Appendix-5

Result of Suspended Sediment and Soil Loss Computation for Micro River Basins

Table-A5.1 Result of Suspended Sediment Measurement in Micro River Basins (Paz, Iguaçu) (1/2)

Name of Main River Basin	Iguacu		Location	City	Latitude	longitude
Micro-River Basin	Paz			Saudades	25°38'	52°36'

Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Fallow (ha)	Total Area (ha)
	238	490	42	75	880

Implementation of Soil Conservation	Terracing (ha)	Main Crop	Maize, Beans
	0		

Suspended Sediment Measurement	Date	Discharge (liter/s)	Concentration (g/liter)	Sediment (kg/day)
	27/02/95	189.5	26.67	436.66
	28/02/95	135.3	143.33	1675.27
	02/03/95	95.3	33.34	274.52
	03/03/95	57.2	16.00	79.07
	04/03/95	1128.4	61.33	5979.29
	05/03/95	447.8	8.67	335.44
	06/03/95	280.9	18.67	453.12
	07/03/95	243.9	21.00	442.53
	08/03/95	246.1	7.33	155.86
	09/03/95	266.0	9.33	214.43

Slope Steepness

Slope (%)	Area (ha)
0-15	44
15-30	440
30-45	396
Total	880

Soil Classification

Soil type	Area (ha)
TRe	176
Ca	440
Li	264
Total	880

Particle Size Analysis

River Bed Material

Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Left	Center	Average
4.000	99.69	73.20	86.45
2.830	99.64	72.27	85.96
2.000	99.53	71.18	85.36
1.410	99.34	70.19	84.77
1.000	98.59	68.20	83.40
0.707	96.24	62.99	79.62
0.500	92.39	54.92	73.66
0.354	88.02	48.07	68.05
0.250	85.50	45.18	65.34
0.177	84.34	43.71	64.03
0.125	82.88	41.53	62.21
0.088	82.26	40.05	61.16
0.062	81.92	38.61	60.27

Suspended Sediment

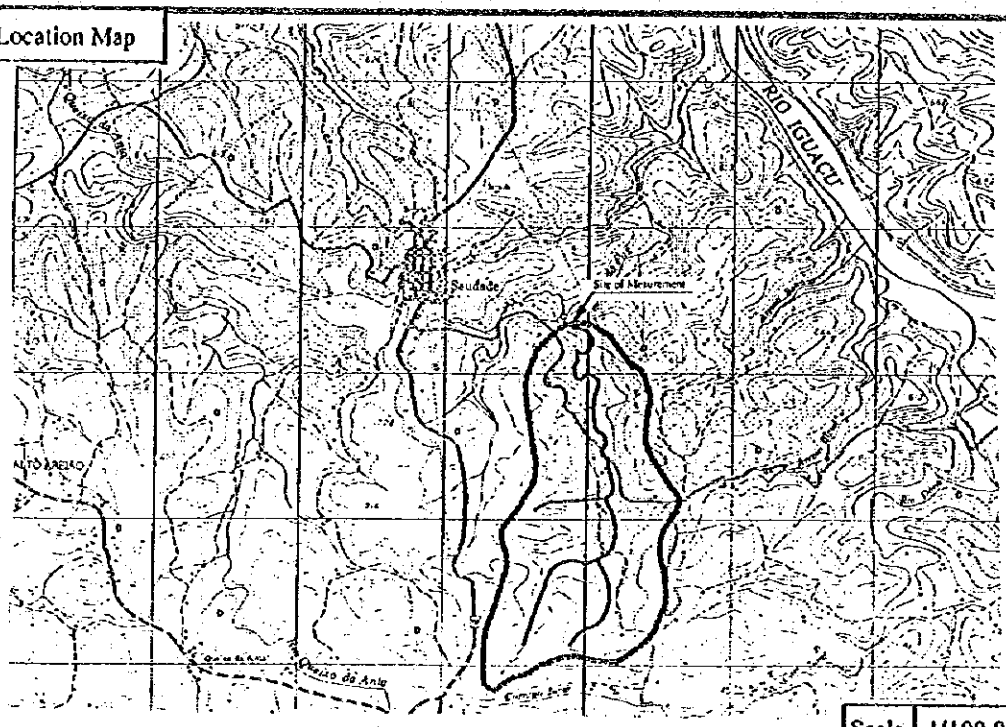
Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Sample 1	Sample 2	Average
0.0625	99.5	99.5	99.5
0.0442	98.5	99.0	98.8
0.0312	97.0	98.0	97.5
0.0221	93.0	95.5	94.3
0.0156	85.0	89.5	87.3
0.0110	78.0	85.5	81.8
0.0078	72.5	84.0	78.3
0.0055	67.0	73.0	70.0
0.0039	56.0	66.0	61.0

Abbreviation
TRe: Terra Roxo Estruturada Eutrofica
Ca: Cambissolo
Li: Solos Litolicos

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

Table-A5.1 Result of Suspended Sediment Measurement in Micro River Basins (Paz, Iguaçu) (2/2)

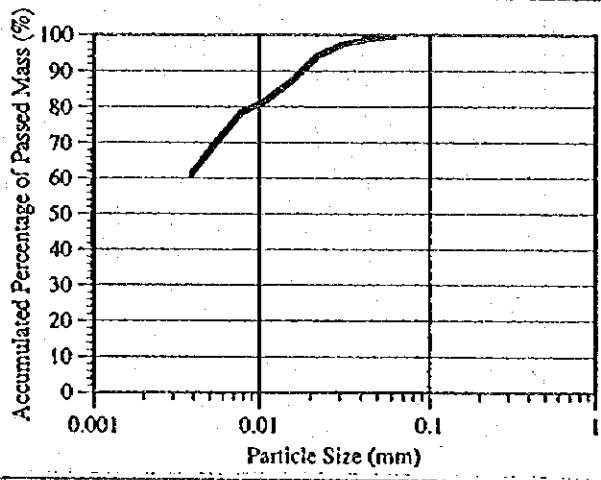
Location Map



Scale 1/100,000

Particle Size Distribution

Suspended Sediment



River Bed Material

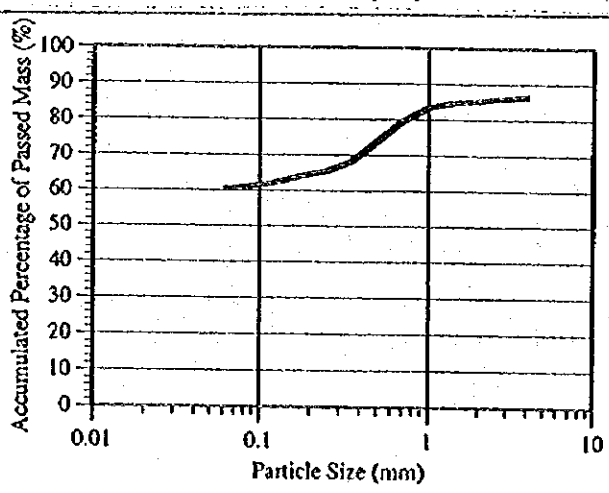


Table-A5.2 Result of Suspended Sediment Measurement in Micro River Basins (Areiao, Iguaçu) (1/2)

Name of Main River Basin	Iguacu			Location	City	Latitude	longitude
Micro-River Basin	Areiao				Sulina	25°40'	52°40'

Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Others (ha)	Total Area (ha)	
	873	300	84	168	1425	
Implementation of Soil Conservation	Terracing (ha)	Buffer Strips (ha)	Organic Manuring (ha)	Green Manuring (ha)	Main Crop	Maize, Soybean, Beans, Rice, Cassava
	215	96	55	20		

Suspended Sediment Measurement	Date	Discharge (liter/s)	Concentration (mg/liter)	Sediment (kg/day)
	27/02/95	345.92	16.67	498.22
	28/02/95	343.17	38.67	1146.56
	02/03/95	233.79	12.00	242.39
	03/03/95	139.52	5.67	68.35
	04/03/95	479.77	137.42	5696.35
	05/03/95	256.33	1.00	22.15
	06/03/95	277.20	16.44	393.74
	07/03/95	346.12	8.33	249.11
	08/03/95	301.67	3.67	95.66
	09/03/95	313.77	10.00	271.10

Slope Steepness

Slope (%)	Area (ha)
0-15	481
15-30	568
30-45	225
>45	151
Total	1425

Soil Classification

Soil type	Area (ha)
TRe	463
Ca	519
Li	301
Others	142
Total	1425

Particle Size Analysis

River Bed Material

Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Left	Center	Right	Average
4.000	68.74	57.16	48.55	58.15
2.830	64.04	53.39	41.16	52.86
2.000	58.12	48.15	33.68	46.64
1.410	51.39	42.46	26.68	40.18
1.000	42.77	34.87	19.87	32.50
0.707	30.38	26.96	12.46	23.27
0.500	20.29	21.70	8.45	16.81
0.354	14.13	18.04	6.11	12.76
0.250	11.94	16.26	5.14	11.11
0.177	10.93	15.38	4.63	10.31
0.125	9.77	14.38	4.18	9.44
0.088	9.23	14.04	4.05	9.11
0.062	8.73	13.86	3.98	8.86

Suspended Sediment

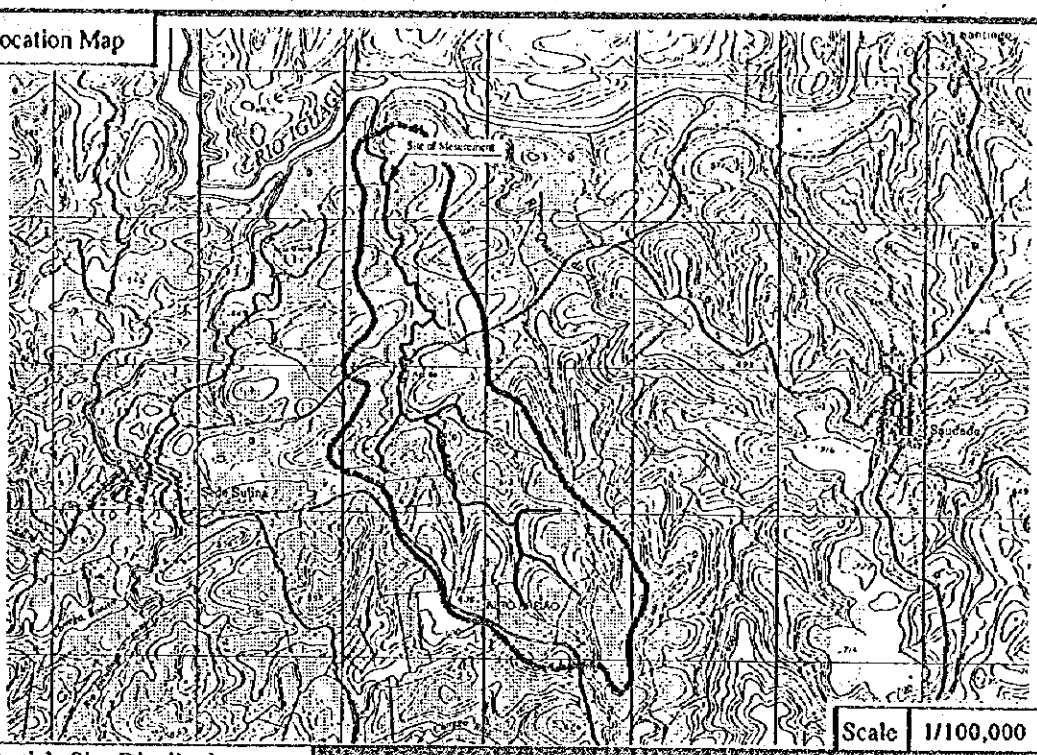
Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Sample 1
0.0625	95.0
0.0442	88.5
0.0312	85.0
0.0221	81.0
0.0156	76.0
0.0110	64.5
0.0078	50.0
0.0055	24.3
0.0039	1.0

Abbreviation
TRe: Terra Roxo Estruturada Eutrofica
Ca: Cambissolo
Li: Solos Litolicos

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

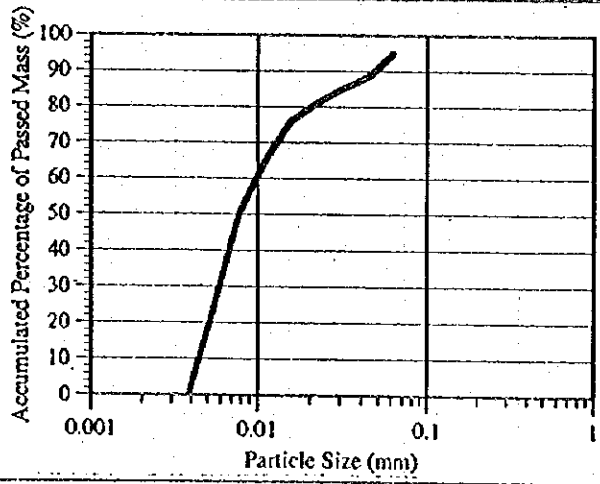
Table-A5.2 Result of Suspended Sediment Measurement in Micro River Basins (Areiao, Iguaçu) (2/2)

Location Map



Particle Size Distribution

Suspended Sediment



River Bed Material

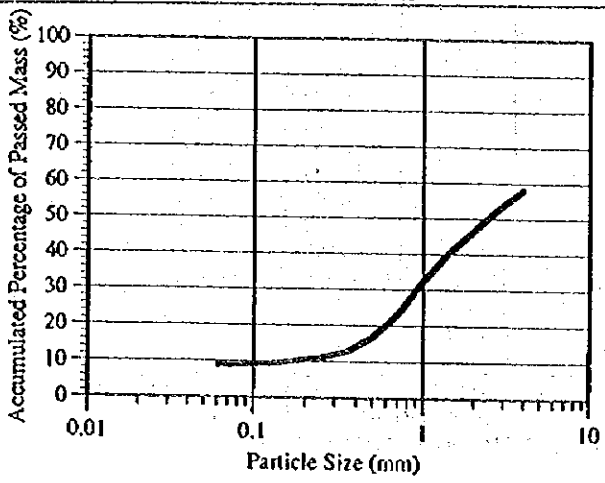


Table-A5.3 Result of Suspended Sediment Measurement in Micro River Basins (Cachoeirinha, Iguaçu) (1/2)

Name of Main River Basin	Iguacu			Location	City	Latitude	longitude
Micro-River Basin	Cachoeirinha				Mageirinha	26°00'	52°20'

Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Fallow (ha)	Total Area (ha)
	135	–	945	270	1350

Implementation of Soil Conservation Measures	Terracing (ha)
	–

Suspended Sediment Measurement	Date	Discharge (liter/s)	Concentration (mg/liter)	Sediment (kg/day)
	28/02/95	118.90	118.33	1215.60
	02/03/95	83.55	2.00	14.44
	03/03/95	73.23	4.33	27.40
	04/03/95	39.90	14.00	48.26
	05/03/95	85.00	8.33	61.18
	06/03/95	86.71	47.67	357.13
	07/03/95	83.42	12.67	91.32
	08/03/95	67.28	5.00	29.06
	09/03/95	24.12	5.33	11.11
	10/03/95	31.20	4.67	12.59

Slope Steepness

Slope (%)	Area (ha)
0-30	1350
Total	1350

Soil Classification

Soil type	Area (ha)
LRd	1350
Total	1350

Particle Size Analysis

River Bed Material

Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Left	Center	Average
4.000	Since the bed is rock, it was not able to collect samples.		
2.830			
2.000			
1.410			
1.000			
0.707			
0.500			
0.354			
0.250			
0.177			
0.125			
0.088			
0.062			

Suspended Sediment

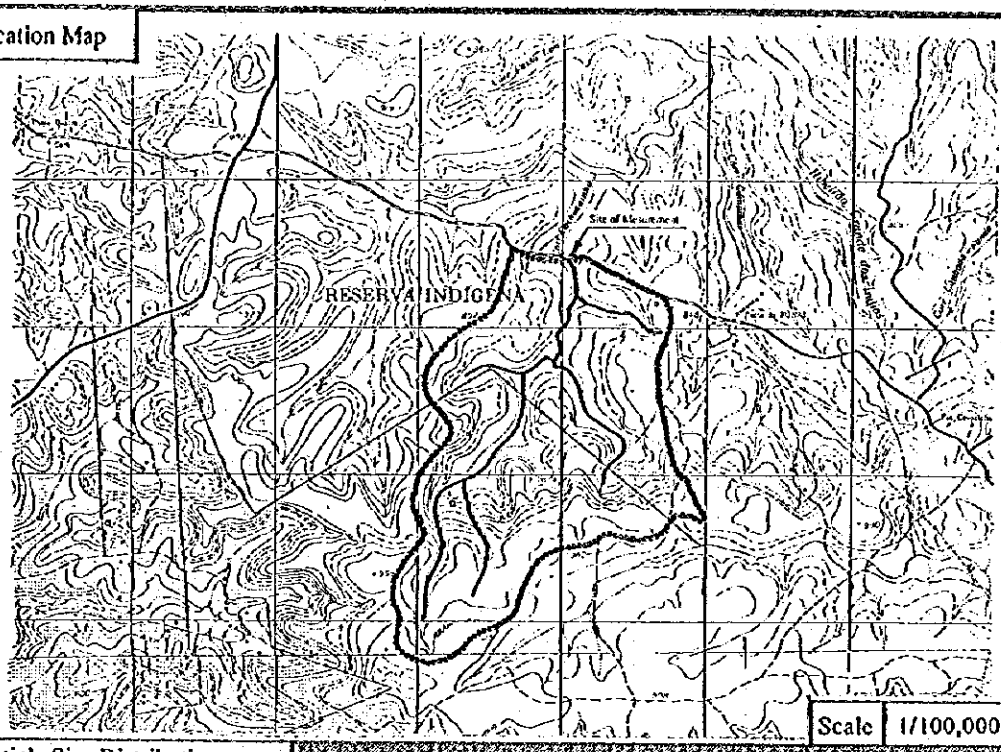
Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Left	Center	Average
0.0625	Amount of sediment is too small for the particle size analysis.		
0.0442			
0.0312			
0.0221			
0.0156			
0.0110			
0.0078			
0.0055			
0.0039			

Abbreviation LRd: Latossolo Roxo Distrofico

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

Table-A5.3 Result of Suspended Sediment Measurement in Micro River Basins (Cachoeirinha, Iguaçu)
(2/2)

Location Map



Particle Size Distribution

Suspended Sediment

River Bed Material

Table-A5.4 Result of Suspended Sediment Measurement in Micro River Basins (Tibagi Main River) (1/2)

Name of Main River Basin		Tibagi		Location	City	Latitude	longitude
Name of Micro-River Basin		–			Jataizinho	23°15'	51°00'
Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Others (ha)	Total Area (ha)		
	–	–	–	–	2,195,500		
Implementation of Soil Conservation	Terracing (ha)						
	–						
Suspended Sediment Measurement	Date	Discharge (m^3/s)	Concentration (mg/liter)	Sediment (t/day)			
	13/02/95	945	84.67	6913			
	16/02/95	810	47.78	3344			
	17/02/95	745	69.11	4448			
	18/02/95	750	41.95	2718			
	19/02/95	800	83.06	5741			
	20/02/95	740	52.78	3375			
	21/02/95	665	100.83	5793			
	22/02/95	640	153.06	8464			
	23/02/95	620	216.78	11612			
	24/02/95	590	28.56	1456			
	13/05/95	240	19.88	412			
	14/05/95	230	17.80	354			
	15/05/95	226	20.12	393			
	16/05/95	220	15.84	301			
	17/05/95	220	21.38	406			

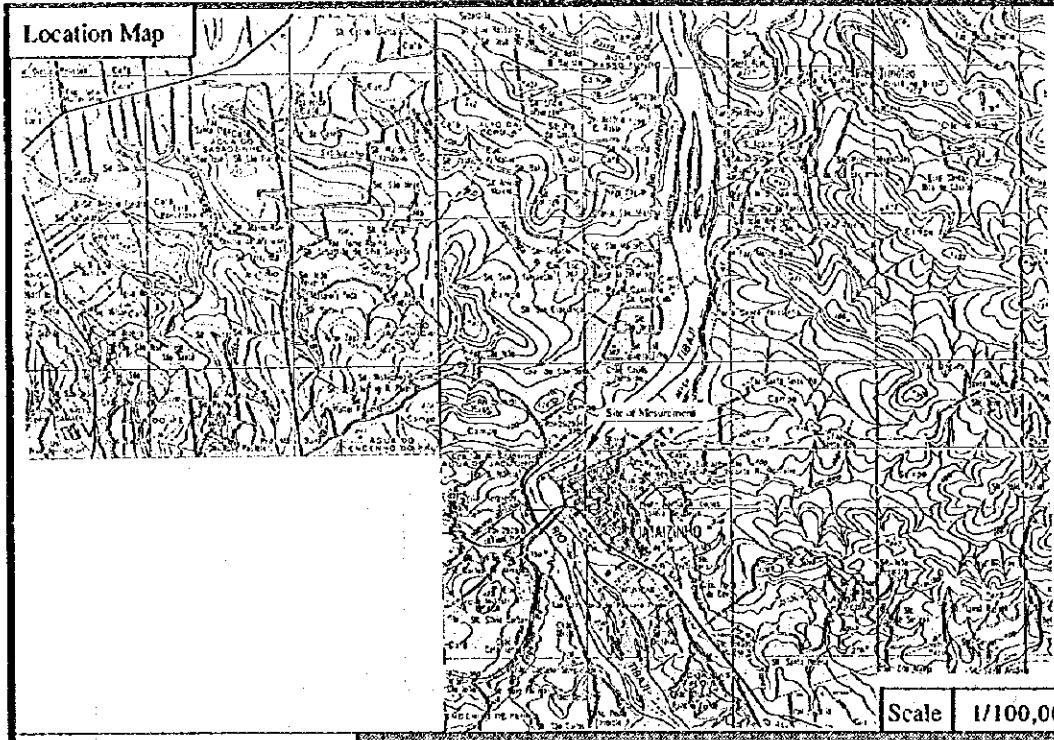
Particle Size Analysis	River Bed Material		Accumulated Percentage of Passed Mass(%)		
		Particle Size (mm)	Center1	Center2	Average
		4.000	100.00	100.00	100.00
		2.830	100.00	100.00	100.00
		2.000	100.00	100.00	100.00
		1.410	99.35	99.94	99.65
		1.000	99.22	99.71	99.47
		0.707	98.49	98.28	98.39
		0.500	92.84	92.74	92.79
		0.354	62.81	69.70	66.26
		0.250	34.79	49.43	42.11
		0.177	22.92	34.74	28.83
		0.125	14.20	5.71	9.96
		0.088	12.01	1.24	6.63
		0.062	11.55	0.15	5.85

	Suspended Sediment		Accumulated Percentage of Passed Mass(%)			
		Particle Size (mm)	Left	Center	Right	Average
		0.0625	99.0	93.0	96.5	97.8
		0.0442	97.0	94.5	94.0	95.2
		0.0312	94.5	89.0	90.0	91.2
		0.0221	90.0	81.0	85.0	85.3
		0.0156	86.5	69.0	75.5	77.0
		0.0110	82.5	63.5	58.5	68.2
		0.0078	80.0	62.0	56.0	66.0
		0.0055	56.5	51.0	25.5	44.3
		0.0039	11.5	21.0	8.0	13.5

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.

Table-A5.4 Result of Suspended Sediment Measurement in Micro River Basins (Tibagi Main River)
(2/2)

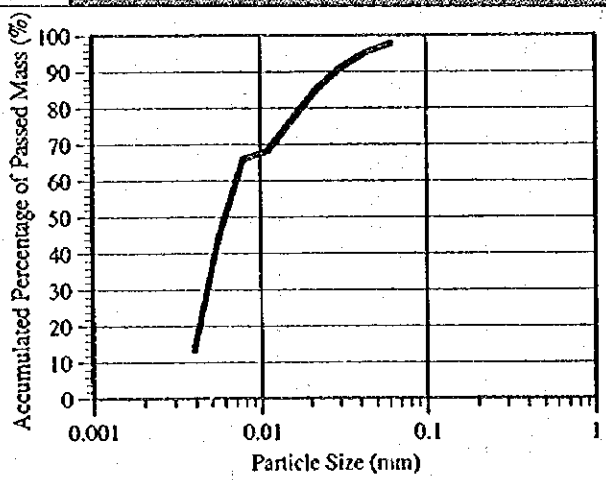
Location Map



Scale 1/100,000

Particle Size Distribution

Suspended Sediment



River Bed Material

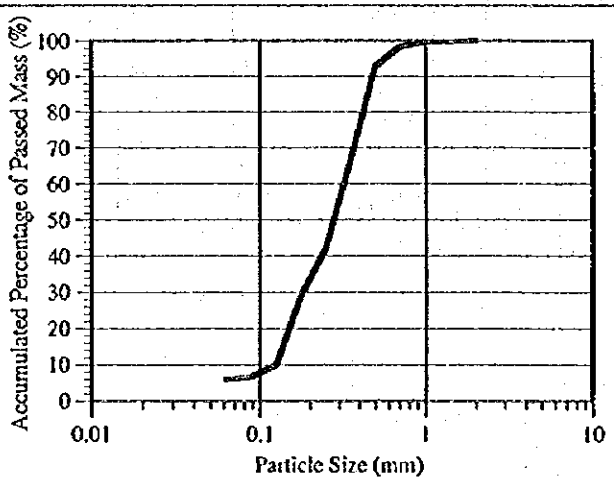


Table-A5.5 Result of Suspended Sediment Measurement in Micro River Basins (Limoeiro, Tibagi)
(1/2)

Name of Main River Basin	Tibagi			Location	City	Latitude	longitude
Name of Micro-River Basin	Limoeiro				Assai	23°30'	51°55'

Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Others (ha)	Total Area (ha)
	905	48	150	0	1103

Implementation of Soil Conservation	Terracing (ha)	Main Crop	Soybean, Maize, Cotton
	0		

Suspended Sediment Measurement

Date	Discharge (liter/s)	Concentration (mg/liter)	Sediment (kg/day)
14/02/95	112.90	24.75	241.43
15/02/95	128.00	11.98	132.49
17/02/95	49.00	56.98	241.23
18/02/95	77.30	16.67	111.33
19/02/95	111.28	63.39	609.47
20/02/95	84.54	40.04	292.46
21/02/95	67.00	19.86	114.97
22/02/95	70.13	17.71	107.31
23/02/95	87.89	14.93	113.37
24/02/95	62.90	6.61	35.92
13/05/95	44.19	3.75	14.32
14/05/95	42.55	1.26	4.63
15/05/95	48.67	1.19	5.00
16/05/95	36.77	3.01	9.56
17/05/95	47.97	2.68	11.11

Slope Steepness

Slope (%)	Area (ha)
0-3	200
3-8	310
8-13	403
13-30	190
Total	1103

Soil Classification

Soil type	Area (ha)
LRe	554
TRe	326
B	111
Re	112
Total	1103

Particle Size Analysis

River Bed Material

Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Center	Right	Average
4.000	97.30	98.09	97.70
2.830	93.21	93.95	93.58
2.000	86.86	90.32	88.59
1.410	81.49	87.35	84.42
1.000	78.31	85.11	81.71
0.707	75.75	82.18	78.97
0.500	74.29	80.35	77.32
0.354	72.65	78.19	75.42
0.250	70.97	76.06	73.52
0.177	68.71	73.86	71.29
0.125	64.80	69.61	67.21
0.088	63.89	67.74	65.82
0.062	63.56	66.64	65.10

Suspended Sediment

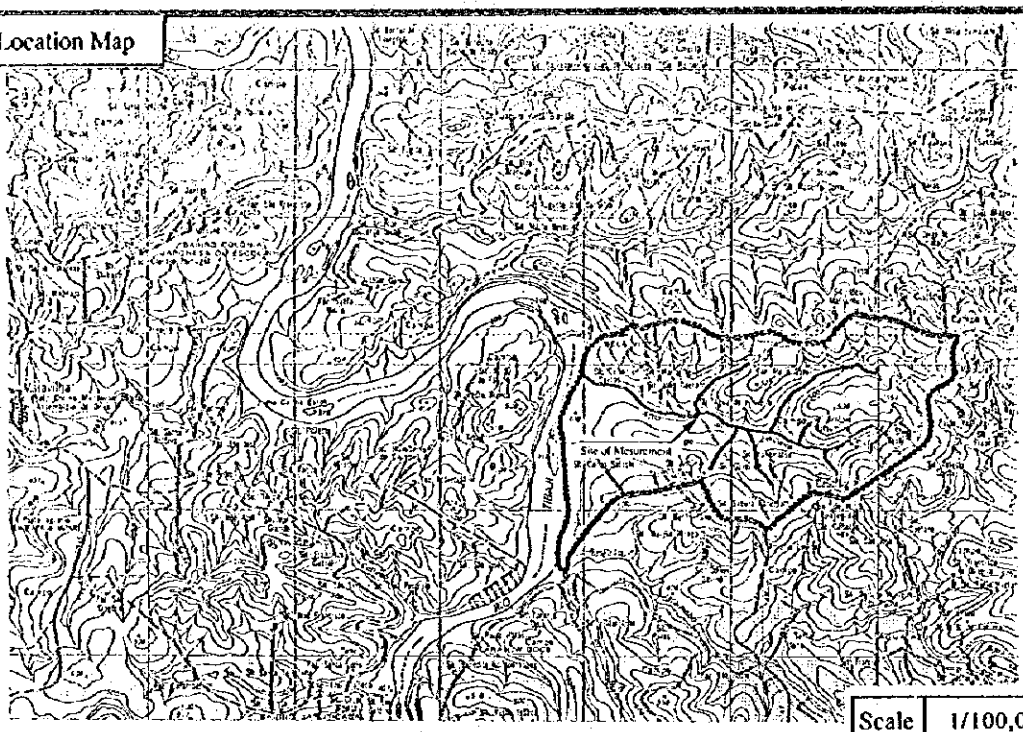
Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Sample 1
0.0625	93.0
0.0442	90.0
0.0312	85.0
0.0221	78.5
0.0156	70.0
0.0110	63.0
0.0078	57.5
0.0055	52.5
0.0039	45.5

Abbreviation
LRe: Latossolo Roxo Eutrofico
TRe: Terra Roxo Estruturada Eutrofica
B: Brunizem Avermelhado
Re: Solos Litolicos Eutroficos

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

Table-A5.5 Result of Suspended Sediment Measurement in Micro River Basins (Limoeiro, Tibagi)
(2/2)

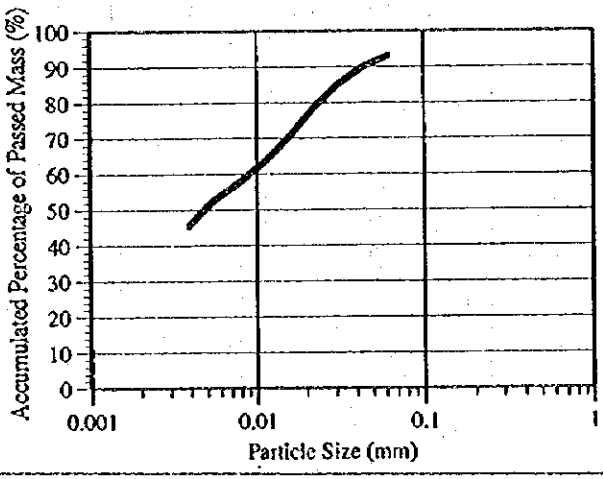
Location Map



Scale 1/100,000

Particle Size Distribution

Suspended Sediment



River Bed Material

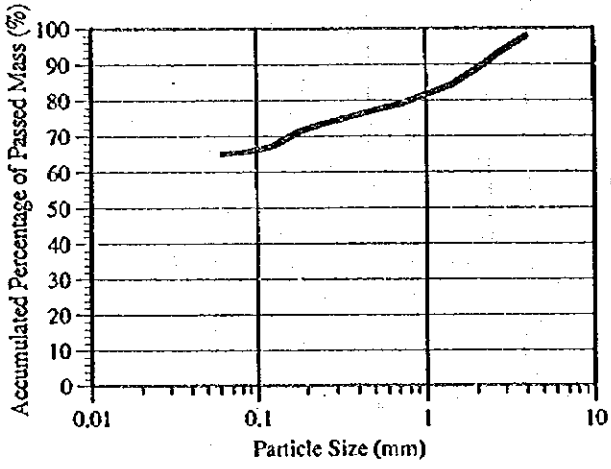


Table-A5.6 Result of Suspended Sediment Measurement in Micro River Basins (Uru, Tibagi) (1/2)

Name of Main River Basin	Tibagi			Location	City	Latitude	longitude
Micro-River Basin	Uru				Congoinhas	23°12'	50°44'

Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Others (ha)	Total Area (ha)
	587	321	0	0	908

Implementation of Soil Conservation Measures	Terracing (ha)	Main Crop	Soybean - wheat, Maize
	510		

Suspended Sediment Measurement	Date	Discharge (liter/s)	Concentration (mg/liter)	Sediment (kg/day)
	15/02/95	94.78	0.45	3.69
	17/02/95	580.70	404.13	20276.20
	18/02/95	38.60	55.71	185.80
	19/02/95	104.55	3.21	29.00
	20/02/95	69.43	3.62	21.72
	21/02/95	54.76	19.31	91.36
	22/02/95	61.10	7.29	38.48
	23/02/95	26.12	44.34	100.07
	24/02/95	18.50	4.71	7.53
	25/02/95	40.70	7.26	25.53
	13/05/95	43.39	10.26	38.46
	14/05/95	43.08	18.40	68.49
	15/05/95	57.67	10.00	49.83
	16/05/95	42.06	17.28	62.80
	17/05/95	41.41	9.64	34.49

Slope Steepness

Slope (%)	Area (ha)
0-8	142
8-13	434
13-30	186
>30	146
Total	908

Soil Classification

Soil type	Area (ha)
LRe	271
TRe	314
C	150
Re	173
Total	908

Particle Size Analysis

River Bed Material

Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Center	Right	Average
4.000	62.85	73.12	67.99
2.830	47.15	69.08	58.12
2.000	28.12	62.80	45.46
1.410	16.85	55.44	36.15
1.000	10.25	42.52	26.39
0.707	7.65	28.86	18.26
0.500	6.35	18.70	12.53
0.354	5.49	13.05	9.27
0.250	5.03	10.50	7.77
0.177	4.80	9.32	7.06
0.125	4.48	7.94	6.21
0.088	4.40	7.65	6.03
0.062	4.38	7.57	5.98

Suspended Sediment

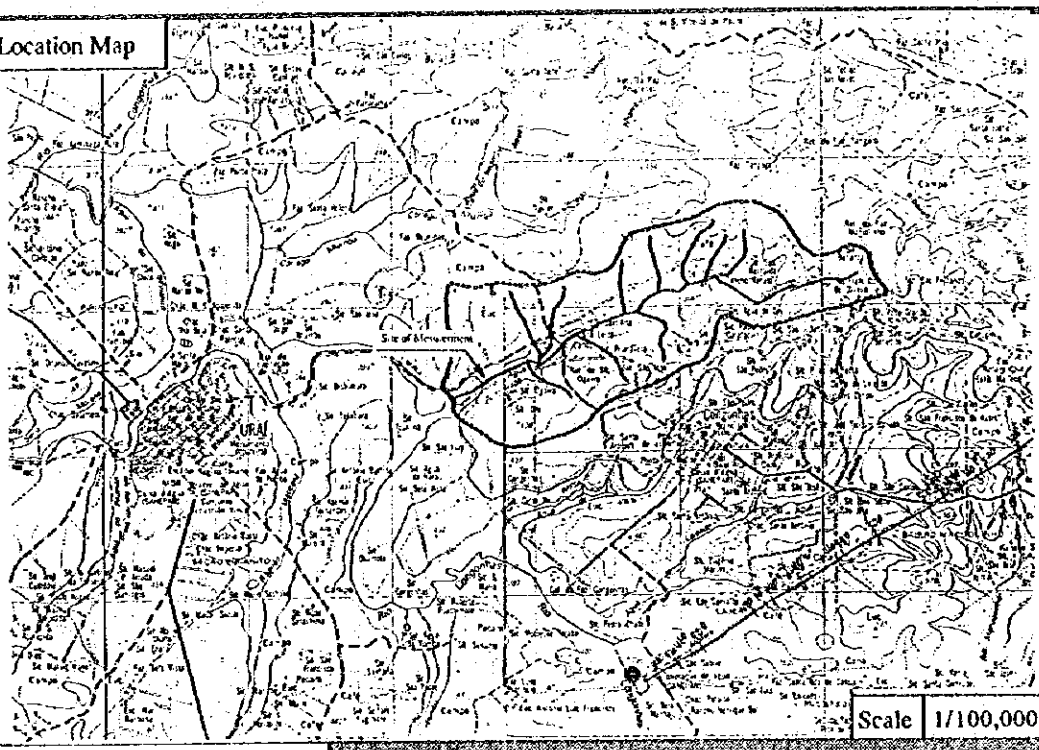
Particle Size (mm)	Accumulated Percentage of Passed Mass(%) Sample 1	Sample 2	Average
0.0625	99.5	99.5	99.5
0.0442	99.0	99.0	99.0
0.0312	97.5	97.5	97.5
0.0221	96.0	91.5	93.8
0.0156	91.5	81.0	86.3
0.0110	79.5	63.5	71.5
0.0078	71.0	47.0	59.0
0.0055	64.0	38.0	51.0
0.0039	57.5	32.0	44.8

Abbreviation
LRe: Latossolo Roxo Eutrofico
TRe: Terra Roxo Estruturada Eutrofica
C: Cambissolo
Re: Solos Litolicos Eutroficos

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

Table-A5.6 Result of Suspended Sediment Measurement in Micro River Basins (Uru, Tibagi) (2/2)

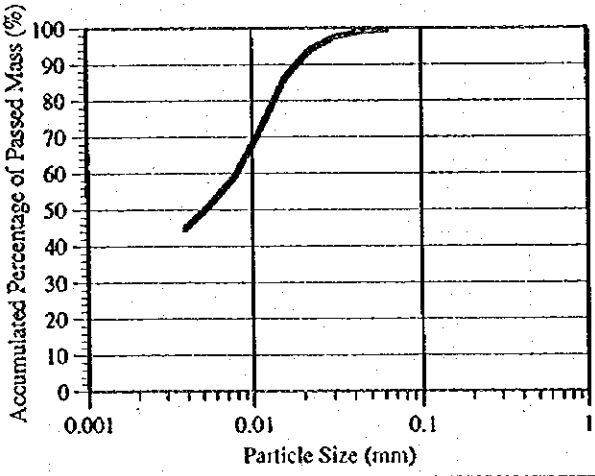
Location Map



Scale 1/100,000

Particle Size Distribution

Suspended Sediment



River Bed Material

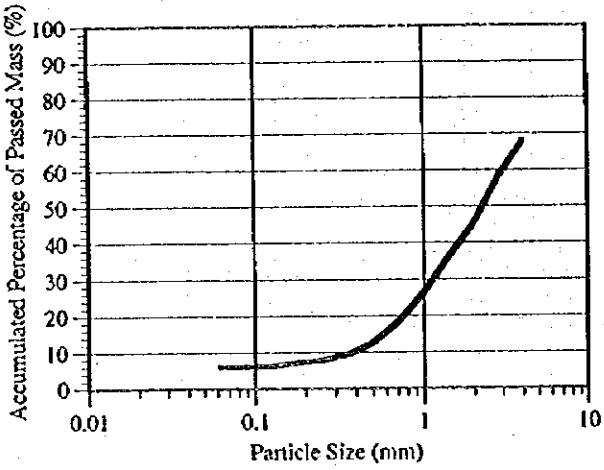


Table-A5.7 Result of Suspended Sediment Measurement in Micro River Basins (Godoy, Tibagi) (1/2)

Name of Main River Basin		Tibagi			Location	City	Latitude	longitude
Micro-River Basin		Godoy				Londrina	23°30'	51°15'
Land Use	Crop (ha)	Pasture (ha)	Forest / Reforestation (ha)	Others (ha)	Total Area (ha)			
	–	–	86	–	86			
Implementation of Soil Conservation Measures	Terracing (ha)							
	–	–	–	–				

Suspended Sediment Measurement	Date	Discharge (liter/s)	Concentration (mg/liter)	Sediment (kg/day)	Slope Steepness	Slope (%)	Area (ha)
	15/02/95	9.50	14.00	11.49		18	26
	16/02/95	5.90	14.59	7.44		33	10
	17/02/95	2.10	12.22	2.22		56	27
	18/02/95	1.20	57.78	5.99		100	23
	19/02/95	1.80	14.00	2.18		Total	86
	20/02/95	1.20	10.58	1.10	Soil Classification	Soil type	Area (ha)
	21/02/95	0.51	12.67	0.56		Re	34
	22/02/95	8.90	50.67	38.96		BR	26
	23/02/95	9.47	9.46	7.74		TRe	26
	24/02/95	9.18	5.24	4.16			
	13/05/95	6.28	4.05	2.20		Total	86
	14/05/95	6.28	6.99	3.79			
	15/05/95	6.28	4.96	2.69			
	16/05/95	6.28	5.00	2.71			
	17/05/95	6.28	6.76	3.67			

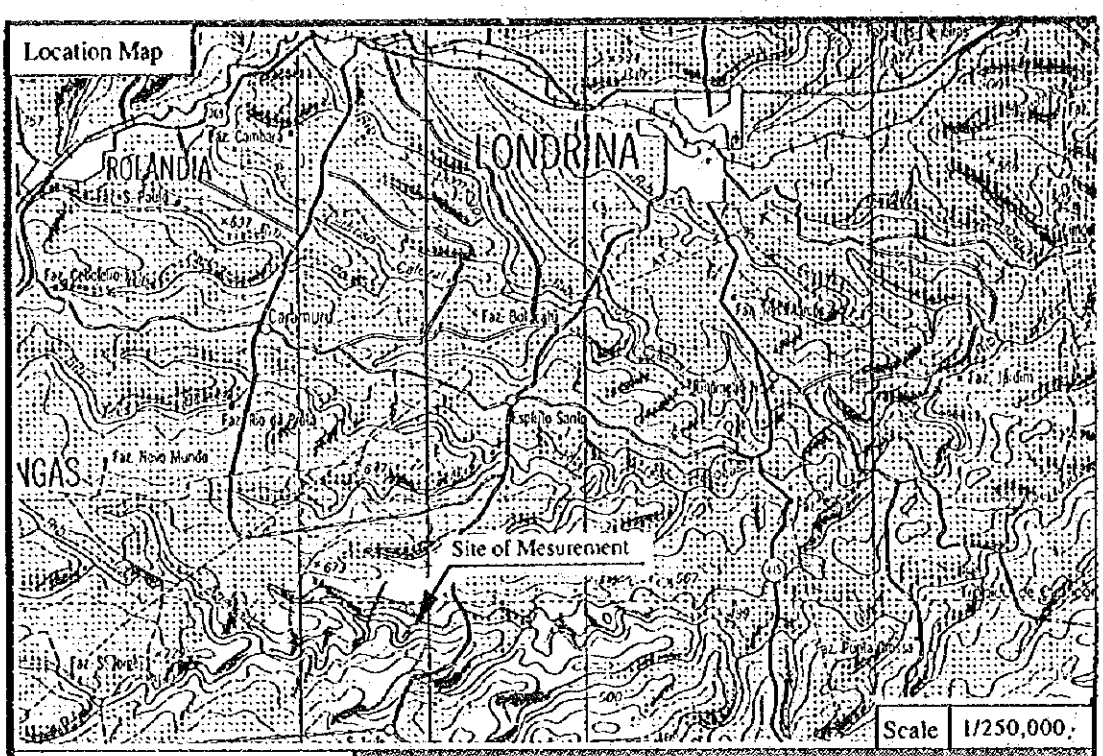
Particle Size Analysis			Accumulated Percentage of Passed Mass(%)		
	River Bed Material	Particle Size (mm)	Center	Right	Average
		4.000	35.16	17.69	26.43
		2.830	34.31	17.62	25.97
		2.000	34.10	17.61	25.86
		1.410	34.00	17.60	25.80
		1.000	23.79	14.48	19.14
		0.707	21.98	13.96	17.97
		0.500	20.47	13.56	17.02
		0.354	18.78	13.20	15.99
		0.250	17.45	12.97	15.21
		0.177	16.31	12.79	14.55
		0.125	15.01	12.50	13.76
		0.088	14.71	12.39	13.55
		0.062	14.69	12.36	13.53
	Suspended Sediment	Particle Size (mm)	Accumulated Percentage of Passed Mass (%)		
		0.0625			
		0.0442	Amount of sediment is too small for the particle size analysis.		
		0.0312			
		0.0221			
		0.0156			
		0.0110			
		0.0078			
		0.0055			
		0.0039			

Abbreviation
BR: Brunizem Avermelhado
Re: Solos Litolicos Eutroficos
TRe: Terra Roxa Estruturada Eutrofica

Source: Suspended sediment measurement and particle size analysis were conducted by a local consultant through the sub-contract with JICA study team.
Other data: EMATER local office

Table-A5.7 Result of Suspended Sediment Measurement in Micro River Basins (Godoy, Tibagi) (2/2)

Location Map



Particle Size Distribution

Suspended Sediment

River Bed Material

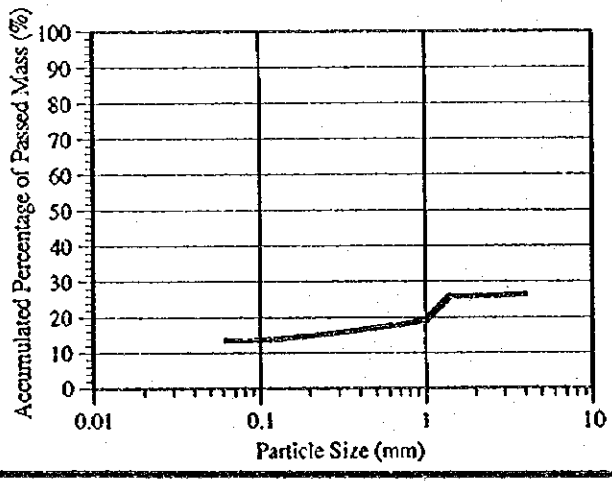


Table-A5.8 R Factor Computation for Micro River Basins in Iguaçu River Basin

Laranjeiras do Sul

DATE	TIME	RAIN (mm)	Intensity (mm/h)	KE (MJ/ha)
1-Mar	5:00 am	0.000	0	0
	5:10 am	1.200	7.2	0.1732
	5:20 am	1.200	7.2	0.1732
Total		2.400	*R factor*	1.66
1-Mar	6:30 am	0.000	0	0
	6:40 am	0.100	0.6	0.0087
	6:50 am	12.000	72	3.4115
	7:00 am	2.900	17.4	0.5873
	7:10 am	0.300	1.8	0.0293
	7:20 am	0.100	0.6	0.0087
	7:30 am	0.100	0.6	0.0087
	7:40 am	0.010	0.06	0.0008
	7:50 am	0.010	0.06	0.0008
	8:00 am	0.010	0.06	0.0008
	8:10 am	0.010	0.06	0.0008
	8:20 am	0.010	0.06	0.0008
	8:30 am	0.010	0.06	0.0008
	8:40 am	0.010	0.06	0.0008
	8:50 am	0.010	0.06	0.0008
	9:00 am	0.020	0.12	0.0016
Total		15.600	*R factor*	123.51
1-Mar				
	3:00 pm	0.000	0	0
	3:10 pm	1.600	9.6	0.2573
	3:20 pm	3.500	21	0.7593
	3:30 pm	0.300	1.8	0.0298
	3:40 pm	0.000	0	0
	6:30 pm	0.000	0	0
	6:40 pm	0.100	0.6	0.0087
Total		5.500	*R factor*	11.40
3-Mar	7:20 pm	0.000	0	0
	7:30 pm	1.000	6	0.1353
	7:40 pm	0.100	0.6	0.0087
	7:50 pm	0.100	0.6	0.0087
Total		1.200	*R factor*	0.37
4-Mar	2:00 am	0.100	0.6	0.0087
	2:10 am	0.700	4.2	0.0845
	2:20 am	0.600	3.6	0.0694
	2:30 am	0.000	0	0
	2:40 am	0.000	0	0
	2:50 am	2.400	14.4	0.4521
	3:00 am	1.500	9	0.2353
	3:10 am	0.000	0	0
	3:20 am	0.000	0	0
	3:30 am	0.000	0	0
	3:40 am	0.100	0.6	0.0087
	3:50 am	0.030	0.18	0.0025
	4:00 am	0.030	0.18	0.0025
	4:10 am	0.040	0.24	0.0033
Total		5.500	*R factor*	5.76
4-Mar	6:20 am	0.000	0	0
	6:30 am	0.010	0.06	0.0008
	6:40 am	0.010	0.06	0.0008
	6:50 am	0.010	0.06	0.0008
	7:00 am	0.010	0.06	0.0008
	7:10 am	0.010	0.06	0.0008
	7:20 am	0.010	0.06	0.0008
	7:30 am	0.010	0.06	0.0008
	7:40 am	0.010	0.06	0.0008
	7:50 am	0.010	0.06	0.0008
	8:00 am	0.010	0.06	0.0008
Total		0.100	*R factor*	0.00
4-Mar	3:50 pm	0.000	0	0
	4:00 pm	7.700	46.2	2.0734
	4:10 pm	0.300	1.8	0.0298
	4:20 pm	0.000	0	0
	4:30 pm	0.000	0	0
	4:40 pm	0.000	0	0
	4:50 pm	2.000	12	0.3508
	5:00 pm	18.900	113.4	5.4674
	5:10 pm	8.000	48	2.1685
	5:20 pm	6.800	40.8	1.7874
	5:30 pm	3.000	18	0.6153
	5:40 pm	2.800	16.8	0.5596
	5:50 pm	1.300	7.8	0.1932
	6:00 pm	0.500	3	0.0551
	6:10 pm	0.400	2.4	0.0419
	6:20 pm	0.300	1.8	0.0298
	6:30 pm	0.300	1.8	0.0298
	6:40 pm	0.200	1.2	0.0187
	6:50 pm	0.200	1.2	0.0187
	7:00 pm	0.050	0.3	0.0042
	7:10 pm	0.050	0.3	0.0042
	7:20 pm	0.010	0.06	0.0008
	7:30 pm	0.010	0.06	0.0008
	7:40 pm	0.010	0.06	0.0008
	7:50 pm	0.010	0.06	0.0008
	8:00 pm	0.010	0.06	0.0008
	8:10 pm	0.010	0.06	0.0008
	8:20 pm	0.010	0.06	0.0008
	8:30 pm	0.010	0.06	0.0008
	8:40 pm	0.010	0.06	0.0008
	8:50 pm	0.010	0.06	0.0008
Total		52.900	*R factor*	906.92
5-Mar	0:40 am	0.000	0	0
	0:50 am	0.010	0.06	0.0008
	1:00 am	0.010	0.06	0.0008
	1:10 am	0.010	0.06	0.0008
	1:20 am	0.010	0.06	0.0008
	1:30 am	0.010	0.06	0.0008
	1:40 am	0.010	0.06	0.0008
	1:50 am	0.010	0.06	0.0008
	2:00 am	0.010	0.06	0.0008
	2:10 am	0.010	0.06	0.0008
	2:20 am	0.010	0.06	0.0008
Total		0.100	*R factor*	0.00
5-Mar	2:40 pm	0.000	0	0
	2:50 pm	0.010	0.06	0.0008
	3:00 pm	0.010	0.06	0.0008
	3:10 pm	0.010	0.06	0.0008
	3:20 pm	0.010	0.06	0.0008
	3:30 pm	0.010	0.06	0.0008
	3:40 pm	0.010	0.06	0.0008
	3:50 pm	0.010	0.06	0.0008
	4:00 pm	0.010	0.06	0.0008
	4:10 pm	0.010	0.06	0.0008
	4:20 pm	0.010	0.06	0.0008
	4:30 pm	0.900	5.4	0.5175
	4:40 pm	0.600	3.6	0.0694
	4:50 pm	0.000	0	0
	5:00 pm	0.000	0	0
	5:10 pm	0.000	0	0
	5:20 pm	0.000	0	0
	5:30 pm	0.000	0	0
	5:40 pm	0.000	0	0
	5:50 pm	0.000	0	0
	6:00 pm	0.000	0	0
	6:10 pm	0.000	0	0
	6:20 pm	0.000	0	0
	6:30 pm	0.200	1.2	0.0187
	6:40 pm	0.200	1.2	0.0187
	6:50 pm	0.200	1.2	0.0187
	7:00 pm	0.300	1.8	0.0298
	7:10 pm	0.300	1.8	0.0298
	7:20 pm	0.300	1.8	0.0298
	7:30 pm	0.300	1.8	0.0298
	7:40 pm	0.200	1.2	0.0187
	7:50 pm	0.100	0.6	0.0087
	8:00 pm	0.030	0.18	0.0025
	8:10 pm	0.030	0.18	0.0025
	8:20 pm	0.040	0.24	0.0033
Total		3.800	*R factor*	1.23
8-Mar	1:50 pm	0.000	0	0
	2:00 pm	7.000	42	1.651
	2:10 pm	4.000	24	0.9084
	2:20 pm	0.400	2.4	0.0419
	2:30 pm	0.100	0.6	0.0087
	2:40 pm	0.300	1.8	0.0298
	2:50 pm	0.600	3.6	0.0694
	3:00 pm	0.800	4.8	0.1006
	3:10 pm	0.700	4.2	0.0845
	3:20 pm	0.700	4.2	0.0845
	3:30 pm	0.400	2.4	0.0419
Total		15.000	*R factor*	73.43

unit of R factor: MJ mm/ha hr KE: Kinetic Energy

Source: IAPAR for Rainfall

Table-A5.9 R Factor Computation for Micro River Basins in Tibagi River Basin

LONDRINA

DATE	TIME	RAIN (mm)	Intensity (mm/h)	KE (MJ/ha)
17-Feb	12:40			
	12:50	0		
	13:00	1.5	9.00	0.2353
	13:10	0	0.00	0.0000
	13:20	0.8	4.80	0.1006
	13:30	0.6	3.60	0.0694
	13:40	0	0.00	0.0000
	13:50	0	0.00	0.0000
	14:00	0	0.00	0.0000
	14:10	0	0.00	0.0000
	14:20	3	18.00	0.6153
	14:30	0.1	0.60	0.0087
	14:40	4	24.00	0.9084
	14:50	17.5	105.00	5.0568
	15:00	0.4	2.40	0.0419
	15:10	0	0.00	0.0000
	15:20	0	0.00	0.0000
	15:30	0	0.00	0.0000
	15:40	0	0.00	0.0000
	15:50	0	0.00	0.0000
	16:00	0	0.00	0.0000
Total		27.9	*R factor*	308.15
	23:20			
	23:30	0		
	23:40	0.1		
	23:50	0.1	too small to compute	
	0:00	0.1		
	0:10	0.1		
	0:20	0		
	0:30	0		
Total		*0.4*		
18-Feb	13:00			
	13:10	0.1	0.60	0.0087
	13:20	0	0.00	0.0000
	13:30	6.2	37.20	1.5965
	13:40	0	0.00	0.0000
	13:50	0	0.00	0.0000
	14:00	0.1	0.60	0.0087
	14:10	0	0.00	0.0000
	14:20	0	0.00	0.0000
	14:30	0	0.00	0.0000
	14:40	0	0.00	0.0000
	14:50	0	0.00	0.0000
	15:00	0	0.00	0.0000
	19:10	3.6	21.60	0.7887
	19:20	7	42.00	1.8510
	19:30	3	18.00	0.6153
	19:40	4.3	25.80	0.9998
	19:50	0.1	0.60	0.0087
	20:00	0	0.00	0.0000
	20:10	0	0.00	0.0000
	20:20	0	0.00	0.0000
	20:30	0	0.00	0.0000
	20:40	0.1	0.60	0.0087
	20:50	0.1	0.60	0.0087
	21:00	0.1	0.60	0.0087
	21:10	0.1	0.60	0.0087
	21:20	0.1	0.60	0.0087
	21:30	0.1	0.60	0.0087
	21:40	0	0.00	0.0000
	21:50	0	0.00	0.0000
	22:00	0	0.00	0.0000
Total		25	*R factor*	169.60

DATE	TIME	RAIN (mm)	Intensity (mm/h)	KE (MJ/ha)
19-Feb	20:00			
	20:10	0.1		
	20:20	0.1		
	20:30	0		
	20:40	0		
	20:50	0.2	too small to compute	
	21:00	0.1		
	21:10	0		
	21:20	0		
	21:30	0		
	21:40	0		
	21:50	0		
	22:00	0		
Total		*0.5*		
21-Feb	13:00			
	13:10	0	0.00	0.0000
	13:20	0	0.00	0.0000
	13:30	0.8	4.80	0.1006
	13:40	0.4	2.40	0.0419
	13:50	0.1	0.60	0.0087
	14:00	0	0.00	0.0000
	14:10	0	0.00	0.0000
	14:20	0.1	0.60	0.0087
		1.4	*R factor*	0.42
	23:10	0		
	23:20	4	24.00	0.9084
	23:30	0.4	2.40	0.0419
	23:40	1.2	7.20	0.1732
	23:50	0.3	1.80	0.0298
	0:00	0.1	0.60	0.0087
Total		*6*	*R factor*	13.01
22-Feb	1:50			
	2:00	0.1		
	2:10	0.1		
	2:20	0	too small to compute	
	2:30	0.2		
	2:40	0		
	2:50	0		
	3:00	0		
Total		*0.4*		

unit of R factor: MJ·mm/ha·hr

Source: IAPAR for Rainfall

Table-A5.10 Soil Loss and Sediment Delivery Ratio (Paz)

Paz Micro River Basin

Date	Day	LARANJEIRAS DO SUL R Factor (MJ mm/ha hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
25-Feb	1						
26-Feb	2						
27-Feb	3			0.190	26.67	437.8	0.0
28-Feb	4	125.2	18.0	0.135	143.33	1671.8	2492.9
1-Mar	5	11.4	5.5	0.115	88.33	878.8	227.0
2-Mar	6			0.095	33.34	274.5	0.0
3-Mar	7	7.1	6.8	0.057	16.00	79.1	141.4
4-Mar	8	906.9	53.0	1.128	61.33	5977.2	18057.9
5-Mar	9			0.448	8.67	335.6	0.0
6-Mar	10			0.281	18.67	453.3	0.0
7-Mar	11			0.244	21.00	442.7	0.0
8-Mar	12			0.246	7.33	155.8	0.0
9-Mar	13			0.268	9.33	214.4	0.0
				total suspended sediment (kg)=		10112.9	
				suspended sediment yield (kg/ha)=		11.49	20919.2 =Soil Loss
				Sediment Delivery Ratio=		0.0005	

K factor

Soil	Area (ha)	K factor
TRe	176	0.017
Ca	440	0.021
Li	264	0.037

SSCon.: Suspended Sediment Concentration

Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

LS factor

Slope (%)	Area (ha)	S factor	Length (m)	*Beta*	*m*	L factor
7.5	44.0	0.84	400	0.891	0.592	5.554
22.5	439.9	3.19	350	1.687	0.628	5.666
37.5	395.9	5.40	300	1.687	0.458	3.299

C factor (Soil Loss Ratio)

Use	Area (ha)	SLR
Corn	189.4	0.3900
Bean/Weed	48.2	0.0110
Permanent pasture	490.2	0.0060
Forest	42.1	0.0001
Fallow	75.3	0.0030

P factor

Use	P
crops	0.7
non-crops	1

KLSCP factors (using described landscape units)

K	LS	C (SLR)	P	KLSCP	area (ha)
0.018	4.653	0.313	0.7	0.01870	44.0
0.020	18.062	0.313	0.7	0.07786	193.6
0.020	18.062	0.005	1	0.00185	246.3
0.032	17.80994	0.005	1	0.00294	395.9

area wghtd. avg = 0.01991

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

Table-A5.11 Soil Loss and Sediment Delivery Ratio (Areiao)

Areiao Micro River Basin

Date	Day	LARANJEIRAS DO SUL R Factor (MJ mm/ha hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
25-Feb	1						0.0
26-Feb	2						0.0
27-Feb	3			0.346	16.67	498.3	0.0
28-Feb	4	125.2	18.0	0.343	38.67	1146.0	5675.0
1-Mar	5	11.4	5.5	0.289	25.34	631.5	516.7
2-Mar	6			0.234	12.00	242.6	0.0
3-Mar	7	7.1	6.8	0.140	5.67	68.6	321.8
4-Mar	8	906.9	53.0	0.450	137.42	5699.1	41107.7
5-Mar	9			0.256	1.00	22.1	0.0
6-Mar	10			0.277	16.44	393.3	0.0
7-Mar	11			0.346	8.33	249.0	0.0
8-Mar	12			0.302	3.67	95.8	0.0
9-Mar	13			0.314	10.00	271.3	0.0
				total suspended sediment (kg)=		8452.3	0.0
				suspended sediment yield (kg/ha)=		5.93	47621.3 =Soil Loss
				Sediment Delivery Ratio=		0.0001	

K factor

Soil	Area (ha)	K factor
TRe	463	0.017
Ca	519	0.021
Li	301	0.037
total=	1283	

SSCon.: Suspended Sediment Concentration

Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

LS factor

Slope (%)	Area (ha)	S factor	Length (m)	*Beta*	*m*	L factor
7.5	266.0	0.84	400	0.891	0.641	6.391
22.5	472.0	3.19	350	1.687	0.628	5.666
7.5	215.0		24	0.891	0.471	1.040
22.5	96.0		18	1.687	0.628	0.879
37.5	225.0	5.40	300	1.687	0.458	3.299
50	151.0	7.01	250	0.891	0.308	2.112
total=	1425.0					

C factor (Soil Loss Ratio)

Use	Area (ha)	SLR
Corn	630.0	0.3850
Soybean	120.0	0.3650
Bean/Weed	46.0	0.0110
Rice	15.0	0.4200
Cassava	48.0	0.4400
P.pasture	300.0	0.0060
Forest	84.0	0.0001
Fallow	130.0	0.0030
total=	1373.0	

***P* factor**

Practice	Area (ha)	P
terraces	215.0	0.05
stone li.	96.0	0.45
none	972	1
area wghtd. avg =		0.80

KLSCP factors (using described landscape units)

K	LS	C	P	KLSCP	area (ha)
0.0183	3.3502	0.3659	0.5754	0.0129	481
0.0240	15.4830	0.3020	0.9070	0.1018	568
0.0317	17.8099	0.0043	1.0000	0.0024	225
0.0370	14.8117	0.0001	1.0000	0.0001	151
			area wghtd. avg.=	0.0453	

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

Table-A5.12 Soil Loss and Sediment Delivery Ratio (Cachoeirinha)

Cachoeirinha Micro River Basin

Date	Day	LARANJEIRAS DO SUL R Factor (MJ mm/ha hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
25-Feb	1						0.0
26-Feb	2						0.0
27-Feb	3						0.0
28-Feb	4	125.2	18.0	0.119	118.33	1216.6	18.8
1-Mar	5	11.4	5.5	0.101	60.17	526.6	1.7
2-Mar	6			0.084	2.00	14.4	0.0
3-Mar	7	7.1	6.8	0.073	4.33	27.4	1.1
4-Mar	8	906.9	53.0	0.040	14.00	48.4	136.1
5-Mar	9			0.085	8.33	61.2	0.0
6-Mar	10			0.087	47.67	358.3	0.0
7-Mar	11			0.083	12.67	90.9	0.0
8-Mar	12			0.067	5.00	28.9	0.0
9-Mar	13			0.024	5.33	11.1	0.0
10-Mar	14			0.031	4.67	12.5	0.0
					total suspended sediment (kg)=	2383.8	
					suspended sediment yield (kg/ha)=	1.77	157.6 =Soil Loss
					Sediment Delivery Ratio=	0.011	

SSCon.: Suspended Sediment Concentration

☐ Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

K factor

Soil	Area (ha)	K factor
LRd	1350	0.012

LS factor

Slope (%)*	Area (%)	S factor	Length (m)*	*Beta*	*m*	L factor
15	100.0	1.99	500	1.366	0.406	3.546

* typical values

C factor

Use	C factor	Area (%)*
Forest	0.0001	70
Fallow	0.0030	20
Cropland	0.0110	10
avg =	0.0018	

* estimated values

P factor

1

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

Table-A5.13 Soil Loss and Sediment Delivery Ratio (Limoeiro)

Limoeiro Micro River Basin

Date	Day	Londrina R Factor (MJ mm/ha hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
14-Feb	6	0.0	7.2	0.113	24.75	241.6	0.0
15-Feb	7	0.0	0.0	0.128	11.98	132.5	0.0
16-Feb	8	0.0	0.0	0.089	34.48	263.6	0.0
17-Feb	9	308.2	27.9	0.049	56.98	241.2	1625.3
18-Feb	10	169.6	25.0	0.077	16.67	111.3	894.5
19-Feb	11			0.111	63.39	607.9	0.0
20-Feb	12	0.0	0.5	0.085	40.04	294.1	0.0
21-Feb	13	13.4	7.4	0.067	19.86	115.0	70.7
22-Feb	14	0.0	0.0	0.070	17.71	107.1	0.0
23-Feb	15	0.0	0.4	0.088	14.93	113.5	0.0
24-Feb	16	0.0	3.3	0.063	6.61	36.0	0.0
				total suspended sediment (kg)=		1590.1	
				suspended sediment yield (kg/ha)=		1.7	2590.5 =Soil Loss
				Sediment Delivery Ratio=		0.0006	

K factor

Soil	Area (%)	K factor
LRe	50.2	0.018
TRe	29.6	0.017
Re	10.1	0.032
B	10.1	0.044
area wghtd. avg.=		0.022

SSCon.: Suspended Sediment Concentration

Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

LS factor

Slope (%)	Area (%)	S factor	Length (m)	*Beta*	*m*	L factor
1.5	18.1	0.19	80	0.252	0.335	1.539
5	28.1	0.57	31	0.669	0.572	1.214
10.5	36.6	1.25	21	1.108	0.689	0.965
21.5	17.2	3.03	394	1.650	0.623	6.013
area wghtd. avg =		1.18	98.65			2.01

C factor (Soil Loss Ratio)

Use	Area (%)	SLR
soybean	63.8	0.017
cotton	15.1	0.219
corn	1.7	0.433
pasture	4.3	0.010
forest	15.1	0.0001
area wghtd. avg.=		0.05

P factor

Use	Area (%)	P
crops	80.6	0.12
non-crops	19.4	1
area wghtd. avg.=		0.29

KLSCP factors (using likely combinations)

K	LS	C	P	KLSCP	area (%)
0.018	0.834	0.064	0.120	0.006	82.8
0.038	18.226	0.002	1.000	0.042	17.2
			area wghtd. avg =	0.0053	

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

Table-A5.14 Soil Loss and Sediment Delivery Ratio (Uru)

Uru Micro River Basin

Date	Day	Londrina R Factor (MJ·mm/ha·hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
15-Feb	7			0.095	0.5	3.7	0.0
16-Feb	8			0.338	202.3	5907.5	0.0
17-Feb	9	308.2	27.9	0.581	404.1	20286.7	517.1
18-Feb	10	169.6	25.0	0.039	55.7	187.7	284.6
19-Feb	11			0.105	3.2	29.1	0.0
20-Feb	12	0.0	0.5	0.069	3.6	21.6	0.0
21-Feb	13	13.4	7.4	0.055	19.3	91.8	22.5
22-Feb	14			0.061	7.3	38.4	0.0
23-Feb	15	0.0	0.4	0.026	44.3	99.6	0.0
24-Feb	16	0.0	3.3	0.019	4.7	7.7	0.0
25-Feb	17	0.0	3.3	0.041	7.3	25.7	0.0
				total suspended sediment (kg)=		20762.6	
				suspended sediment yield (kg/ha)=		22.87	824.24 =Soil Loss
				Sediment Delivery Ratio=		0.0277	

K factor

Soil	Area (%)	K factor
LRe	29.9	0.018
TRe	34.7	0.017
Re	19	0.032
C	16.5	0.042

SSCon.: Suspended Sediment Concentration

Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

LS factor

Slope (%)	Area (%)	S factor	Length (m)	*Beta*	*m*	L factor
4	15.6	0.46	36	0.566	0.531	1.296
10.5	47.9	1.25	21.45	1.108	0.689	0.980
21.5	20.4	3.03	400	1.108	0.356	2.807
30	16.1	4.33	300	1.650	0.452	3.252
area wghtd. avg.=		1.99				1.77

C factor (Soil Loss Ratio)

Use	Area (%)	SLR
soybean	56.2	0.359
corn	6.5	0.704
cotton	1.9	0.222
pasture	35.4	0.010

P factor

Use	Area (%)	P
crops	63.5	0.05
non-crops	36.5	1

KLSCP factors (using likely combinations)

K	LS	C	P	KLSCP	area (%)
0.017	1.074	0.355	0.050	0.00033	63.5
0.037	10.963	0.010	1.000	0.00402	36.5
			(area wghtd. avg.)=	0.00168	

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

Table-A5.15 Soil Loss and Sediment Delivery Ratio (Godoy)

Godoy Micro River Basin

Date	Day	Londrina R Factor (MJ·mm/ha·hr)	Rain (mm)	Discharge (m3/s)	SS Con. (g/m3)	Sediment (kg/day)	Soil Loss (kg/ha)
16-Feb	8			0.0059	14.6	7.4	0.00
17-Feb	9	308.2	27.9	0.0021	12.2	2.2	18.14
18-Feb	10	169.6	25.0	0.0012	57.8	6.0	9.98
19-Feb	11			0.0018	14.0	2.2	0.00
20-Feb	12	0.0	0.5	0.0012	10.6	1.1	0.00
21-Feb	13	13.4	7.4	0.0005	12.7	0.6	0.79
22-Feb	14			0.0089	50.7	39.0	0.00
23-Feb	15	0.0	0.4	0.0095	9.5	7.8	0.00
24-Feb	16	---	3.3	0.0092	5.2	4.2	
					total suspended sediment (kg)=	58.8	
					suspended sediment yield (kg/ha)=	0.68	28.92 =Soil Loss
					Sediment Delivery Ratio=	0.0237	

K factor

Soil	Area (%)	K factor
Re	40	0.015
BR	30	0.044
TE	30	0.020
area wghtd. avg.=		0.025

SSCon.: Suspended Sediment Concentration

☐ Suspended sediment induced by rainfall incident during the measurement

Daily rainfall is taken from 9 am to 9 am in next day.

For example March 1 means 9 am on March 1 to 9 am on March 2.

LS factor

Slope (%)	Area (ha)	S factor
18	26	2.48
33	9.8	4.76
56	27	7.71
100	23	11.38
area weighted average=		6.77

	Length* (m)	L factor
	215	
Beta=	2.390	
m=	0.544	3.45

* typical value

C factor
0.0001

***P* factor**
1

Source: IAPAR for Rainfall
EMATER for Agricultural Data
ESPAR (Roloff) for USLE Factors

JICA