered in the above table. Other livestocks fed are duck and fish. The value of the I region is very high because there are large-scaled fowl raising farm houses in the region.

* Same as Table A10-2

In the whole, the rates of sheep feeding and fowl feeding are highest. It seems, in the areas where crop income is comparatively low, the dependency on livestock feeding is high. (To be specific, in A, D, and H areas) The price of sheep varies depending on the age. In the market, a ram is sold between 100,000 and 150,000Rp, and an ewe between 75,000 and 100,000Rp (according to an interview. A lamb is sold between 30,000 and 50,000Rp.) The motives of livestock feeding are the income from the selling of livestock, and the use of livestock's excreta as fertilizer. Some of the farmers interviewed replied they purchase livestock's excreta as fertilizer, and others replied the main motive

for livestock feeding is the security of excreta.

(4) Farming Plan

By the analysis so far made, it was made clear that the crop income of the respondents from their farmland is comparatively low. Described below are the measures the respondents plan to take to increase agricultural income and the support they expect.

The responses to the question, "What kind of measures do you want to take to increase income in the future?" are indicated in the following.

i) With respect to the farming technologies:
- Introduction of high-yield and certified varieties 16%
- Improvement of farming techniques 15%
- Cultivation of commercial crops 11%
- Soil conservation 10%

ii) With respect to the funds:
- Funds 11%

iii) With respect to the farmland:
- Enlargement of farmland 11%

iv) With respect to the livestock:
- Livestock feeding 9%

v) With respect to the agricultural inputs:
- Retail shops of agricultural inputs 9%
- The balance of fertilizer 7%
- (Capital) intensive agriculture 6%

The percentage indicates the rate of respondents among 150 farm households questioned. (Multiple responses were made.)

According to the responses, funds are going to be used to purchase agricultural inputs, and to start a new business (handicrafts and others). As for the farmland, the enlargement of cultivated lands is expected through long-term tenant contract with the owners of vast land. Requests regarding agricultural inputs are: arrangement of retail shops handling in fertilizer and others, stable availability of purchase fund and control of the rise in the price of small-amount purchase.

The respondents were asked which crop items they are interersted in. This question is related with farming technology items: 1) introduction of high-yield

and certified species, and 2) cultivation of commercial crops. The kinds of crops the respondents are interested in are indicated below.

Crop that Respondents Want to Cultivate	Rate (%)	Retail Price (Rp)
· Maize (Jagung)	83	375
· Red bean (Kacang Merah)	69	775
· Albizia (Albezie)	69	-
· Upland rice (Padi Gogo)	68	310
· Cassava (Ketela Pohon)	62	225
· Chili I (Cabe Cengeh)	39	1,100
· Pasture (Rumput)	34	-
· Jack-fruit tree (Nangka)	33	-
· Chili II (Cabe Kriting)	31	1,500
· Ground nut (Kacang Tanah)	30	1,400
· Banana (Pisang)	30	-
· Coffee (Kopi)	29	-
· Citrus fruits (Jeruk)	24	-
· Melinjo (Melinjo)	23	1,000
· Sweet potato (Ubi Jalar)	20	200
· Parkia speciosa (Petai)	19	2,500

Notes: 1) The percentage indicates the rate of responders among 150 farm households questioned. (Multiple responses were made.)

2) The retail price is the orally quoted price per Kg in the Pasar Induk Gedebage in the suburbs of the Bandung City and the markets of Cicalengka and Majalaya in October 1992. (The price of corn is for the grains only. The price of upland rice is that of the standard undried and unhulled rice cultivated in the Study Area. The price of Parkia speciosa is the retail price of one bunch.)

The crops that respondents want to cultivate vary greatly depending on the area. In general, however, farmers want to have a higher yield of the crops that they are currently cultivating (corn especially). This tendency was caused, it is presumed, because the farmers do not want to take the risk of introducing new crops and because extension workers guided the farmers in cultivating crops which affect bad effects on the soil conservation. On the other hand, about 70% of the respondents are willing to plant trees like albizia because they are good for soil conservation. This tendency must be taken into consideration in making the future action program.

With regard to livestock feeding, it was made clear that many farmers want to increase the number of sheep and fowl they feed.

· Cows	30%
· Goats	6%
· Sheep	66%
· Fowl	59%
· Buffaloes	2%

Note: The percentage indicates the rate of respondents among 150 farm households questioned. (Multiple responses were made.)

Indicated below is what kind of support the respondents expect for the increase of income.

i) Funds Support:	
· Funds (loan or subsidy)	45%
ii) Material Support:	
· Agricultural inputs	30%
· High-yield and certified varieties	23%
· Agricultural machinery	12%
iii) Technical Support:	
· Farming technology	10%
· Technical support	7%
iv) Others:	
· Improvement of transportation	10%

Note: The percentage indicates the rate of respondents among 150 farm households questioned. (Multiple responses were made.)

About half of the respondents said they are short of funds, and so the funds support will be an important factor for the increase of income. Many farmers pointed out this factor in the interview, too. Asked about saving habits and fund-loaning experience, farmers replied as follows:

Saving Habits

i) Have you a Bank account?	Yes	31%
	No	65%

ii) Have you ever had a loan?	Yes	11%
	No	85%

iii) Purpose of loaning

· Agricultural production equipment	23%
· Purchase of agricultural inputs	29%
· Living funds	9%
iv) Others	1%

Notes: 1) "No reply" is left out in the above table.
2) Even those who had no loan experience replied to the question about the purpose of loaning, probably in expectation of receiving a loan in the future.

Only a few respondents have had the experience of receiving a loan. The reasons for that may be: they tend to avoid the risk which accompanies loaning; they are not accustomed to loaning procedures; they are short of security; and there are few available financial agencies nearby. Shortage of security especially can be imagined because only 11% of the respondents have their land registered at the National Land Agency (BPN).

The demand rate of the improvement of transportation varies depending on the area. The farmers of the E region especially are in need of support for the improvement of transportation. When asked about the sales method of produce in connection with transportation and access to markets, 33% of the respondents replied they take produce directly to markets, and 66% replied they sell produce through brokers.

2.2 Condition of Farmers' Group

There are several farmers' groups in the Planning Area. The farmers' groups questioned (Babakan Peutey and Cileunyi) were formed to participate the governmental activities, as an object of assistance activities. Another group (Bojong) was formed under the guidance of extension workers.

The farmers' group of Babakan Peutey functions comparatively well under a capable leader, but to become a member of the group, one is requested to present a simple written consent to the following points:

1) Observance of the regulations set up by members
2) Subscription to the joint fund
3) Purchase and use of the chemical fertilizer the group purchases
4) Repayment of the loan from the joint fund of the group

From the above, it is clear that the farmers' group exists to purchase chemical fertilizer as a group using the group's joint fund. With the periodical joint saving, the amount of individual farmers who are short of funds at the planting season is reduced.

The leaders of the Babakan Peutey and Bojong groups cultivate the seedlings of albizia and coffee using nurseries, for sale in and out of the group. Both of them say group leaders must take the challenge of having new business and demonstrate a good model to the members of their groups. In Bojong, the farmers' group has a short loan from KUD and carries out produce collecting work.

Taking the above into consideration, were asked about their views on the activities of farmers' groups with the questionnaire of a selective type. The views are as follows:

1) Do you purchase agricultural inputs as a group currently?	Yes	13.3%
	No	81.3%
2) What do you expect from the group?		
・ group purchase of agricultural inputs		74.0%
・ savings in and loans from the joint fund		50.7%
・ establishment of nurseries		43.3%
・ marketing		40.0%
・ others		0.7%

Note: "No reply" is left out in the above table.

Asked to describe the significance of farmers' groups, respondents gave the following replies:

· cooperation in farming works	11%
· ease in obtaining agricultural inputs	9%
· marketing	9%
· cooperation in solving various problems	9%
· establishment of joint fund	3%
· transmission and acquisition of information	3%
· knowledge about agricultural technologies and inputs	2%

Note: "No reply" is left out in the above table.

From the above, it is derived that the respondents acknowledge the significance of farmers' groups as a measure to purchase inputs like seeds and chemical fertilizer, and as a means for cooperative works and information exchange.

A11 List of Crops Referred to in Report

NO.	ENGLISH NAME	LOCAL NAME	BOTANICAL NAME
1	-	Cebreng	Gliricidia maculata
2	-	Jengkol	Phythecelebium lobatum
3	-	Kamper	Dryobalanops sp.
4	-	Kayu manis	Cinnamomum burmanni
5	-	Pakis	-
6	-	Petai	Parkia speciosa
7	-	Ramin	Gonystylus sp.
8	-	Setaria	Setaria sp.
9	-	Surian	Toona sureni, T.sinensis
10	Albizia	Sengon	Paraserienthes falcataria
11	Avocado	Adpokat	Persea americana
12	Bamboo	Bambu	Awi tali/Gigantochloa apus
13	Banana	Pisang	Musa paradisiaca
14	Brachiaria decumbens grass	Rumput Brachiaria decumbens	Brachiaria decumbens
15	Cabbage	Kol/Kobis	Brassica oleracea
16	Caliandra	Kaliandra	Calliandra calothyrsus
17	Cardamon	Kapol	Amomum cardamomum
18	Carrot	Wortel	Daucus carota
19	Cashew	Jambu mete	Anacardium occidentale
20	Cassava	Ketela pohon/Ubi kayu	Manihot utilissima
21	Cauliflower	Blumkol	Brassica oleracea
22	Chili	Cabe cengek	Capsicum frutescens
23	Chili	Cabe kriting	Capsicum sp.
24	Chili	Cabe merah	Capsicum annuum
25	Citrus	Jeruk	Citrus spp.
26	Clove	Cengkeh	Eugenia aromatica
27	Coconut palm	Kelapa	Cocos nucifera
28	Coffee	Kopi	Coffea spp.
29	Cogon grass	Alang alang	Imperata cylindrica
30	Cotton	Kapas	Gossypium spp.
31	Crotalaria	Crotalaria	Crotalaria sp.
32	Cucumber	Mentimun	Cucumis sativus
33	Durian	Durian	Durio zibethinus
34	Egg plant	Terong	Solanum melongena
35	Elephant grass	Rumput gajah	Penisetum purpureum
36	French bean	Kacang buncis	Phaseolus vulgaris
37	Garlic	Bawang putih	Allium sativum
38	Ginger	Jahe	Zingiber officinale
39	Gnemon tree	Melinjo/Tangkil	Gnetum gnemon
40	Green gram	Kacang tunggak	Vigna radiata
41	Ground nut	Kacang tanah	Arachis hypogaea
42	Guava	Jambu batu	Psidium guajava
43	Jack fruit	Nangka	Artocarpus integra
44	King grass	-	-
45	Lantana/Saliara	Lantana/Saliara	Lantana spp.
46	Lemon grass	Serai wangi	Cymbopogon flexuosus
47	Maesopsis	Kayu africa	Maesopsis emini
48	Mahogany	Mahoni	Swietenia macrophylla
49	Maize	Jagung	Zea mays
50	Mango	Mangga	Mangifera indica
51	Melon	Blewah	Cucumis melo
52	Merkusi pine	Pinus/Tusam	Pinus merkusii
53	Mulberry	Murbei	Morus alba
54	Paddy rice	Padi sawah	Oryza sativa
55	Palm	-	Palmae
56	Papaya	Pepaya	Carica papaya
57	Passion fruit	Markisa	Passiflora edulis
58	Pepper	Lada	Piper nigrum
59	Pineapple	Nanas	Ananas comosus
60	Pigeon pea	Gude/Hiris	Cajanus cajan
61	Potato	Ubi kentang	Solanum tuberosum
62	Quinine tree	Kina	Cinchona spp.
63	Radish	Lobak	Raphanus sativus
64	Rattan	Rotan	Calamus spp.
65	Red bean	Kacang merah	Phaseolus vulgaris
66	Red onion	Bawang merah	Allium oscalonicum
67	Sapodilla	Sawo	Achras zapota
68	Scallion	Bawang daun	Allium fistulosum
69	Sitronella grass	Serai wangi	Cymbopogon nardus
70	Sorghum	Sorghum	Sorghum bicolor
71	Soursop	Sirsak	Annona muricata
72	Soybean	Kacang kedele/Kedelei	Glycine max
73	Star fruit	Belimbing manis	Averrhoa carambola
74	Strawberry	Arbei	Fragaria ananassa
75	Sugar cane	Tebu	Saccharum officinarum
76	Sugar palm	Aren	Arenga pinnata
77	Swamp cabbage	Kangkung	Ipomoea reptans
78	Sweet potato	Ubi jalar	Ipomoea batatas
79	Taro	Talas/Keladi	Colocasia esculenta
80	Tea	Teh	Thea sinensis
81	Teak	Jati	Tectona grandis
82	Tobacco	Tembakau	Nicotiana tabacum
83	Tomato	Tomat	Solanum lycopersicum
84	Upland rice	Padi gogo	Oryza sativa
85	Vanilla	Panili	Vanilla planifolia
86	Water apple	Jambu air	Eugenia aquea

B1 Criteria for Conservation Measure Matrix

(1) Zone Classification

The DEPHUT classifies all land as a ① protection zone, ② buffer zone and ③ cultivation zone to ensure appropriate land use and management. The classification depends on the score given to land in terms of the ① inclination, ② soil unit and ③ rainfall intensity as shown in Table B1-1. Land with a score of 175 or more is classified as protection zone. Similarly, land with a score of 125 - 174 is classified as buffer zone while land with a score of upto 124 points is classified as cultivation zone. However, there is an exception to these rules. When the subject land has a gradient of 40% or more, it is automatically classified as a protected zone regardless of the actual score. The ratio of each zone in the Planning Area is 24% for protection zones, 20% for buffer zones and 56% for cultivation zones.

Table B1-1 Scoring Criteria for Zoning

Item	Category	Class No.	Score
Inclination	0 - 8%	1	20
	8 - 15%	2	40
	15 - 25%	3	60
	25 - 40%	4	80
	40% <	5	100
Soil Unit	Cambisols Complex I	2	30
	Cambisols Complex II	2	30
	Cambisols Complex III	2	30
	Cambisols-Andosols Complex	4	60
	Andosols	4	60
	Paddy Soils	1	15
	Man-Made Immature Soils	2	30
	Housing and Factory Land	1	15
	River, Pond and Road	1	15
Daily Rainfall Intensity	0 - 13.6mm	1	10
	13.6 - 20.7mm	2	20
	20.7 - 27.7mm	3	30

(2) Ranking of Soil Erosion Risk

Ranking of the soil erosion risk was introduced using the soil erosion ranks adopted by the DEPHUT in order to prepare appropriate measures vis-a-vis the actual scale of sediment discharge.

① Rank 1 : upto 15 tons/ha/year

② Rank 2 : 15 - 60 tons/ha/year

③ Rank 3 : 60 - 180 tons/ha/year

④ Rank 4 : 180 - 480 tons/ha/year

⑤ Rank 5 : over 480 tons/ha/year

(3) Land Use and Vegetation Categories Subject to Soil Conservation Measures

The total and average soil erosion volumes of the principal land use and vegetation categories subject to soil conservation measures are given in Table B1-2.

Table B1-2 Soil Erosion by Land Use and Vegetation Category

Land Use and Vegetation Category	Total Soil Erosion Volume (tons/year)	Average Soil Erosion Volume (tons/ha/year)
1. rrigated Paddy Field	2,556	0.6
2. Rain-Fed Paddy Field	19,408	19.6
3. Dry Crop Field (with Terraces)	129,391	115.5
4. Dry Crop Field (without Terraces)	7,978,385	718.3
5. Mixed Garden (≧71%)	41,408	79.0
6. Mixed Garden (21 - 70%)	367,692	483.8
7. Estate	10,767	21.5
8. Shrub	183,628	147.5
9. Bamboo	37,395	20.6
10. Settlement	895,059	382.5
11. Fish Pond	375	23.5
12. Quarry	135,495	2,117.1
13. Grassland	11,781	36.8
14. Natural Secondary Forest	20,180	9.7
15. Man-Made Forest	201,771	35.2

Under the Project, soil conservation measures will be planned for the following land use and vegetation categories with a high average soil erosion volume.

- dry crop field (with terraces)
- dry crop field (without terraces)
- mixed garden (crown density: ≧71%)
- mixed garden (crown density: 21 - 70%)
- shrub
- quarry
- grassland

From the viewpoint of soil conservation requirements, the status quo will be maintained in the case of paddy fields (both irrigated and rain-fed), forests (both natural secondary and man-made) and bamboo forests. Special arrangements will be made for settlements in connection to conservation of the village environment.

C1 Suitability of Tree and Crop Species in Planning Area

	Natural Conditions				Economic Conditions				Others		General	
Species	Rainfall	Temperature	Elevation	Soil	Demand	Market-ability	Transpor-tation	Intensive Work	Resistance to Shade	Resistance to Disease/ Insects	Suitability	Remarks
Albizia	O	O	O	O	O	O	O	X	Δ	Δ	O	Suitable for agroforestry and forest development; EL 400 - 800m, fast-growing
Maesopsis	O	O	O	O	O	Δ	O	X	Δ	Δ	Δ	Suitable for agroforestry and home gardens; good fodder for sheep; quick growth; good fertilizer absorption; low marketability; good for self-consumption
Mahogany	Δ	Δ	Δ	O	O	O	O	X	Δ	Δ	Δ	Suitable for composting; felling cycle of 20 years; suitable for mixed planting; excellent marketability
Surian	O	O	O	O	O	O	O	X	O	Δ	O	Suitable for agroforestry; EL 500m or more; felling cycle of 10 - 15 years; good marketability; suitable for furniture and construction timber
Pinus merkusii	O	O	O	O	O	O	O	X	O	Δ	O	Observed only in national forests; felling cycle of 15 years or more
Caliandra	O	O	O	O	Δ	Δ	O	X	O	O	O	Suitable for terrace reinforcement; firewood; fodder and apiculture; felling cycle of 4 years
Gliricidia maculata	O	O	O	O	Δ	Δ	O	X	O	O	O	Suitable as spar tree for vanilla and pepper; suitable for terrace reinforcement, hedging, shade and fodder; quick growth
Cinnamomun burmanii	Δ	Δ	Δ	Δ	Δ	Δ	O	X	O	Δ	Δ	Observed only in national forests; EL 900m or more; suitable as construction timber
Bamboo	O	O	O	O	Δ	Δ	O	X	O	O	O	Suitable for bank conservation
Rattan	Δ	Δ	Δ	O	Δ	Δ	O	X	O	O	Δ	Suitable for high elevation
Jack fruit	O	O	O	O	O	O	O	Δ	Δ	Δ	O	Suitable for agroforestry and home garden; low cost
Guava	O	O	O	O	Δ	Δ	O	Δ	Δ	Δ	Δ	Suitable for home garden; popular item; low marketability
Avocado	O	O	O	O	O	O	Δ	Δ	Δ	Δ	O	Suitable for agroforestry and home garden; low cost
Star fruit	O	O	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Suitable for home garden and as ornamental tree
Durian	O	O	O	O	O	O	O	Δ	Δ	Δ	O	Suitable for home garden
Mango	Δ	Δ	Δ	Δ	O	O	Δ	Δ	X	Δ	Δ	Suitable as ornamental tree under high temperature
Sapodilla	O	O	O	O	Δ	Δ	Δ	Δ	X	Δ	Δ	Suitable for home garden
Soursop	O	O	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Suitable for home garden

Citrus fruits	O	O	O	Δ	O	O	Δ	Δ	X	O	Δ	High cost; shortage of seedlings; liable to virus damage
Gnemon tree	O	O	O	O	O	O	O	O	Δ	Δ	O	Shortage and high price of seedlings; promising product
Petai	O	O	O	O	O	O	O	Δ	Δ	Δ	O	EL.800m or below; high marketability; liable to disease; promising product
Jengkol	O	O	O	O	Δ	Δ	O	Δ	Δ	O	Δ	Suitable for home garden
Clove	O	O	O	O	O	Δ	O	O	X	X	Δ	Estate crop
Tea	O	O	O	O	O	O	O	O	Δ	Δ	O	Suitable for home garden
Coffee	O	O	O	O	O	O	O	O	O	Δ	O	Suitable for high elevation
Mulberry	O	O	O	O	X	Δ	O	Δ	Δ	Δ	X	Limited cultivation at present; collective efforts required
Palm tree	O	O	Δ	O	O	O	O	Δ	X	Δ	X	Unsuitable; EL.600m or below; difficult to grow
Banana	O	O	O	O	O	O	Δ	Δ	Δ	Δ	O	Suitable for agroforestry and home garden
Papaya	O	O	O	O	O	O	Δ	Δ	X	Δ	O	Suitable for agroforestry and home garden
Vanilla	O	O	O	O	O	Δ	O	O	O	O	Δ	Suitable for home garden
Pepper	Δ	Δ	Δ	Δ	Δ	Δ	O	Δ	O	Δ	Δ	Trial in progress
Cardamon	O	O	O	O	Δ	Δ	O	Δ	O	Δ	Δ	Suitable for home garden
Cotton	Δ	Δ	Δ	Δ	O	O	O	O	X	Δ	Δ	Cultivated only in home garden
Tabacco	O	O	O	O	O	O	O	O	X	Δ	O	Suitable for sloped lands and monoculture
Maize	O	O	O	O	Δ	Δ	O	Δ	X	Δ	O	Suitable as secondary crop; EL.800m or below
Chili	O	O	O	O	O	O	O	O	X	X	O	EL.800m or above; high water requirement
Cassava	O	O	O	O	Δ	Δ	O	X	Δ	O	O	Low cost; use of stem as fuel; undesirable from the viewpoint of soil conservation
Upland rice	O	Δ	Δ	O	O	Δ	O	O	X	Δ	O	Suitable for self-consumption
Paddy rice	O	O	O	O	O	Δ	O	O	X	Δ	O	high water requirement
Red bean	O	O	O	O	Δ	Δ	O	Δ	X	Δ	O	Only 60-70 days for harvesting; EL.800m or below
Ground nut	O	O	O	O	Δ	Δ	O	Δ	X	Δ	O	Currently small production; suitable as a dry season crop
Soybean	O	O	O	O	O	O	O	O	X	X	O	EL.700m or above; liable to soil-born disease
Ginger	O	O	O	O	O	O	O	O	O	Δ	O	Suitable for home garden; useful for soil conservation; good prospect for monoculture; high water requirement; potential product for medicine and export
Tomato	O	O	O	O	O	O	Δ	O	X	X	O	EL.800m or above; high cost; price unstable; suitable for monoculture; high water requirement

Cabbage	O	O	O	O	Δ	Δ	Δ	O	X	X	O	EL.790-800m or above; high cost; price unstable; suitable for mono-culture; high water requirement
Sweet potato	O	O	O	O	Δ	Δ	O	Δ	Δ	Δ	Δ	suitable for the dry season
Potato	O	O	O	O	O	O	O	O	X	X	O	EL.800m or above; high cost
Taro	O	O	O	O	X	X	O	X	Δ	Δ	Δ	high water requirement
Pineapple	Δ	X	X	Δ	Δ	Δ	O	X	X	Δ	X	Only for home garden
Red onion	O	O	O	O	O	O	O	O	X	Δ	O	Suitable for dry field
Scallion	O	O	O	O	O	O	Δ	O	X	X	O	Suitable for dry field
Cucumber	O	O	O	O	O	O	Δ	Δ	X	X	O	Suitable for monoculture
Carrot	O	O	O	O	O	O	O	Δ	X	Δ	O	Suitable for dry field
Raddish	O	O	O	O	Δ	Δ	O	Δ	X	Δ	O	Suitable for dry field
Egg plant	O	O	O	O	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Limited marketability
Swamp cabbage	O	O	O	O	O	O	Δ	Δ	X	Δ	O	Suitable for fish pond
Melon	O	O	O	O	X	X	Δ	O	X	Δ	X	Trial required
Califlower	O	O	O	O	O	O	Δ	O	X	X	O	EL.900m or above
Strawberry	O	Δ	Δ	O	Δ	X	X	O	Δ	Δ	X	Untried; trial required
Setaria	O	O	O	O	Δ	X	O	X	O	O	Δ	Suitable for terrace reinforcement and sheep feed; low nutrition
King grass	O	O	O	O	Δ	Δ	O	X	O	O	O	Suitable for grazing forest
Elephant grass	O	O	O	O	Δ	Δ	O	Δ	O	O	O	Suitable for grazing forest and dry field conservation
Brachiaria decumbens grass	O	O	O	O	Δ	X	O	X	X	X	O	Suitable for terrace reinforcement

Legend: (Degree of Suitability) O : High
Δ : Medium
X : Low

Source: Findings of the interviews at the SBRLKT Citarum, the Bandung District Agriculture Service and three BPPs located in the Study Area

C2 Estimated Transition of Sedimentation Volume and Remaining Capacity of Saguling Dam

(Unit: m^3)

Year/Month	Maximum Sedimentation Volume Upto Upper End of Water Intake		Remaining Capacity Upto Upper End of Water Intake	
	Without Project	With Project	Without Project	With Project
1992 6	12,878,000	12,878,000	154,811,000	154,811,000
1993 6	16,286,000	16,286,000	151,403,000	151,403,000
1994 6	19,694,000	19,694,000	147,995,000	147,995,000
1995 6	23,102,000	22,728,000	144,587,000	144,961,000
1996 6	26,510,000	25,762,000	141,179,000	141,927,000
1997 6	29,918,000	28,796,000	137,771,000	138,893,000
1998 6	33,326,000	31,830,000	134,363,000	135,859,000
1999 6	36,734,000	34,864,000	130,955,000	132,825,000
2000 6	40,142,000	37,898,000	127,547,000	129,791,000
2001 6	43,550,000	40,932,000	124,139,000	126,757,000
2002 6	46,958,000	43,966,000	120,731,000	123,723,000
2003 6	50,366,000	47,000,000	117,323,000	120,689,000
2004 6	53,774,000	50,034,000	113,915,000	117,655,000
2005 6	57,182,000	53,068,000	110,507,000	114,621,000
2006 6	60,590,000	56,102,000	107,099,000	111,587,000
2007 6	63,998,000	59,136,000	103,691,000	108,553,000
2008 6	67,406,000	62,170,000	100,283,000	105,519,000
2009 6	70,814,000	65,204,000	96,875,000	102,485,000
2010 6	74,222,000	68,238,000	93,467,000	99,451,000
2011 6	77,630,000	71,272,000	90,059,000	96,417,000
2012 6	81,038,000	74,306,000	86,651,000	93,383,000
2013 6	84,446,000	77,340,000	83,243,000	90,349,000
2014 6	87,854,000	80,374,000	79,835,000	87,315,000
2015 6	91,262,000	83,408,000	76,427,000	84,281,000
2016 6	94,670,000	86,442,000	73,019,000	81,247,000
2017 6	98,078,000	89,476,000	69,611,000	78,213,000
2018 6	101,486,000	92,510,000	66,203,000	75,179,000
2019 6	104,894,000	95,544,000	62,795,000	72,145,000
2020 6	108,302,000	98,578,000	59,387,000	69,111,000
2021 6	111,710,000	101,612,000	55,979,000	66,077,000
2022 6	115,118,000	104,646,000	52,571,000	63,043,000
2023 6	118,526,000	107,680,000	49,163,000	60,009,000
2024 6	121,934,000	110,714,000	45,755,000	56,975,000
2025 6	125,342,000	113,748,000	42,347,000	53,941,000
2026 6	128,750,000	116,782,000	38,939,000	50,907,000
2027 6	132,158,000	119,816,000	35,531,000	47,873,000
2028 6	135,566,000	122,850,000	32,123,000	44,839,000
2029 6	138,974,000	125,884,000	28,715,000	41,805,000
2030 6	142,382,000	128,918,000	25,307,000	38,771,000
2031 6	145,790,000	131,952,000	21,899,000	35,737,000
2032 6	149,198,000	134,986,000	18,491,000	32,703,000
2033 6	152,606,000	138,020,000	15,083,000	29,669,000
2034 6	156,014,000	141,054,000	11,675,000	26,635,000
2035 6	159,422,000	144,088,000	8,267,000	23,601,000
2036 6	162,830,000	147,122,000	4,859,000	20,567,000
2037 6	166,238,000	150,156,000	1,451,000	17,533,000
2038 6	169,646,000	153,190,000	-1,957,000	14,499,000
2039 6	173,054,000	156,224,000	-5,365,000	11,465,000
2040 6	176,462,000	159,258,000	-8,773,000	8,431,000
2041 6	179,870,000	162,292,000	-12,181,000	5,397,000
2042 6	183,278,000	165,326,000	-15,589,000	2,363,000
2043 6	186,686,000	168,360,000	-18,997,000	-671,000

Note: It is assumed that the Project will commence in fiscal 1994.

C3 Data for Cost Estimate

1. The Quantity and Unit Price
   (1) Farmland and Forest Land Conservation Plan
   (2) Torrent and Bank Conservation Plan
   (3) Extension Plan
   (4) Infranstructure Plan
   (5) Environmental Care Plan
   (6) Management Plan
2. Total Project Cost (Exclusing Physical Contingency)
   (1) Price Escalation
   (2) Base Cost
   (3) Government Contribution

Note : See D2 for conversion of cropping patterns comprising forest development, intruduction of agroforestry and improvement of dry farming, and construction of checkdams.

1. The Quantity and Unit Price

CIT_COST

(1) Farmland and Forest Land Conservation Plan

(Unit: Rp)

ABSORBING WELL		Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Stone	m3	2	11,000	26,400			26,400		
Sand	m3	2	25,000	37,500			37,500		
Cement	sack	3	7,500	22,500				22,500	
Brick	unit	140	300	42,000			42,000		
Pipe/Iron rod	m	15	4,500	67,500				67,500	
Wire net	m2	1	3,500	1,750				1,750	
Skilled laborer		8	5,000	40,000		40,000			
Non-skilled laborer		29	3,000	87,000	87,000				
Supervision				12,000		12,000			
Social engineering				8,000			8,000		
Name board				25,000			25,000		
Absorbing Well Total				369,650	87,000	52,000	138,900	91,750	0
					23.5%	14.1%	37.6%	24.8%	0.0%

BENCH TERRACE		Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Field preparation									
Boundary establishment	ha	25		400,000	400,000				
Enrollement of participants*		21		50,000					50,000
Board	unit	1		50,000			50,000		
Work house	unit	1		300,000			300,000		
Stake	stem	0	100	0			0		
Planting hole	hole	0	50	0	0				
Equipment	unit			100,000				100,000	
Seed, seedling:									
Elephant grass	bundle	100,000	25	2,500,000			2,500,000		
Grass	m2	13,000	300	3,900,000			3,900,000		
Fruit tree	stem	0	400	0			0		
Stone	m3	71	7,500	535,050			535,050		
Terrace rehabilitation									
Terrace improvement	ha	25	100,000	2,500,000	2,500,000				
Waterway establishment	m	995	1,000	995,000	995,000				
Planting:									
Terrace reinforcement	bundle	100,000	5	500,000	500,000				
Planting	stem	0	50	0	0				
Slope protection	m2	13,000	50	650,000	650,000				
Drop structure establishmen	unit	164	1,500	246,000	246,000				
Maintenance									
Weeding and plowing	ha	25	4,000	100,000	100,000				
Terrace and waterway	ha	25	4,000	100,000	100,000				
Social engineering				180,000			180,000		
Bench Terrace Total				13,106,050	5,491,000	0	7,465,050	100,000	50,000
* kk=head of household			Price/ha=	524,242	41.9%	0.0%	57.0%	0.8%	0.4%

SMALL DIKE TERRACE		Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Field preparation									
Boundary establishment	ha	25		400,000	400,000				
Enrollement of participants*		21		50,000					50,000
Board	unit	1		50,000			50,000		
Work house	unit	1		300,000			300,000		
Stake	stem	0	100	0			0		
Planting hole	hole	0	50	0			0		
Equipment	unit			100,000				100,000	
Seed, seedling:							0		
Elephant grass	bundle	100,000	25	2,500,000			2,500,000		
Grass	m2	0	300	0			0		
Fruit tree	stem	0	400	0			0		
Reinforcing tree	stem	5,000	50	250,000			250,000		
Stone	m3	71	7,500	535,050			535,050		
Terrace rehabilitation									
Terrace improvement	ha	25	70,000	1,750,000	1,750,000				
Waterway establishment	m	995	1,000	995,000	995,000				
Planting:									
Terrace reinforcement	bundle	100,000	5	500,000	500,000				
Planting	stem	5,000	50	250,000	250,000				
Slope protection	m2	0	50	0					
Drop structure establishmen	unit	164	1,050	172,200	172,200				
Maintenance									
Weeding and plowing	ha	25	4,000	100,000	100,000				
Terrace and waterway	ha	25	2,800	70,000	70,000				
Social engineering				180,000			180,000		
Small Dike Terrace Total				8,202,250	4,237,200	0	3,815,050	100,000	50,000
* kk=head of household			Price/ha=	328,090	51.7%	0.0%	46.5%	1.2%	0.6%

RIVERSIDE REVEGETATION (1ha)		Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Stone	m3								
Wire	unit								
Bamboo	stem	6	1,500	9,000			9,000		
Albizia	stem	1,025	100	102,500			102,500		
Calliandra	stem								
Avocado	stem	50	1,000	50,000			50,000		
Stake	stem	1,075	50	53,750			53,750		
Paint	tin	0	4,000	1,200				1,200	
Tape-measure	unit	0	30,000	0					
Bamboo wire	stem	50	250	12,500			12,500		
Surveyer		0.38	43,000	16,340		16,340			
Skilled laborer			5,000	0		0			
Foreman		2	4,000	8,000		8,000			
Non-skilled laborer		56	3,000	168,000	168,000				
Name board				5,000			5,000		
Supervision				50,000		50,000			
Social engineering				10,000			10,000		
Reverside Revegitation Total				486,290	168,000	74,340	242,750	1,200	0
					34.5%	15.3%	49.9%	0.2%	0.0%

(2) Torrent and Bank Conservation Plan

RIVERBANK LINE PLANTING (1km)		Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Stone	m3								
Wire	unit								
Bamboo	stem	0	1,500	0					
Albizia	stem	0	100	0					
Calliandra	stem	8,000	80	640,000			640,000		
Avocado	stem	0	1,000	0					
Stake	stem	8,000	50	400,000			400,000		
Paint	tin	0	4,000	0					
Tape-measure	unit	0	30,000	0					
Bamboo wire	stem	0	250	0					
		0	43,000	0					
Skilled laborer		0	5,000	0					
Foreman		24	4,000	96,000		96,000			
Non-skilled laborer		360	3,000	1,080,000	1,080,000				
Name board				0					
Supervision				0					
Social engineering				0					
River Bank Line Planting Total				2,216,000	1,080,000	96,000	1,040,000	0	0
					48.7%	4.3%	46.9%	0.0%	0.0%

REVETMENT WORK		123 m Quantity	Unit price	Total Cost	Labor Unskilled	Labor Skilled	Material Nontradable	Material Tradable	Others
Stone	m3	132	11,000	1,452,000			1,452,000		
Wire	unit	82	35,000	2,870,000				2,870,000	
Bamboo	stem	0	1,500	0					
Albizia	stem	0	100	0					
Calliandra	stem	0	80	0					
Avocado	stem	0	1,000	0					
Stake	stem	0	50	0					
Paint	tin	0	4,000	0					
Tape-measure	unit	0	30,000	0					
Bamboo wire	stem	0	250	0					
		0	43,000	0					
Skilled laborer		0	5,000	0					
Foreman		66	4,000	264,000		264,000			
Non-skilled laborer		408	3,000	1,224,000	1,224,000				
Name board				0					
Supervision				0					
Social engineering				0					
Revetment Work Total				5,810,000	1,224,000	264,000	1,452,000	2,870,000	0
			Price/100m	4,723,577	21.1%	4.5%	25.0%	49.4%	0.0%

GULLY PLUG		Quantity	Unit price	Total Cost	Labor Labor Unskilled	Labor Skilled	Material Material Nontradable	Material Tradable	Others
Stone	m2	12	11,000	132,000			132,000		
Wire	m3	50	3,000	150,000				150,000	
Thin wire	kg	2	3,500	7,000				7,000	
Palm fiber	kg	20	500	10,000			10,000		
Bamboo	kg	5	1,500	7,500			7,500		
Plastic rope	stem	15	500	7,500				7,500	
Equipment				3,500				3,500	
Skilled laborer		13	5,000	65,000		65,000			
Non-skilled laborer		35	3,000	105,000	105,000				
Supervision				25,000		25,000			
Social engineering				10,000			10,000		
Total				522,500	105,000	90,000	159,500	168,000	0
					20.1%	17.2%	30.5%	32.2%	0.0%

COES_02 (3) Extension Plan

COST ESTIMATION OF DEMONSTRATION PLOT(UPSA) (10ha)
1 YEAR

	ITEM	QUALITY	UNIT	UNIT COST	AMOUNT	REMARK	Cost Breakdown Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable	Others
1	(LABOUR COST)										
1 - 1	FIELD PREPARATION										
1 - 1 - 1	BOUNDARY OF LOCATION	6	MANDAY	43,000	258,000	SPECIALIST		258,000			
		8	MANDAY	3,000	24,000	LABOUR	24,000				
1 - 1 - 2	GUIDE BOARD	2	MANDAY	3,000	6,000		6,000				
1 - 1 - 3	WORK HOUSE	25	MANDAY	3,000	75,000		75,000				
1 - 2	LAND CONSTRACTION										
1 - 2 - 1	BENCH TERRACE	450	MANDAY	3,000	1,350,000	10ha	1,350,000				
1 - 2 - 2	WATER WAY (SPA)	90	MANDAY	3,000	270,000	210m	270,000				
1 - 2 - 3	DROP STRUCTURE	15	MANDAY	3,000	45,000	27unit	45,000				
1 - 2 - 4	AGRICURTURE PRODUCTION (FIRST SEASON)										
	•PADDY	200	MANDAY	3,000	600,000		600,000				
	•MAIZE	75	MANDAY	3,000	225,000		225,000				
	•RED BEAN	100	MANDAY	3,000	300,000		300,000				
1 - 2 - 5	ORGANIC FERTILIZER	100	MANDAY	3,000	300,000		300,000				
1 - 2 - 6	NON-ORGANIC FERTILIZER	150	MANDAY	3,000	450,000		450,000				
1 - 2 - 7	PESTICIDE	35	MANDAY	3,000	105,000		105,000				
1 - 2 - 8	AGRICURTURE PRODUCTION (SECOND SEASON)										
	•SOY BEAN	40	MANDAY	3,000	120,000		120,000				
	•RED BEAN	100	MANDAY	3,000	300,000		300,000				
1 - 2 - 9	NON-ORGANIC FERTILIZER	100	MANDAY	3,000	300,000		300,000				
1 - 2 -10	TREE PLANTING										
	•ALBIZIA	25	MANDAY	3,000	75,000		75,000				
	•ABOGADO	25	MANDAY	3,000	75,000		75,000				
1 - 2 -11	CONTROL	48	MANDAY	3,000	144,000		144,000				
	SUB TOTAL	1,594	MANDAY		5,022,000		4,764,000	258,000			
2	(MATERIAL AND FACILITES)										
2 - 1	PATICIPANT REGISTRATIO	20	person		50,000						50,000
2 - 1 - 1	BOUNDARY OF LOCATION	10	ha		100,000				100,000		
2 - 1 - 2	GUIDE BOARD	1	unit		50,000				50,000		
2 - 1 - 3	WORK HOUSE	1	unit		175,000				175,000		
2 - 1 - 4	SPRAYER	2	set		300,000					300,000	
2 - 2 -	LAND CONSTRUCTION										
2 - 2 - 1	REINFORCEMENT GRASS	40,000	unit	5	200,000				200,000		
2 - 2 - 2	MATERIAL OF SPA	13	m³	7,500	97,500				97,500		
2 - 2 - 3	GREENING OF SPA	105	m²	500	52,500				52,500		
2 - 2 - 4	AGRICURTURE PRODUCTION (FIRST SEASON)										
	•PADDY	400	kg	750	300,000					300,000	
	•MAIZE	150	kg	3,000	450,000					450,000	
	•RED BEAN	200	kg	1,000	200,000					200,000	
2 - 2 - 5	NON-ORGANIC FERTILIZER										
	•UREA	1,000	kg	240	240,000					240,000	
	•TSP	500	kg	310	155,000					155,000	
	•KCL	500	kg	350	175,000					175,000	
2 - 2 - 6	ORGANIC FERTILIZER	1,000	kg	50	50,000				50,000		
2 - 2 - 7	PESTICIDE										
	•CAIRAN	10	liter	20,000	200,000					200,000	
	•BUTIRAN	25	kg	3,000	75,000					75,000	
2 - 2 - 8	AGRICURTURE PRODUCTION (SECOND SEASON)										
	•SOY BEAN	240	kg	3,000	720,000					720,000	
	•RED BEAN	600	kg	1,000	600,000					600,000	
2 - 2 - 9	NON-ORGANIC FERTILIZER										
	•UREA	1,000	kg	240	240,000					240,000	
	•TSP	500	kg	310	155,000					155,000	
	•KCL	500	kg	350	175,000					175,000	
2 - 2 -10	TREE PLANTING										
	•ALBIZIA	1,000	seedli	100	100,000				100,000		
	•ABOGADO	1,000	seedli	1,000	1,000,000				1,000,000		
2 - 2 -11	REKAYASA SOSIAL	12	month		200,000						200,000
	SUB TOTAL				6,060,000		0	0	1,825,000	3,985,000	250,000
	TOTAL				11,082,000		4,764,000	258,000	1,825,000	3,985,000	250,000

COST ESTIMATION OF DEMONSTRATION PLOT(UPSA) (10ha)
2 YEAR

	ITEM	QUALITY	UNIT	UNIT COST	AMOUNT	REMARK	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable	Others
1	LABOUR COST										
1 - 1	NON-ORGANIC FERTILIZER	100	MANDAY	3,000	300,000		300,000				
1 - 2	PESTICIDE	13	MANDAY	3,000	39,000		39,000				
1 - 3	MAINTENANCE						0				
1 - 3 - 1	TERRACE	40	MANDAY	3,000	120,000		120,000				
1 - 3 - 2	SPA	21	MANDAY	3,000	63,000		63,000				
1 - 3 - 3	DROP STRUCTURE	6	MANDAY	3,000	18,000		18,000				
1 - 3 - 4	REINFORCEMENT						0				
	•TREE PLANTING	25	MANDAY	3,000	75,000		75,000				
	•GREENING	100	MANDAY	3,000	300,000		300,000				
1 - 4	CONTROL	48	MANDAY	3,000	144,000		144,000				
	SUB TOTAL	353	MANDAY		1,059,000		1,059,000				
2	MATERIAL AND FACILITES										
2 - 1	GOAT										
2 - 1 - 1	MALE	2	HEAD	200,000	400,000				400,000		
2 - 1 - 2	FEMALE	19	HEAD	150,000	2,850,000				2,850,000		
2 - 2	NON-ORGANIC FERTILIZER										
2 - 2 - 1	UREA	1,000	kg	240	240,000					240,000	
2 - 2 - 2	TSP	500	kg	310	155,000					155,000	
2 - 2 - 3	KCL	500	kg	350	175,000					175,000	
2 - 3	PESTICIDE										
2 - 4	CAIRAN	5	liter	20,000	100,000					100,000	
2 - 5	REINFORCEMENT GRASS										
2 - 5 - 1	TREE	250	STEM	1,000	250,000				250,000		
2 - 5 - 2	GRASS	10,000	UNIT	5	50,000				50,000		
2 - 6	REKAYASA SOSIAL	12	month		128,000						128,000
	SUB TOTAL				4,348,000		0	0	3,550,000	670,000	128,000
	TOTAL				5,407,000		1,059,000	0	3,550,000	670,000	128,000

COES_02 (3) Extension Plan

COST ESTIMATION OF DEMONSTRATION PLOT(UPSA) (10ha)

3 YEAR

	ITEM	QUALITY	UNIT	UNIT COST	AMOUNT	REMARK	Labor		Materials		Others
							Unskilled	Skilled	Nontradable	Tradable	
1	LABOUR COST										
1 - 1	NON-ORGANIC FERTILIZER	50	MANDAY	3,000	150,000		150,000				
1 - 2	PESTICIDE	13	MANDAY	3,000	39,000		39,000				
1 - 3	MAINTENANCE										
1 - 3 - 1	TERRACE	30	MANDAY	3,000	90,000		90,000				
1 - 3 - 2	SPA	21	MANDAY	3,000	63,000		63,000				
1 - 3 - 3	DROP STRUCTURE	4	MANDAY	3,000	12,000		12,000				
1 - 4	CONTROL	12	MANDAY	3,000	36,000		36,000				
	SUB TOTAL	130	MANDAY		390,000		390,000				
2	MATERIAL AND FACILITES										
2 - 1	NON-ORGANIC FERTILIZER										
2 - 1 - 1	UREA	500	kg	240	120,000					120,000	
2 - 1 - 2	TSP	250	kg	310	77,500					77,500	
2 - 1 - 3	KCL	250	kg	350	87,500					87,500	
2 - 2	PESTICIDE	0									
2 - 2 - 1	CAIRAN	5	liter	20,000	100,000					100,000	
2 - 3	REKAYASA SOSIAL	12	month		30,000						30,000
	SUB TOTAL				415,000		0	0	0	385,000	30,000
	TOTAL				805,000		390,000	0	0	385,000	30,000

COST ESTIMATION OF DEMONSTRATION PLOT(UPSA) (10ha)

1 YEAR			
LABOUR COST	1,594	MANDAY	5,022,000
MATERIAL AND FACILITES			6,060,000
TOTAL			11,082,000
2 YEAR			
LABOUR COST	353	MANDAY	1,059,000
MATERIAL AND FACILITES			4,348,000
TOTAL			5,407,000
3 YEAR			
LABOUR COST	130	MANDAY	390,000
MATERIAL AND FACILITES			415,000
TOTAL			805,000
GROUND TOTAL			17,294,000

COES_03

File: COES_3 (3) Extension Plan

COST ESTIMATION OF EDUCATION AND TRAINING

1. UNIT COST OF STAFF, INSTRUCTOR, TRAINEES

ITEM	UNIT	UNIT COST(Rp)	REMARK
(1)STAFF			
a. HEAD	MONTH	400,000	Annual Base-up
b. SECTION CHIEF	MONTH	300,000	5.0%
c. STAFF	MONTH	200,000	
d. INSTURACTOR	MONTH	300,000	
(2)EXTERNAL INSTRACTOR			
a. INSTRUCTOR	HOUR	6,000	
(3)SECURITY GAURD			
a. SECURITY GAURD	DAY	3,500	
(4)TRAINEES			
a. PLP	PERSON/DAY	20,000	TRANS 100000
b. PMP	PERSON/DAY	25,000	TRANS 100000
c. FARMER'S LEADER	PERSON/DAY	20,000	TRANS 100000
d. VILLAGE LEADER	PERSON/DAY	25,000	TRANS 100000

2. ANNUAL PLAN OF STAFF, INSTRUCTOR, TRAINEES

ITEM/YEAR	1	2	3	4	5	6	7	TOTAL
(1)STAFF	10	10	10	10	10	10	10	
(2)INSTRUCTOR								
INTERNAL	5	5	5	5	5	5	5	
EXTERNAL	70	70	70	70	70	70	70	
(3)TRAINEES								
a. PLP	25	25	25	25	25	25	25	175
b. PMP	25	25	25	25	25	25	25	175
c. FARMER'S LEADER	600	600	600	600	600	600	600	4,200
d. VILLAGE LEADER								
*DESA	125	125	125	125	125	125	125	875
*LKMD	125	125	125	125	125	125	125	875
(4)GAURD	2	2	2	2	2	2	2	
TOTAL								

2. ANNUAL PLAN OF STAFF, INSTRUCTOR, TRAINEES

ITEM/YEAR	1	2	3	4	5	6	7	TOTAL
(1)STAFF	40,950,000	42,997,500	45,147,375	47,404,744	49,774,981	52,263,730	54,876,916	333,415,246
(2)INSTRUCTOR								
INTERNAL	20,475,000	21,498,750	22,573,688	23,702,372	24,887,490	26,131,865	27,438,458	166,707,623
EXTERNAL	1,764,000	1,852,200	1,944,810	2,042,051	2,144,153	2,251,361	2,363,929	14,362,503
(3)TRAINEES								
a. PLP	11,250,000	11,250,000	11,250,000	11,250,000	11,250,000	11,250,000	11,250,000	78,750,000
b. PMP	13,125,000	13,125,000	13,125,000	13,125,000	13,125,000	13,125,000	13,125,000	91,875,000
c. FARMER'S LEADER	270,000,000	270,000,000	270,000,000	270,000,000	270,000,000	270,000,000	270,000,000	1,890,000,000
d. VILLAGE LEADER								
*DESA	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	153,125,000
*LKMD	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	21,875,000	153,125,000
(4)GAURD	2,682,750	2,816,888	2,957,732	3,105,618	3,260,899	3,423,944	3,595,142	21,842,973
TOTAL	403,996,750	407,290,338	410,748,604	414,379,785	418,192,524	422,195,900	426,399,445	2,903,203,345
	403,996,750	407,290,338	410,748,604	414,379,785	418,192,524	422,195,900	426,399,445	2,903,203,345

3 COST ESTIMATION OF TRAINING FACILITES

ITEM	Quantity	UNIT	UNIT COST	AMOUNT	REMARK	Materials Nontradable	Materials Tradable
OFFICE	330	m2	320,000	105,600,000		90.0%	10.0%
CONFERENCE ROOM	160	m2	320,000	51,200,000		90.0%	10.0%
LIBERARY	120	m2	320,000	38,400,000		90.0%	10.0%
LECTURE BUILDING	200	m2	320,000	64,000,000		90.0%	10.0%
LOGGIONG OF TRAINEES	250	m2	320,000	80,000,000		90.0%	10.0%
LOGGING OF INSTRUCTORS	150	m2	320,000	48,000,000		90.0%	10.0%
EXPERIMENTAL BUILDING	100	m2	320,000	32,000,000		90.0%	10.0%
DINING HALL	400	m2	320,000	128,000,000		90.0%	10.0%
GARAGE	200	m2	240,000	48,000,000	UNIT COST +75%	90.0%	10.0%
WATER SUPPLY ROOM	45	m2	400,000	18,000,000	UNIT COST +125%	90.0%	10.0%
POWER DISTRIBUTION	45	m2	400,000	18,000,000	UNIT COST +125%	90.0%	10.0%
SUB TOTAL	2,000	m2		631,200,000			
ARBORETUM	10,000	m2	100	1,000,000		100.0%	0.0%
AGROFOREST	10,000	m2	160	1,600,000		100.0%	0.0%
EROSION CONTROL	10,000	m2	50	500,000		90.0%	10.0%
NURSERY	5,000	m2	2,000	10,000,000		90.0%	10.0%
ROAD	5,000	m2	10,000	50,000,000		80.0%	20.0%
OTHERS	8,000	m2	10,000	63,120,000	BUILDING COST*10%	90.0%	10.0%
SUB TOTAL	48,000	m2	500,000	126,220,000			
ELECTIC	1	SET		63,120,000	BUILDING COST*10%	20.0%	80.0%
WATER SUPPLY	1	SET		63,120,000	BUILDING COST*10%	20.0%	80.0%
TOTAL				883,660,000			

4 COST ESTIMATION OF TRAINING MATERIALS

ITEM	QUALITY	UNIT	UNIT COST	AMOUNT	REMARK	Materials Nontradable	Materials Tradable
VEHICLE							
4*4 TYPE(DAIHATSU TAFT F7	4	UNIT	37,000,000	148,000,000			148,000,000
LARGE BUS(MERCEDES BENZ)	1	UNIT	120,000,000	120,000,000			120,000,000
MOTERCYCLE (HONDA)	10	UNIT	3,750,000	37,500,000			37,500,000
COMUNICATION							0
RADIOYTEREGRAPH	2	SETS	13,750,000	27,500,000			27,500,000
TELEPHONE	10	SETS	765,000	7,650,000			7,650,000
AUDIO -VISUAL MACHINERY							0
SLIDE PROJECTOR	2	SETS	1,500,000	3,000,000			3,000,000
OVERHEAD PROJECTOR	2	SETS	2,000,000	4,000,000			4,000,000
VIDEO SET	2	SETS	7,500,000	15,000,000			15,000,000
CAMERA	5	SETS	3,000,000	15,000,000			15,000,000
OFFICE EQUIPMENT							0
PERSONAL COMPUTER SET	2	SETS	15,415,000	30,830,000			30,830,000
WHITE BOARD	5	UNIT	150,000	750,000		750,000	
DESK AND CHAIR	150	SETS	300,000	45,000,000		45,000,000	
BOOK SHELVES	40	SETS	350,000	14,000,000		14,000,000	
APPARATUS FOR DINING HALL	1	SET		6,312,000	COST*1%	6,312,000	
MATERIALS FOR LODGING	1	SET		6,312,000	COST*1%	6,312,000	
MATERIALS FOR NURSERY	1	SET		6,312,000	COST*1%	6,312,000	
EQUIPEMENT FOR EXTENTION	1	SET		6,312,000	COST*1%	3,156,000	3,156,000
TOTAL				493,478,000		81,842,000	411,636,000

5 COST ESTIMATION OF MATERIALS AND FACILIUTES FOR EXTENTION

ITEM	QUALITY	UNIT	UNIT COST	AMOUNT	REMARK	Materials Nontradable	Materials Tradable
VEHICLE							
MOTERCYCLE (HONDA)	15	UNIT	3,750,000	56,250,000			56,250,000
COMUNICATION							0
RADIOYTEREGRAPH	6	SETS	13,750,000	82,500,000			82,500,000
TELEPHONE	3	SETS	765,000	2,295,000			2,295,000
AUDIO -VISUAL MACHINERY							0
SLIDE PROJECTOR	3	SETS	1,500,000	4,500,000			4,500,000
CAMERA	6	SETS	3,000,000	18,000,000			18,000,000
OFFICE EQUIPMENT							0
ELECTRIC TYPEWRITER	6	SETS	1,541,500	9,249,000			9,249,000
TOTAL				172,794,000			172,794,000

(4) Infrastructure Plan

File:COSE_4
COST ESTIMATION OF ROAD CONSTRUCTION

ITEM	UNIT	UNIT COST	TOTAL	
NEW ROAD CONSTRUCTION				
FOR CHECK DAM	26,600 m	31,468	837,058,957	
FOR DEMONSTRATION PLOT	6,000 m	31,468	188,810,291	
FOR DAILY USE	41,800 m	31,468	1,315,378,361	
IMPROVEMENT OF ROAD				
COMONN ROAD				
GRAVEL-GRAVEL	11,833 m3	19,358	229,068,144	19721m*0.6m2
GRAVEL-ASPHALT	6,576 m2	6,475	42,576,523	2192m*3m
TRACK				
GRAVEL-GRAVEL	38,893 m3	19,358	752,906,899	64822m*0.6m2
EARTH-GRAVEL	24,310 m3	23,403	568,928,956	40516m*0.6m2
EARTH-GRAVEL	1,621 m3	23,403	37,936,398	2702m*0.6m2
SLOPE PROTECTUON				
COMMONN ROAD				
REGREENING OF SLOPE	54,781 m3	417	22,825,417	
DRAIN	27,390 m	2,581	70,686,489	109560m*0.25m2
DROP STRUCTURE	1,096 unit	8,450	9,261,200	
TRACK				
REGREENING OF SLOPE	67,525 m3	417	28,135,417	
DRAIN	33,761 m	2,581	87,128,388	135045m*0.25m2
DROP STRUCTURE	1,351 unit	8,450	11,415,950	
ROADSIDE PLANTING	29,352 seedling	620	18,198,240	146763m/10seedling*2
TOTAL			4,220,315,631	

ANNUAL PLAN OF ROAD CONSTRACTION

ITEM/YEAR	1	2	3	4	5	6	7	TOTAL
NEW ROAD CONSTRACTION								
FOR CHECK DAM	3,000	3,200	4,100	4,100	4,100	4,100	4,100	26,700
FOR DEMONSTRATION PLOT	2,000	2,000	2,000					6,000
FOR DAILY USE	8,360	8,360	8,360	8,360	8,360			41,800
SUB TOTAL	13,360	13,560	14,460	12,460	12,460	4,100	4,100	74,500
IMPROVEMENT OF ROAD								
COMONN ROAD								
GRAVEL-GRAVEL	2,367	2,367	2,367	2,367	2,367			11,833
GRAVEL-ASPHALT	1,315	1,315	1,315	1,315	1,315			6,576
TRACK								
GRAVEL-GRAVEL	7,779	7,779	7,779	7,779	7,779			38,893
EARTH-GRAVEL	4,862	4,862	4,862	4,862	4,862			24,310
EARTH-GRAVEL	324	324	324	324	324			1,621
SLOPE PROTECTUON								
COMMONN ROAD								
REGREENING OF SLOPE	10,956	10,956	10,956	10,956	10,956			54,781
DRAIN	5,478	5,478	5,478	5,478	5,478			27,390
DROP STRUCTURE	219	219	219	219	219			1,096
TRACK								
REGREENING OF SLOPE	13,505	13,505	13,505	13,505	13,505			67,525
DRAIN	6,752	6,752	6,752	6,752	6,752			33,761
DROP STRUCTURE	270	270	270	270	270			1,351
ROADSIDE PLANTING	5,870	5,870	5,870	5,870	5,870			29,352

ANNUAL PLAN OF ROAD CONSTRACTION

ITEM/YEAR	1	2	3	4	5	6	7	TOTAL
NEW ROAD CONSTRACTION								
FOR CHECK DAM	94,405,146	100,698,822	129,020,366	129,020,366	129,020,366	129,020,366	129,020,366	840,205,795
FOR DEMONSTRATION PLOT	62,936,764	62,936,764	62,936,764	0	0	0	0	188,810,291
FOR DAILY USE	263,075,672	263,075,672	263,075,672	263,075,672	263,075,672	0	0	1,315,378,361
SUB TOTAL	420,417,582	426,711,258	455,032,802	392,096,038	392,096,038	129,020,366	129,020,366	2,344,394,448
IMPROVEMENT OF ROAD								
COMONN ROAD								
GRAVEL-GRAVEL	45,813,629	45,813,629	45,813,629	45,813,629	45,813,629			229,068,144
GRAVEL-ASPHALT	3,013,547	3,013,547	3,013,547	3,013,547	3,013,547			15,067,735
TRACK								
GRAVEL-GRAVEL	150,581,380	150,581,380	150,581,380	150,581,380	150,581,380			752,906,899
EARTH-GRAVEL	113,785,791	113,785,791	113,785,791	113,785,791	113,785,791			568,928,956
EARTH-GRAVEL	7,587,280	7,587,280	7,587,280	7,587,280	7,587,280			37,936,398
SUB TOTAL	320,781,627	320,781,627	320,781,627	320,781,627	320,781,627			1,603,908,133
SLOPE PROTECTUON								
COMONN ROAD								
REGREENING OF SLOPE	4,565,083	4,565,083	4,565,083	4,565,083	4,565,083			22,825,417
DRAIN	14,137,298	14,137,298	14,137,298	14,137,298	14,137,298			70,686,489
DROP STRUCTURE	1,852,240	1,852,240	1,852,240	1,852,240	1,852,240			9,261,200
TRACK								
REGREENING OF SLOPE	5,627,083	5,627,083	5,627,083	5,627,083	5,627,083			28,135,417
DRAIN	17,425,678	17,425,678	17,425,678	17,425,678	17,425,678			87,128,388
DROP STRUCTURE	2,283,190	2,283,190	2,283,190	2,283,190	2,283,190			11,415,950
SUB TOTAL	45,890,572	45,890,572	45,890,572	45,890,572	45,890,572			229,452,860
ROADSIDE PLANTING	3,639,648	3,639,648	3,639,648	3,639,648	3,639,648			18,198,240
SUB TOTAL	3,639,648	3,639,648	3,639,648	3,639,648	3,639,648			18,198,240
TOTAL	787,089,780	793,383,457	821,705,000	758,768,236	758,768,236	129,020,366	129,020,366	4,195,953,681

COST ESTIMATION OF NEW ROAD CONSTRACTION

ITEM		UNIT	UNIT COST	TOTAL COST
CUT BACK	89,784	m3	17,522	1,573,172,802
BACK FILLING	58,050	m3	4,938	286,659,900
RESURFACING	232,200	m2	2,291	532,045,020
MAKING DITCH	1,935	m3	2,581	4,993,733
DROP STRUCTURE	774	unit	8,450	6,540,300
REGREENING	77,400	m2	417	32,259,000
TOTAL				2,435,652,755
UNIT COST				31,468

CUT BACK :1.16m2*77,400m
BACK FILLING :0.75m2*77,400m
RESURFACING :3.0m*77,400m
MAKING DITCH:0.25m2*77,400m
DROP STRUCTURE :77,400m/100m
REGREENING :0.5m*77,400m*2

CUT BACK

ITEM		UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER								
SUPERVISOR	2	MANDAY	4,000	8,000		8,000		
SKILLED OPERATOR	1	MANDAY	5,000	5,000		5,000		
ASSISTANT OPERATOR	1	MANDAY	4,500	4,500		4,500		
SKILLED DRIVER	6	MANDAY	5,000	30,000		30,000		
ASSISTANT DRIVER	6	MANDAY	4,500	27,000		27,000		
UNSKILLED LABOUR	60	MANDAY	3,000	180,000	180,000			
SUB TOTAL		MANDAY		254,500	180,000	74,500	0	0
MATERIAL								
TOOL	2	SET	13,000	45,600				45,600
SUB TOTAL				45,600	0	0	0	45,600
MACHINARY								
TANDEM ROLLER 6ton	5	HOUR	24,448	122,240				122,240
WATER TANK TRACK 115HP	5	HOUR	24,519	122,595				122,595
CONTAINER TRACK 3.5ton 115HP	30	HOUR	16,879	506,370				506,370
SUB TOTAL				751,205	0	0	0	751,205
TOTAL				1,051,305	180,000	74,500	0	796,805
Rp1,051,305/60m3=Rp17,522/m3				17,522				

BACK FILLING

ITEM		UNIT	UNIT COST(TOTAL COST(Rp)		Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER								
SUPERVISOR	1	MANDAY	4,000	4,000		4,000		
SKILLED LABOUR	2	MANDAY	4,000	8,000		8,000		
UNSKILLED LABOUR	10	MANDAY	3,000	30,000	30,000			
SUB TOTAL		MANDAY		42,000	30,000	12,000	0	0
MATERIAL								
TOOL	0.40	SET	13,000	7,600				7,600
SUB TOTAL				7,600	0	0	0	7,600
MACHINARY								
TAMPER	10	HOUR	2,447	24,470				24,470
SUB TOTAL				24,470	0	0	0	24,470
TOTAL				74,070	30,000	12,000	0	32,070
Rp74,070/15m3=Rp4,938/m3				4,938				

RESURFACING

ITEM		UNIT	UNIT COST(TOTAL COST(Rp)		Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER								
SUPERVISOR	2	MANDAY	4,000	8,000		8,000		
SKILLED OPERATOR	4	MANDAY	5,000	20,000		20,000		
ASSISTANT OPERATOR	4	MANDAY	4,500	18,000		18,000		
SKILLED DRIVER	2	MANDAY	5,000	10,000		10,000		
ASSISTANT DRIVER	2	MANDAY	4,500	9,000		9,000		
SKILLED LABOUR	4	MANDAY	4,000	16,000		16,000		
UNSKILLED LABOUR	24	MANDAY	3,000	72,000	72,000			
SUB TOTAL		MANDAY		153,000	72,000	81,000	0	0
MATERIAL								
RIVER SAND	30	m3	11,000	330,000			330,000	
ASPHALT	3,620	kg	700	2,534,000			1,267,000	1,267,000
FUEL OIL	1,060	lt	400	424,000				424,000
TOOL	0.96	SET	13,000	13,240				18,240
SUB TOTAL				3,305,240	0	0	1,597,000	1,709,240
MACHINARY								
TIRE ROLLER	10	HOUR	37,143	371,430				371,430
ASPHALT SPRAYER	10	HOUR	8,846	88,460				88,460
DUMP TRACK 3.5ton/115HP	10	HOUR	20,525	205,250				205,250
SUB TOTAL				665,140	0	0	0	665,140
TOTAL				4,124,380	72,000	81,000	1,597,000	2,374,380
Rp4,124,380/1,800m2=Rp2,291/m2				2,291				

MAKING DITCH

ITEM		UNIT	UNIT COST TOTAL COST		Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER								
SUPERVISOR	1	MANDAY	4,000	4,000		4,000		
UNSKILLED LABOUR	36	MANDAY	3,000	108,000	108,000			
SUB TOTAL		MANDAY		112,000	108,000	4,000	0	0
MATERIAL								
TOOL	1	SET	13,000	27,360				27,360
SUB TOTAL				27,360	0	0	0	27,360
TOTAL				139,360	108,000	4,000	0	27,360
Rp139,360/54m3=Rp2,581/m3				2,581				

DROP STRUCTURE

ITEM	UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER							
SUPERVISOR	0.5 MANDAY	4,000	2,000		2,000		
UNSKILLED LABOUR	0.5 MANDAY	3,000	1,500	1,500			
SUB TOTAL	MANDAY		3,500	1,500	2,000	0	0
MATERIAL							
STONE	0 m3	11,000	4,950			4,950	
SUB TOTAL			4,950	0	0	4,950	0
TOTAL			8,450	1,500	2,000	4,950	0
Rp8,450/1m3=Rp8,450/m3			8,450				

REGREENING

ITEM	UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER							
SUPERVISOR	1 MANDAY	4,000	4,000		4,000		
UNSKILLED LABOUR	1 MANDAY	3,000	3,000	3,000			
SUB TOTAL	MANDAY		7,000	3,000	4,000	0	0
MATERIAL							
GRASS	60 m2	300	18,000			18,000	
SUB TOTAL			18,000	0	0	18,000	0
TOTAL			25,000	3,000	4,000	18,000	0
Rp25,000/60m2=Rp417/m2			417				

GRAVEL-ASPHALT

ITEM	UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER							
SUPERVISOR	6 MANDAY	4,000	24,000		24,000		
SKILLED OPERATOR	6 MANDAY	5,000	30,000		30,000		
ASSISTANT OPERATOR	6 MANDAY	4,500	27,000		27,000		
SKILLED DRIVER	3 MANDAY	5,000	15,000		15,000		
ASSISTANT DRIVER	3 MANDAY	4,500	13,500		13,500		
SKILLED LABOUR	6 MANDAY	4,000	24,000		24,000		
UNSKILLED LABOUR	196 MANDAY	3,000	588,000	588,000			
SUB TOTAL	MANDAY		721,500	588,000	133,500	0	0
MATERIAL							
CLASHED STONE 3CM	56 m3	26,000	1,456,000			1,456,000	
CLASHED STONE 2CM	31 m3	28,000	868,000			868,000	
CLASHED STONE 1CM	15 m3	30,000	450,000			450,000	
SAND FOR CEMENT	3 m3	26,000	78,000			78,000	
ASPHALT	6,270 kg	700	4,389,000			2,194,500	2,194,500
FUEL OIL	450 lt	400	180,000				180,000
TOOL	8 SET	19,000	152,000				152,000
SUB TOTAL			7,573,000	0	0	5,045,500	2,526,500
MACHINARY							
TIRE ROLLER	15 HOUR	25,598	383,970				383,970
ASPHALT SPRAYER	15 HOUR	8,845	132,690				132,690
DUMP TRACK 3.5ton/115HP	15 HOUR	16,879	253,185				253,185
SUB TOTAL			769,845	0	0	0	769,845
TOTAL			9,064,345	588,000	133,500	5,045,500	3,296,345
Rp9,064,345/1,400m2=Rp6,475/m2			6,475				

GRAVEL-GRAVEL

ITEM	UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER							
SUPERVISOR	2 MANDAY	4,000	8,000		8,000		
SKILLED OPERATOR	1 MANDAY	5,000	5,000		5,000		
ASSISTANT OPERATOR	1 MANDAY	4,500	4,500		4,500		
SKILLED DRIVER	1 MANDAY	5,000	5,000		5,000		
ASSISTANT DRIVER	1 MANDAY	4,500	4,500		4,500		
UNSKILLED LABOUR	60 MANDAY	3,000	180,000	180,000			
SUB TOTAL	MANDAY		207,000	180,000	27,000	0	0
MATERIAL							
RIVER STONE	72 m3	10,000	720,000			720,000	
TOOL	0.24 SET	19,000	4,560				4,560
SUB TOTAL			724,560	0	0	720,000	4,560
MACHINARY							
ROAD ROLLER	5 HOUR	37,143	185,715				185,715
WATER TANK	5 HOUR	8,846	44,230				44,230
SUB TOTAL			229,945	0	0	0	229,945
TOTAL			1,161,505	180,000	27,000	720,000	234,505
Rp1,161,505/60m3=Rp19,358/m3			19,358				

EARTH-GRAVEL

ITEM	UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Labor Skilled	Materials Nontradable	Materials Tradable
MANPOWER							
SUPERVISOR	2 MANDAY	4,000	8,000		8,000		
SKILLED OPERATOR	1 MANDAY	5,000	5,000		5,000		
ASSISTANT OPERATOR	1 MANDAY	4,500	4,500		4,500		
SKILLED DRIVER	1 MANDAY	5,000	5,000		5,000		
ASSISTANT DRIVER	1 MANDAY	4,500	4,500		4,500		
UNSKILLED LABOUR	60 MANDAY	3,000	180,000	180,000			
SUB TOTAL	MANDAY		207,000	180,000	27,000	0	0
MATERIAL							
RIVER SAND	71 m3	11,000	781,000			781,000	
SAND	7.50 kg	16,000	120,000			120,000	
TOOL	2.40 SET	19,000	45,600				45,600
SUB TOTAL			946,600	0	0	901,000	45,600
MACHINARY							
ROAD ROLLER	5 HOUR	25,598	127,990				127,990
WATER TANK	5 HOUR	24,519	122,595				122,595
SUB TOTAL			250,585	0	0	0	250,585
TOTAL			1,404,185	180,000	27,000	901,000	296,185
Rp1,404,185/60m3=Rp23,403/m3			23,403				

ROADSIDE PLANTING

ITEM		UNIT	UNIT COST	TOTAL COST	Labor Unskilled	Skilled	Materials Nontradable	Tradable
MANPOWER								
UNSKILLED LABOUR	4	MANDAY	3,000	12,000	12,000			
SUB TOTAL		MANDAY		12,000	12,000	0	0	0
MATERIAL								
SEEDLI	100	SEEDLI	500	50,000			50,000	
SUB TOTAL				50,000	0	0	50,000	0
TOTAL				62,000	12,000	0	50,000	0

Rp62,000/100SEEDLING=Rp620/m2 620

(4) Infrastructure Plan

Financial Cost on Nursery

Table 1: Parameter Table (per Ha)

Item	
Economic Indicator	
Domestic Inflation Rate	8.0%
Foreign Inflation Rate	5.0%
Exchange Rate per US$ (Base Year 1992)	2,050
Number of Nurseries to construct	12

Nursery Establishment (including production cost of seedlings)	Quantity	Unit Cost	Amount	Labor Unskilled	Labor Skilled	Material Nontradabl	Material Tradable	
1. Labor Cost	147	3,000	441,000	441,000				
2. Equipment & Materials								
2-1 Field Preparation								
2-1-1 Land Rent	0.25	600,000	150,000			150,000		
2-1-2 Boundary	0.25	600,000	150,000			150,000		
2-2 Nursery Equipment								
2-2-1 Prenial Crops	10	10,000	0				0	
2-2-2 Fruit Tree Seeds	10,000	20	0			0		
2-2-3 Terrace Strengthening	20,000	5	100,000			100,000		
2-2-4 Organic Fertilizer	1,500	50	0			0		
2-2-5 Non-organic Fertilizer	1,100	250	0				0	
2-2-6 Pesticide	5	16,000	0				0	
2-2-7 Plastic Bags	350	3,000	0				0	
2-2-8 Hand Sprayer, Water Equip.	1	160,000	160,000				160,000	
2-2-9 Guide Board & Small House	1	225,000	225,000			225,000		
2-2-10 Bamboo	200	1,200	240,000			240,000		
Total of 1. & 2.			1,466,000	441,000	0	865,000	160,000	1,466,000

Seedling Production	Quantity	Unit Cost	Amount	Labor Unskilled	Labor Skilled	Material Nontradabl	Material Tradable	
1. Labor Cost	653	3,000	0	0				
2. Equipment & Materials								
2-1 Field Preparation								
2-1-1 Land Rent	0.00	600,000	0			0		
2-1-2 Boundary	0.00	600,000	0			0		
2-2 Nursery Equipment								
2-2-1 Prenial Crops	10	10,000	0				0	
2-2-2 Fruit Tree Seeds	10,000	20	0			0		
2-2-3 Terrace Strengthening	20,000	5	100,000			100,000		
2-2-4 Organic Fertilizer	1,500	50	0			0		
2-2-5 Non-organic Fertilizer	1,100	250	0				0	
2-2-6 Pesticide	5	16,000	0				0	
2-2-7 Plastic Bags	350	3,000	0				0	
2-2-8 Hand Sprayer, Water Equip.	1	0	0				0	
2-2-9 Guide Board & Small House	1	0	0			0		
2-2-10 Bamboo	200	0	0			0		
Total of 1. & 2.			100,000	0	0	100,000	0	100,000

NURSERY:31 (4) Infrastructure Plan

Table 2: Inflation Rates and Indexes, Exchange Rate, and Productivity Indexes

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5
Domestic Inflation Rate	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Domestic Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59
change in Domestic Inflation		0	0	0	0	0
Foreign Inflation	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Foreign Inflation Index	1.05	1.10	1.16	1.22	1.28	1.34
Relative Inflation	1.03	1.06	1.09	1.12	1.15	1.18
Exchange Rate per US$	2,050					
Expected Exchange Rate [Nominal]	2,109	2,169	2,231	2,295	2,360	2,428
Expected Exchange Rate [Real]	2,050	2,050	2,050	2,050	2,050	2,050

Table 3 : Annual Expenditures

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59
Nursery Establishment		20,519,309				
Seedling Production			1,511,654	1,632,587	1,763,194	1,904,249
Total Production		20,519,309	1,511,654	1,632,587	1,763,194	1,904,249

Financial Cost of Environmental Assessment

Table 1: Parameter Table

Item					Nontradable	Tradable
Economic Indicator			Monitoring Cost(Year 1)	685,200,000		
Domestic Inflation Rate	8.0%		1. Hardware	445,200,000		
Foreign Inflation Rate	5.0%		Design	12,000,000		
Interest Rate(Lending)			House Installation	120,000,000		
Interest Rate(Saving)			Auto. Water Level Recorder	180,000,000		
Exchange Rate per US$(Yen)	125		Auto. Rainfall Recorder	120,000,000		
Exchange Rate per US$(Rp)	2,050		Stationary	1,200,000		
(Base Year: End of 1992)			Measuring Apparatus	12,000,000		
			2. Software	240,000,000		
			Rating Curve Preparation	60,000,000		
			Curve Measurement Equip.	180,000,000		
			Water Quality Analysis (DPHA)	(Annual Cost) (Rp)		
Discount Rate		1.	Labor Cost(1-7)	7,056,000		
Total Investment	10.0%	2.	Physical(1-7)	1,008,000		
Farmers' View Point	9.0%	3.	Chemical(Year 1,4,7)	4,716,000		
Freight & Insurance	10.0%		Chemical(Year 2,3,5,6)	4,320,000		
Custom Clearance (% of Domestic Price)		4.	Bacteriology(Yr1,4,7)	240,000		
		5.	Pesticide(Yr 1,4,7)	1,740,000		
		6.	Water Classification(1-7)	960,000		
			Extension Equipment for Water Quality (SBRLKT)	(Yen)		
		1.	Hardware	1,189,600		
			Tester on ph	50,000		
			Tester on electric conduct.	792,000		
			Tester on turbidity & color	234,000		
			Tester on water temperature	3,600		
			Stationary	10,000		
			Measuring apparatus	100,000		
		2.	Software			
			Maintenance(Hardware * 25%)	25.0%		
			Others			
		1.	Data Processing	15,415,300		
		2.	Documentation (Year 1)	40,000,000		
			Documentation (Year 2-7)	10,000,000		

(5) Environmental Care Plan

Table 3 : Monitoring Cost for Environment

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5	1999 6	2000 7
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85
Water & Sediment		799,217,280						
Water Quality (DPMA)		18,335,808	16,809,597	16,154,365	23,097,837	21,175,251	22,869,271	29,096,623
Water Quality (SBRLKT)		22,704,210	6,130,137	6,620,548	7,150,192	7,722,207	8,339,983	9,007,182
Data Processing		17,980,406						
Documentation		46,656,000	12,597,120	13,604,890	14,693,281	15,868,743	17,138,243	18,509,302
Total Cost		904,893,704	35,536,854	38,379,802	44,941,310	44,766,201	48,347,497	56,613,107
		1	2	3	4	5	6	7
Environmental Monitoring (nominal)		904,893,704	35,536,854	38,379,802	44,941,310	44,766,201	48,347,497	56,613,107
Environmental Monitoring (real)		775,800,501	28,210,300	28,210,300	30,586,300	28,210,300	28,210,300	30,586,300
Environmental Monitoring (nominal)		904,893,704	35,536,854	38,379,802	44,941,310	44,766,201	48,347,497	56,613,107
Environmental Monitoring (real)		775,800,501	28,210,300	28,210,300	30,586,300	28,210,300	28,210,300	30,586,300

MANAGEME:30 (6) Management Plan

Financial Cost of Project Management

Table 1: Parameter Table

Item		
Economic Indicator		
Domestic Inflation Rate	8.0%	
Foreign Inflation Rate	5.0%	
Exchange Rate per US$ (Base Year 1992)	2,050	
Working Capital	8.3% of Operating Expense	

Project Management Cost Personnel Cost	Monthly Salary(Rp)	Months	Annual Salary (Rp)	No. of Persons	Annual Total Cost (Rp)
1. Project Office					
a. Project Officer	400,000	13	5,200,000	1	5,200,000
b. Deputy Project Officer	350,000	13	4,550,000	3	13,650,000
c. Section Chief	300,000	13	3,900,000	2	7,800,000
d. Staff	200,000	13	2,600,000	37	95,200,000
Annual Base-Up	5.0%				
2. Consultant	(Remuneration + Direct Cost)				
a. Foreign Consultant	52,000,000	12	624,000,000		
a) Project Manager					
b) Finance & Procurement					
c) Education & Training					
a) Watershed Management					
b. Local Consultant	13,000,000	12	156,000,000		
a) Building					
b) Extension					
c) Seedling/Greening					
d) Dry Farming Improvement					
e) Civil Work					
f) Agricultural Economy					
g) Environment					

Equipment & Facilities	Unit Cost	Quantity	Total Amount
3. Office Construction			
a. Office	320,000	390	124,800,000
b. Electricity	(Office Construction * 10 %)		12,480,000
c. Water Supply	(Office Construction * 10 %)		12,480,000
d. Copy, Telephone	(Office Construction * 10 %)		12,480,000
e. Vehicle	37,000,000	9	333,000,000
4. Office Running Cost			
a. Material	(Office Construction * 1 %)		1,248,000
b. Electri.& Water	(Office Construction * 1 %)		1,248,000
c. Fuel			6,840,000

(6) Management Plan

Table 3 : Assignment plan of Staff at Project Office and Consultants

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5	1999 6	2000 7
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85
1. Project Office (no. of staff)								
a. Project Officer		1	1	1	1	1	1	1
b. Assistant Project Officer		3	3	3	3	3	3	3
c. Section Chief		2	2	2	2	2	2	2
d. Staff		37	37	37	37	37	37	37
2. Consultant (man-months)								
a. Foreign Consultant								
a)Project Manager		8	8	8	8	8	8	8
b)Finance & Procurement		6	6					
c)Education & Training		4	4	3	3	3	3	3
e)Watershed Management		4	2	2	2	2	2	2
b. Local Consultant								
a)Building		8						
b)Extension(assist. to farmer groups)		4	6	6	6	4	2	2
c)Seedling/Greening		4	4	4	4	4	4	4
d)Dry Farming Improvement		4	4	4	4	4	4	4
e)Civil Work		10	10	10	10	10	10	10
f)Agricultural Economy(marketing)		4	4	4	2	2	2	2
g)Environment		4	2	2	2	2	2	2

Table 4 : Annual Expenditures for Office Staff and Cosnsultant

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5	1999 6	2000 7
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85
1. Project Office		128,992,500	135,442,125	142,214,231	149,324,943	156,791,190	164,630,749	172,862,287
a. Project Officer		5,460,000	5,733,000	6,019,650	6,320,633	6,636,664	6,968,497	7,316,922
b. Deputy Project Officer		14,332,500	15,049,125	15,801,581	16,591,660	17,421,243	18,292,305	19,206,921
c. Section Chief		8,190,000	8,599,500	9,029,475	9,480,949	9,954,996	10,452,746	10,975,383
d. Staff		101,010,000	106,060,500	111,363,525	116,931,701	122,778,286	128,917,201	135,363,061
2. Consultant		1,815,135,282	1,696,920,343	1,360,224,055	1,362,704,237	1,399,673,943	1,435,420,871	1,517,682,198
a. Foreign Consultant		1,238,933,682	1,172,880,151	794,260,648	827,868,818	863,310,422	900,707,700	940,191,973
a)Project Manager		450,521,339	469,152,060	488,775,783	509,457,734	531,267,952	554,281,661	578,579,675
b)Finance & Procurement		337,891,004	351,864,045	0	0	0	0	0
c)Education & Training		225,260,669	234,576,030	183,290,919	191,046,650	199,225,482	207,855,623	216,967,378
e)Watershed Management		225,260,669	117,288,015	122,193,946	127,364,433	132,816,988	138,570,415	144,644,919
b. Local Consultant		576,201,600	524,040,192	565,963,407	534,835,420	536,363,521	534,713,172	577,490,226
a)Building		121,305,800	0	0	0	0	0	0
b)Extension		60,652,800	131,010,048	141,490,852	114,607,590	82,517,465	44,559,431	48,124,185
c)Seedling/Greening		60,652,800	65,505,024	70,745,426	76,405,060	82,517,465	89,118,862	96,248,371
d)Dry Farming Improvement		60,652,800	65,505,024	70,745,426	76,405,060	82,517,465	89,118,862	96,248,371
e)Civil Work		151,632,000	163,762,560	176,863,565	191,012,650	206,293,662	222,797,155	240,620,927
f)Agricultural Economy		60,652,800	65,505,024	70,745,426	38,202,530	41,258,732	44,559,431	48,124,185
g)Environment		60,652,800	32,752,512	35,372,713	38,202,530	41,258,732	44,559,431	48,124,185
Total Personnel Cost (1+2)		1,944,127,782	1,832,362,468	1,502,438,286	1,512,029,180	1,556,465,133	1,600,051,621	1,690,544,485

Table 5 : Office Construction and Annual Expenditures for Office Expenses

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5	1999 6	2000 7
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85
3. Office Construction		577,547,936						
a. Office		145,566,720						
b. Electricity		14,556,672						
c. Water Supply		14,556,672						
d. Copy, Telephone		14,556,672						
e. Vehicle		388,411,200						
4. Office Running Cost		22,546,345	12,370,737	13,344,272	14,394,883	15,528,697	16,752,327	18,072,914
a. Material		1,455,667	1,572,121	1,697,890	1,833,721	1,980,419	2,138,853	2,309,961
b. Electri.& Water		1,455,667	1,572,121	1,697,890	1,833,721	1,980,419	2,138,853	2,309,961
c. Fuel		7,978,176	8,616,430	9,305,744	10,050,204	10,854,220	11,722,558	12,660,363
d. Change in Working Capital		11,656,834	610,065	642,747	677,236	713,638	752,054	792,630
Expense at Project Office (3 + 4)		600,194,281	12,370,737	13,344,272	14,394,883	15,528,697	16,752,327	18,072,914
Total of 1,2,3 & 4 (Nominal)		2,544,322,062	1,844,733,205	1,515,782,558	1,526,424,063	1,571,993,830	1,616,803,948	1,708,617,399
Total of 1,2,3 & 4 (Real)		2,181,346,075	1,464,408,694	1,114,145,430	1,038,858,569	990,622,765	943,389,575	923,112,816

(6) Management Plan

Table 6 : Working Capital

Year	1993 0	1994 1	1995 2	1996 3	1997 4	1998 5	1999 6	2000 7
Inflation Index	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85
Operating Expense (Staff Salary + Office Running Cost)		139,882,010	147,202,796	154,915,756	163,042,590	171,606,249	180,631,013	190,142,571
Working Capital		11,656,834	12,266,900	12,909,646	13,586,882	14,300,521	15,052,584	15,845,214
Change in Woking Capital		11,656,834	610,065	642,747	677,236	713,638	752,064	792,630

	1994	1995	1996	1997	1998	1999	2000
1. Project Office (nominal)	128,992,500	135,442,125	142,214,231	149,324,943	156,791,190	164,630,749	172,862,287
2. Consultant	1,815,135,282	1,696,920,343	1,360,224,055	1,362,704,237	1,399,673,943	1,435,420,871	1,517,682,198
a. Foreign Consultant	1,238,933,682	1,172,880,151	794,260,648	827,858,818	863,310,422	900,707,700	940,191,973
b. Local Consultant	576,201,600	524,040,192	565,963,407	534,835,420	536,363,521	534,713,172	577,490,226
3. Office Construction	577,647,936	0	0	0	0	0	0
4. Office Running Cost	22,546,345	12,370,737	13,344,272	14,394,883	15,528,697	16,752,327	18,072,914
Total (1 - 4) (nominal)	2,544,322,062	1,844,733,205	1,515,782,558	1,526,424,063	1,571,993,830	1,616,803,948	1,708,617,399
Total (1 - 4) (real)	2,181,346,075	1,464,408,694	1,114,145,430	1,038,858,569	990,622,765	843,389,575	923,112,816

	1994	1995	1996	1997	1998	1999	2000
1. Project Office (real)	110,590,278	107,518,326	104,531,705	101,628,047	98,805,046	96,060,461	93,392,115
2. Consultant	1,556,185,941	1,347,070,079	999,805,287	927,433,607	882,032,006	837,554,292	819,956,468
a. Foreign Consultant	1,062,185,941	931,070,079	583,805,287	563,433,607	544,032,006	525,554,292	507,956,468
b. Local Consultant	494,000,000	416,000,000	416,000,000	364,000,000	338,000,000	312,000,000	312,000,000
3. Office Construction	495,240,000	0	0	0	0	0	0
4. Office Running Cost	19,329,856	9,820,290	9,808,438	9,796,916	9,785,713	9,774,822	9,764,233
Total (1 - 4) (nominal)							
Total (1 - 4) (real)							
1. Project Office (real)	110,590,278	107,518,326	104,531,705	101,628,047	98,805,046	96,060,461	93,392,115
2. Consultant	1,556,185,941	1,347,070,079	999,805,287	927,433,607	882,032,006	837,554,292	819,956,468
a. Foreign Consultant	1,062,185,941	931,070,079	583,805,287	563,433,607	544,032,006	525,554,292	507,956,468
b. Local Consultant	494,000,000	416,000,000	416,000,000	364,000,000	338,000,000	312,000,000	312,000,000
3. Office Construction	495,240,000	0	0	0	0	0	0
4. Office Running Cost	19,329,856	9,820,290	9,808,438	9,796,916	9,785,713	9,774,822	9,764,233

COST_A:15 2. Total Project Cost (Exclusing Physical Contingency)

(1) Price Escalation

Table 5

Farm/Forest Land Conservation Plan	49,986,635,257		59.5%
Terracing	5,046,401,786	6.0%	
Bench Terrace			
Bike Terrace			
Forest Development	11,410,617,476	13.6%	
Forest 1			
Forest 2			
Forest 3			
Introduction of Agroforestry	11,408,585,703	13.6%	
Agroforestry 1			
Agroforestry 2			
Improvement of Dry Farming	21,058,870,824	25.1%	
Dry Farming 1			
Dry Farming 2			
Conservation of Settlement Environme	1,052,159,468	1.3%	
Absorbing Well			
Trees			
Ikegaki			
Torrent Conservation Plan	7,859,806,190		9.4%
Check Dam	3,562,890,248	4.2%	
Small Check Dam	1,018,029,137	1.2%	
Gully Plug	1,632,832,255	1.9%	
Revetment Work	1,047,845,466	1.2%	
Riverside Line Planting	284,134,127	0.3%	
Riverside Revegetation	314,074,957	0.4%	
Extension Plan	6,467,941,451		7.7%
Demonstration Plot			
(1st year)	149,878,010	0.2%	
(2nd year)	132,185,631	0.2%	
(3rd year)	113,019,890	0.1%	
Training Center	1,030,701,024	1.2%	
Education and Training	4,328,393,301	5.2%	
Extension/Guidance	0	0.0%	
Vehicles	95,460,509	0.1%	
Infastructure Plan	6,181,822,495		7.4%
Access Road	6,154,491,413	7.3%	
New Road Construction			
Improvement of Road			
Gravel-Gravel			
Earth-Gravel			
Slope Protection			
Regreening of Slope			
Drain			
Drop Structure			
Roadside Planting			
Nursery	27,330,993	0.0%	
Environmental Assessment	1,173,478,473		1.397%
Management Plan	12,328,677,065		14.7%
Administration	1,059,258,025	1.3%	
Project Office Construction			
Project Office Running Cost			
Project Office Personnel			
Consultant	113,010,174	0.1%	
	83,998,360,843	100.0%	100.0%

COST_B:16

(2) Base Cost

Table 5

Farm/Forest Land Conservation Plan	35,793,622,000		59.8%
Terracing	3,598,560,000	6.0%	
Bench Terrace			
Dike Terrace			
Forest Development	8,188,676,000	13.7%	
Forest 1			
Forest 2			
Forest 3			
Introduction of Agroforestry	8,187,762,000	13.7%	
Agroforestry 1			
Agroforestry 2			
Improvement of Dry Farming	15,063,528,000	25.2%	
Dry Farming 1			
Dry Farming 2			
Conservation of Settlement Environme	755,096,000	1.3%	
Absorbing Well			
Trees			
Ikegaki			
Torrent Conservation Plan	5,292,170,000		8.8%
Check Dam	2,352,000,000	3.9%	
Small Check Dam	676,930,000	1.1%	
Gully Plug	1,081,600,000	1.8%	
Revetment Work	752,000,000	1.3%	
Riverside Line Planting	204,240,000	0.3%	
Riverside Revegetation	225,400,000	0.4%	
Extension Plan	4,709,260,445		7.9%
Demonstration Plot			
(1st year)	100,233,400	0.2%	
(2nd year)	85,384,700	0.1%	
(3rd year)	70,507,000	0.1%	
Training Center	883,660,000	1.5%	
Education and Training	2,903,203,345	4.9%	
Extension/Guidance	0	0.0%	
Vehicles	81,842,000	0.1%	
Inftastructure Plan	4,441,393,415		7.4%
Access Road	4,419,091,415	7.4%	
New Road Construction			
Improvement of Road			
Gravel-Gravel			
Earth-Gravel			
Slope Protection			
Regreening of Slope			
Drain			
Drop Structure			
Roadside Planting			
Nursery	22,302,000	0.0%	
Environmental Assessment	949,814,301		1.587%
Management Plan	8,655,883,925		14.5%
Administration	712,525,978	1.2%	
Project Office Construction			
Project Office Running Cost			
Project Office Personnel			
Consultant	78,080,268	0.1%	
	59,842,144,086	100.0%	100.0%

COST_C:17

(3) Government Contribution

Table 5

Farm/Forest Land Conservation Plan	21,673,714,000		47.4%
Terracing	3,598,560,000	7.9%	
Bench Terrace			
Dike Terrace			
Forest Development	4,617,788,000	10.1%	
Forest 1			
Forest 2			
Forest 3			
Introduction of Agroforestry	4,978,542,000	10.9%	
Agroforestry 1			
Agroforestry 2			
Improvement of Dry Farming	7,723,728,000	16.9%	
Dry Farming 1			
Dry Farming 2			
Conservation of Settlement Environme	755,096,000	1.7%	
Absorbing Well			
Trees			
Ikegaki			
Torrent Conservation Plan	5,292,170,000		11.6%
Check Dam	2,352,000,000	5.1%	
Small Check Dam	676,930,000	1.5%	
Gully Plug	1,081,600,000	2.4%	
Revetment Work	752,000,000	1.6%	
Riverside Line Planting	204,240,000	0.4%	
Riverside Revegetation	225,400,000	0.5%	
Extension Plan	4,709,260,445		10.3%
Demonstration Plot			
(1st year)	100,233,400	0.2%	
(2nd year)	85,384,700	0.2%	
(3rd year)	70,507,000	0.2%	
Training Center	883,660,000	1.9%	
Education and Training	2,903,203,345	6.3%	
Extension/Guidance	0	0.0%	
Vehicles	81,842,000	0.2%	
Inftastructure Plan	4,441,393,415		9.7%
Access Road	4,419,001,415	9.7%	
New Road Construction			
Improvement of Road			
Gravel-Gravel			
Earth-Gravel			
Slope Protection			
Regreening of Slope			
Drain			
Drop Structure			
Roadside Planting			
Nursery	22,392,000	0.0%	
Environmental Assessment	949,814,301		2.077%
Management Plan	8,655,883,925		18.9%
Administration	712,525,978	1.6%	
Project Office Construction			
Project Office Running Cost			
Project Office Personnel			
Consultant	78,080,268	0.2%	
	45,722,235,055	100.0%	100.0%

D1 Forecast of Post-Project Yields

In the case of some of the existing demonstration plots and conservation projects, monitoring of the changes in crop yield after the construction of terraces has been conducted. In many cases, the yield actually increased after project implementation, indicating the positive effect of terraces on crop yield. The actual increase following the completion of terraces varies depending on the project contents, subject areas and year of implementation due to several reasons, notably (i) the construction of terraces is often followed by the introduction of improved varieties and technical improvement in terms of fertilizer use and the prevention of damage caused by disease and harmful insects, (ii) the yield is affected by the weather conditions each year and (iii) a project can be implemented in a piece-meal fashion over many years due to budgetary and other constraints. Thus, the yield tends to decline after the project period as there is less incentive for farmers.

For the purposes of the present study, the average yield was estimated for each crop before and after the construction of terraces based on the findings of the interviews at the 3 BPPs in the Study Area while taking into consideration the relevant performance of the Wonogiri soil and water conservation project, the subject area of which is very similar to that of the present Project, and that of the Simalungun soil and water conservation project in Sumatera. The average yield increase of the 5 principal crops in the Study Area is 15% as shown in Table C2-1 although the actual increase rate varies from one crop to another.

Furthermore, yearly changes of the crop yield after the completion of the Project were forecast based on an assumed maximum yield increase by terracing of 10% and a yield increase by fertilizer use of 5% based on the findings of the interview at the Bandung District Agricultural Service. As shown in Fig. D1-1, the crop yield will gradually to start to increase in the second year after project completion, reaching the maximum level in the seventh year.

Table D1-2 shows the forecast of the fruit bearing age and yield of fruit trees based on the findings of the interview at the Bandung District Agricultural Service.

Table D1-1 Yield Forecast Before and After Construction of Terraces

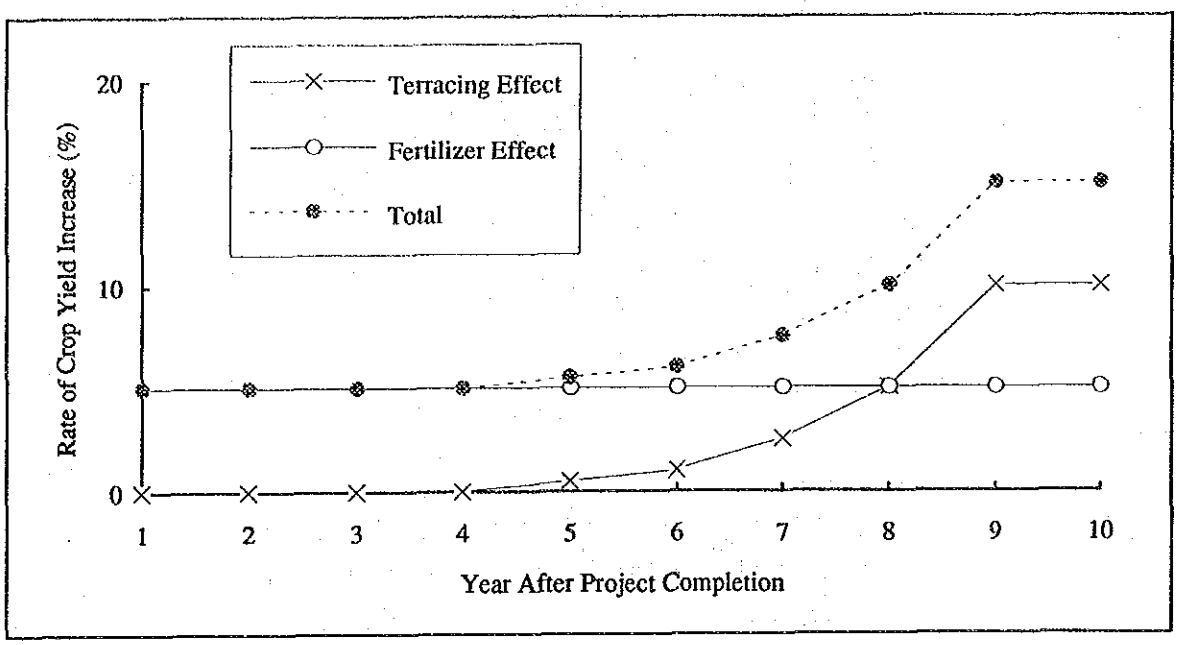
Principal Crop	Yield (tons/ha)		Rate of Increase
	Before	After	(%)
Upland Rice	2.6	3.1	19.2
Maize	2.9	3.4	17.2
Red Beans	1.9	2.2	15.8
Groundnuts	1.3	1.5	15.4
Soybeans	1.3	1.4	7.7
Average			15.1

Sources
1) Institutional Strengthening For Evaluation and Effectiveness of Upper Solo (Wonogiri) Watershed Protection Project, Project Planning and Implementation Unit, 1992
2) Feasibility Study for Soil and Water Conservation Project for Upper Simalungun Watershed, Volume 1 Main Report, Watershed Management Consultants Korea and Indonesia, 1988

Table D1-2 Fruit Bearing Age and Yield Forecast

(Unit: yield (%))

Year After Project Completion	1	2	3	4	5	6	7	8	9	10 - 25
Jack Fruit	0	0	40	60	80	100	100	100	100	100
Avocado	0	0	0	0	0	40	60	80	100	100



Rate of Crop Yield Increase (%)										
Year After Project Completion	1	2	3	4	5	6	7	8	9	10 ~
Terracing Effect	0	0	0	0	0.5	1	2.5	5	10	10
Fertilizer Effect	5	5	5	5	5	5	5	5	5	5
Total	5	5	5	5	5.5	6	7.5	10	15	15

Fig. D1-1 Forecast of Yearly Crop Yield After Project Completion