RIV-T-12 Specific Sediment Yield by Murano's Formula

Annex RIV-T-12 Estimation of Sediment Yield by Murano's Formula

Sub-basin	Name of river	Calculation point	Catchment area (km2)	Annual mean rainfall (mm)	Basin conditions					Relief ratio	Geological conditions	log qs	Specific sediment yield (ton/km^2/year)
					Highest point (m)	Lowest point (m)	Mean elevation (m)	Longitude ①－② (m)	of river (m)	③/④			
			A	R	①	②	ME	③	④	Rr			qs
L30-1	Sanga do Meireles	At the junction of Arr. Camaqua Chico	11.1	1,350	384	186	285	198	7,500	0.02640	I	-4.002	0.00010
			11.1	1,350	384	186	285	198	7,500	0.02640	IV	2.448	280.63564
											I & IV		**140.3**
L30-1	Arr. Imbicui	At the junction of Arr. da Mantiqueira	23.7	1,350	409	210	310	199	10,500	0.01895	I	-4.108	0.00008
			23.7	1,350	409	210	310	199	10,500	0.01895	IV	2.386	243.17176
											I & IV		**121.6**
L30-2	Arr. Marmeleiro	At the junction of Arr. Joao Dias	33.2	1,400	335	123	229	212	11,500	0.01843	I	-4.176	0.00007
			33.2	1,400	335	123	229	212	11,500	0.01843	IV	2.221	166.15294
											I & IV		**83.1**
L30-3	Sanga do Guabiju	At junction of Camaqua river	19.0	1,300	349	53	201	296	11,000	0.02691	IV	2.193	**155.8**
L30-4	Arr. Sutilzinho	At the upper basin (EL 160m)	40.2	1,300	594	160	377	434	11,000	0.03945	IV	2.290	**195.0**
L30-4	Arroio Duro	At the upper basin (EL 80m)	55.3	1,300	490	80	285	410	17,500	0.02343	IV	2.170	**147.9**
L30-5	Arroio Laranja	At the upper basin (EL 168m)	11.6	1,300	491	168	330	323	6,500	0.04969	IV	2.423	**264.9**
L30-6	Arroio Grande	At the upper basin (EL 100m)	57.8	1,350	465	100	283	365	17,500	0.02086	IV	2.186	**153.5**
L40-4	Jaguarao	At the upper basin (EL 130m)	12.6	1,400	214	130	172	84	6,500	0.01292	I	-4.028	0.00009
			12.6	1,400	214	130	172	84	6,500	0.01292	IV	2.301	200.02542
													100.0
L40-5	Arr. das Cafurnas	At the upper basin (EL 300m)	44.5	1,300	300	100	200	200	9,000	0.02222	IV	2.064	**115.9**
L40-6	Piratini	At the junction of Arr. Maria Cristina	29.8	1,400	487	290	389	197	9,500	0.02074	IV	2.448	**280.8**
L40-8	Arroio Pelotas	At the upper basin (EL 200m)	59.3	1,400	495	200	348	295	15,000	0.01967	IV	2.290	**194.8**

Source: JICA Study Taem

Note: Relief ratio is the difference in height between the highest point along the main water cource and the outlet of valley in watershed divided by the length of main watershed

RIV-T-13 Harvested Area of Suspicious Crop

1. **Harvested Area of Paddy in the Study Area**
2. **Harvested Area of Soybean in the Study Area**
3. **Harvested Area of Tobacco in the Study Area**
4. **Harvested Area of Potato in the Study Area**
5. **Harvested Area of Onion in the Study Area**
6. **Harvested Area of Peach in the Study Area**

1. Harvested Area of Paddy in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	4,020	1,005	
	Lavras do Sul	0.50	1,950	975	
	Bage	0.25	18,000	4,500	
	Dom Pedrito	0.10	34,500	3,450	9,930
L30-2	Cacapava do Sul	0.25	4,020	1,005	
	Bage	0.25	18,000	4,500	
	Hulha Negra	0.25	1,400	350	
	Candiota	0.10	600	60	5,915
L30-3	Santana da Boa Vista	0.50	435	218	
	Pinheiro Machado	0.50	400	200	
	Piratini	0.50	1,320	660	
	Encruzilhada do Sul	0.50	1,000	500	
	Cangucu	0.67	1,710	1,146	
	Amaral Ferrador	1.00	650	650	
	Dom Feliciano	0.67	190	127	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	1,220	244	3,745
L30-4	Camaqua	0.50	25,535	12,768	
	Cristal	1.00	5,920	5,920	
	Sao Lourenco do Sul	0.33	9,530	3,145	21,832
L30-5	Barao do Triunfo	0.33	150	50	
	Cerro Grande do Sul	1.00	656	656	
	Sentinela do Sul	0.80	1,801	1,441	
	Tapes	0.95	11,000	10,450	
	Camaqua	0.25	25,535	6,384	
	Arambare	1.00	11,200	11,200	30,180
L30-6	Sao Lourenco do Sul	0.67	9,530	6,385	
	Camaqua	0.25	25,535	6,384	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	10,750	1,075	13,844
L-20	Viamao	0.40	22,300	8,920	
	Sta. Antonio da Patrulha	0.33	12,700	4,191	
	Osorio	0.20	3,410	682	
	Cidreira	0.10	1,434	143	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	24,500	24,010	
	Mostardas	1.00	33,300	33,300	
	Tavares	1.00	2,120	2,120	
	Sao Jose do Norte	0.45	2,730	1,229	74,595
L40-9	Parmares do Sul	0.00	24,500	0	
	Mostardas	0.00	33,300	0	
	Tavares	0.00	2,120	0	
	Sao Jose do Norte	0.55	2,730	1,502	1,502
L40-1	Rio Grande	0.40	26,000	10,400	
	Santa Vitoria do Palmar	0.55	90,000	49,500	
	Chui	0.45	0	0	59,900
L40-2	Rio Grande	0.20	26,000	5,200	5,200
L40-3	Rio Grande	0.40	26,000	10,400	
	Santa Vitoria do Palmar	0.45	90,000	40,500	
	Chui	0.55	0	0	50,900
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	1,400	1,050	
	Candiota	0.90	600	540	
	Pedras Altas	1.00	0	0	
	Herval	0.50	5,500	2,750	
	Jaguarao	0.60	22,000	13,200	17,540
L40-5	Herval	0.50	5,500	2,750	
	Jaguarao	0.40	22,000	8,800	
	Arroio Grande	1.00	39,000	39,000	
	Pedro Osorio	1.00	3,000	3,000	53,550
L40-6	Pinheiro Machado	0.50	400	200	
	Piratini	0.50	1,320	660	
	Cangucu	0.17	1,710	291	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	8,000	1,600	2,751
L40-7	Morro Redondo	0.80	10	8	
	Capao do Leao	0.80	8,000	6,400	
	Pelotas	0.25	10,750	2,688	9,096
L40-8	Cangucu	0.16	1,710	274	
	Pelotas	0.65	10,750	6,988	7,261
Total				367,740	367,740

Source: Economy and Statistic Foundation (CEE) /SCP

2. Harvested Area of Soybean in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	2,000	500	
	Lavras do Sul	0.50	500	250	
	Bage	0.25	1,500	375	
	Dom Pedrito	0.10	4,000	400	1,525
L30-2	Cacapava do Sul	0.25	2,000	500	
	Bage	0.25	1,500	375	
	Hulha Negra	0.25	300	75	
	Candiota	0.10	100	10	960
L30-3	Santana da Boa Vista	0.50	200	100	
	Pinheiro Machado	0.50	500	250	
	Piratini	0.50	7,000	3,500	
	Encruzilhada do Sul	0.50	600	300	
	Cangucu	0.67	15,000	10,050	
	Amaral Ferrador	1.00	0	0	
	Dom Feliciano	0.67	0	0	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	0	0	14,200
L30-4	Camaqua	0.50	1,500	750	
	Cristal	1.00	2,100	2,100	
	Sao Lourenco do Sul	0.33	4,000	1,320	4,170
L30-5	Barao do Triunfo	0.33	0	0	
	Cerro Grande do Sul	1.00	4,500	4,500	
	Sentinela do Sul	0.80	0	0	
	Tapes	0.95	0	0	
	Camaqua	0.25	1,500	375	
	Arambare	1.00	200	200	5,075
L30-6	Sao Lourenco do Sul	0.67	4,000	2,680	
	Camaqua	0.25	1,500	375	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	5,000	500	3,555
L-20	Viamao	0.40	2,850	1,140	
	Sta. Antonio da Patrulha	0.33	400	132	
	Osorio	0.20	0	0	
	Cidreira	0.10	0	0	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	100	98	
	Mostardas	1.00	0	0	
	Tavares	1.00	0	0	
	Sao Jose do Norte	0.45	0	0	1,370
L40-9	Parmares do Sul	0.00	100	0	
	Mostardas	0.00	0	0	
	Tavares	0.00	0	0	
	Sao Jose do Norte	0.55	0	0	0
L40-1	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.55	300	165	
	Chui	0.45	0	0	165
L40-2	Rio Grande	0.20	0	0	0
L40-3	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.45	300	135	
	Chui	0.55	0	0	135
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	300	225	
	Candiota	0.90	100	90	
	Pedras Altas	1.00	0	0	
	Herval	0.50	300	150	
	Jaguarao	0.60	170	102	567
L40-5	Herval	0.50	300	150	
	Jaguarao	0.40	170	68	
	Arroio Grande	1.00	4,000	4,000	
	Pedro Osorio	1.00	1,500	1,500	5,718
L40-6	Pinheiro Machado	0.50	500	250	
	Piratini	0.50	7,000	3,500	
	Cangucu	0.17	15,000	2,550	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	2,500	500	6,800
L40-7	Morro Redondo	0.80	40	32	
	Capao do Leao	0.80	2,500	2,000	
	Pelotas	0.25	5,000	1,250	3,282
L40-8	Cangucu	0.16	15,000	2,400	
	Pelotas	0.65	5,000	3,250	5,650
Total				53,172	53,172

Source: Economy and Statistic Foundation (CEE) /SCP

3. Harvested Area of Tobacco in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	0	0	
	Lavras do Sul	0.50	0	0	
	Bage	0.25	0	0	
	Dom Pedrito	0.10	0	0	0
L30-2	Cacapava do Sul	0.25	0	0	
	Bage	0.25	0	0	
	Hulha Negra	0.25	0	0	
	Candiota	0.10	0	0	0
L30-3	Santana da Boa Vista	0.50	0	0	
	Pinheiro Machado	0.50	0	0	
	Piratini	0.50	0	0	
	Encruzilhada do Sul	0.50	320	160	
	Cangucu	0.67	2,800	1,876	
	Amaral Ferrador	1.00	1,900	1,900	
	Dom Feliciano	0.67	3,000	2,010	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	1,200	240	6,186
L30-4	Camaqua	0.50	4,700	2,350	
	Cristal	1.00	300	300	
	Sao Lourenco do Sul	0.33	2,500	825	3,475
L30-5	Barao do Triunfo	0.33	1,162	383	
	Cerro Grande do Sul	1.00	3,220	3,220	
	Sentinela do Sul	0.80	800	640	
	Tapes	0.95	0	0	
	Camaqua	0.25	4,700	1,175	
	Arambare	1.00	0	0	5,418
L30-6	Sao Lourenco do Sul	0.67	2,500	1,675	
	Camaqua	0.25	4,700	1,175	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	2,800	280	3,130
L-20	Viamao	0.40	0	0	
	Sta. Antonio da Patrulha	0.33	530	175	
	Osorio	0.20	10	2	
	Cidreira	0.10	0	0	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	0	0	
	Mostardas	1.00	0	0	
	Tavares	1.00	0	0	
	Sao Jose do Norte	0.45	0	0	177
L40-9	Parmares do Sul	0.00	0	0	
	Mostardas	0.00	0	0	
	Tavares	0.00	0	0	
	Sao Jose do Norte	0.55	0	0	0
L40-1	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.55	0	0	
	Chui	0.45	0	0	0
L40-2	Rio Grande	0.20	0	0	0
L40-3	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.45	0	0	
	Chui	0.55	0	0	0
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	0	0	
	Candiota	0.90	0	0	
	Pedras Altas	1.00	0	0	
	Herval	0.50	0	0	
	Jaguarao	0.60	0	0	0
L40-5	Herval	0.50	0	0	
	Jaguarao	0.40	0	0	
	Arroio Grande	1.00	0	0	
	Pedro Osorio	1.00	0	0	0
L40-6	Pinheiro Machado	0.50	0	0	
	Piratini	0.50	0	0	
	Cangucu	0.17	2,800	476	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	0	0	476
L40-7	Morro Redondo	0.80	7	6	
	Capao do Leao	0.80	0	0	
	Pelotas	0.25	2,800	700	706
L40-8	Cangucu	0.16	2,800	448	
	Pelotas	0.65	2,800	1,820	2,268
Total				21,836	21,836

Source: Economy and Statistic Foundation (CEE) /SCP

4. Harvested Area of Potato in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	15	4	
	Lavras do Sul	0.50	30	15	
	Bage	0.25	0	0	
	Dom Pedrito	0.10	0	0	19
L30-2	Cacapava do Sul	0.25	15	4	
	Bage	0.25	0	0	
	Hulha Negra	0.25	0	0	
	Candiota	0.10	0	0	4
L30-3	Santana da Boa Vista	0.50	9	5	
	Pinheiro Machado	0.50	30	15	
	Piratini	0.50	280	140	
	Encruzilhada do Sul	0.50	0	0	
	Cangucu	0.67	1,600	1,072	
	Amaral Ferrador	1.00	20	20	
	Don Feliciano	0.67	95	64	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	10	2	1,317
L30-4	Camaqua	0.50	180	90	
	Cristal	1.00	650	650	
	Sao Lourenco do Sul	0.33	7,500	2,475	3,215
L30-5	Barao do Triunfo	0.33	6	2	
	Cerro Grande do Sul	1.00	60	60	
	Sentinela do Sul	0.80	5	4	
	Tapes	0.95	5	5	
	Camaqua	0.25	180	45	
	Arambare	1.00	0	0	116
L30-6	Sao Lourenco do Sul	0.67	7,500	5,025	
	Camaqua	0.25	180	45	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	3,000	300	5,370
L-20	Viamao	0.40	14	6	
	Sta. Antonio da Patrulha	0.33	180	59	
	Osorio	0.20	10	2	
	Cidreira	0.10	2	0	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	4	4	
	Mostardas	1.00	4	4	
	Tavares	1.00	4	4	
	Sao Jose do Norte	0.45	8	4	83
L40-9	Parmares do Sul	0.00	4	0	
	Mostardas	0.00	4	0	
	Tavares	0.00	4	0	
	Sao Jose do Norte	0.55	8	4	4
L40-1	Rio Grande	0.40	50	20	
	Santa Vitoria do Palmar	0.55	5	3	
	Chui	0.45	0	0	23
L40-2	Rio Grande	0.20	50	10	10
L40-3	Rio Grande	0.40	50	20	
	Santa Vitoria do Palmar	0.45	5	2	
	Chui	0.55	0	0	22
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	0	0	
	Candiota	0.90	0	0	
	Pedras Altas	1.00	0	0	
	Herval	0.50	0	0	
	Jaguarao	0.60	15	9	9
L40-5	Herval	0.50	0	0	
	Jaguarao	0.40	15	6	
	Arroio Grande	1.00	15	15	
	Pedro Osorio	1.00	170	170	191
L40-6	Pinheiro Machado	0.50	30	15	
	Piratini	0.50	280	140	
	Cangucu	0.17	1,600	272	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	650	130	557
L40-7	Morro Redondo	0.80	660	528	
	Capao do Leao	0.80	650	520	
	Pelotas	0.25	3,000	750	1,798
L40-8	Cangucu	0.16	1,600	256	
	Pelotas	0.65	3,000	1,950	2,206
Total				14,944	14,944

Source: Economy and Statistic Foundation (CEE) /SCP

5. Harvested Area of Onion in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	3	1	
	Lavras do Sul	0.50	10	5	
	Bage	0.25	5	1	
	Dom Pedrito	0.10	0	0	7
L30-2	Cacapava do Sul	0.25	3	1	
	Bage	0.25	10	3	
	Hulha Negra	0.25	0	0	
	Candiota	0.10	0	0	3
L30-3	Santana da Boa Vista	0.50	0	0	
	Pinheiro Machado	0.50	2	1	
	Piratini	0.50	50	25	
	Encruzilhada do Sul	0.50	2	1	
	Cangucu	0.67	1,500	1,005	
	Amaral Ferrador	1.00	5	5	
	Dom Feliciano	0.67	30	20	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	1	0	1,057
L30-4	Camaqua	0.50	50	25	
	Cristal	1.00	20	20	
	Sao Lourenco do Sul	0.33	600	198	243
L30-5	Barao do Triunfo	0.33	1	0	
	Cerro Grande do Sul	1.00	10	10	
	Sentinela do Sul	0.80	7	6	
	Tapes	0.95	0	0	
	Camaqua	0.25	50	13	
	Arambare	1.00	0	0	28
L30-6	Sao Lourenco do Sul	0.67	600	402	
	Camaqua	0.25	50	13	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	1,500	150	565
L-20	Viamao	0.40	8	3	
	Sta. Antonio da Patrulha	0.33	40	13	
	Osorio	0.20	10	2	
	Cidreira	0.10	10	1	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	20	20	
	Mostardas	1.00	800	800	
	Tavares	1.00	2,300	2,300	
	Sao Jose do Norte	0.45	2,500	1,125	4,264
L40-9	Parmares do Sul	0.00	20	0	
	Mostardas	0.00	800	0	
	Tavares	0.00	2,300	0	
	Sao Jose do Norte	0.55	2,500	1,375	1,375
L40-1	Rio Grande	0.40	1,850	740	
	Santa Vitoria do Palmar	0.55	5	3	
	Chui	0.45	0	0	743
L40-2	Rio Grande	0.20	1,850	370	370
L40-3	Rio Grande	0.40	1,850	740	
	Santa Vitoria do Palmar	0.45	5	2	
	Chui	0.55	0	0	742
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	0	0	
	Candiota	0.90	0	0	
	Pedras Altas	1.00	0	0	
	Herval	0.50	50	25	
	Jaguarao	0.60	15	9	34
L40-5	Herval	0.50	50	25	
	Jaguarao	0.40	15	6	
	Arroio Grande	1.00	0	0	
	Pedro Osorio	1.00	70	70	101
L40-6	Pinheiro Machado	0.50	2	1	
	Piratini	0.50	50	25	
	Cangucu	0.17	1,500	255	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	40	8	289
L40-7	Morro Redondo	0.80	105	84	
	Capao do Leao	0.80	40	32	
	Pelotas	0.25	1,500	375	491
L40-8	Cangucu	0.16	1,500	240	
	Pelotas	0.65	1,500	975	1,215
Total				11,527	11,527

Source: Economy and Statistic Foundation (CEE) /SCP

6. Harvested Area of Peach in the Study Area (1995)

Sub-basin	Municipality	Area in Percentage	Gross Harvested Area (ha)	Net Harvested Area (ha)	Sub-total (ha)
L30-1	Cacapava do Sul	0.25	40	10	
	Lavras do Sul	0.50	15	8	
	Bage	0.25	15	4	
	Dom Pedrito	0.10	6	1	22
L30-2	Cacapava do Sul	0.25	40	10	
	Bage	0.25	15	4	
	Hulha Negra	0.25	5	1	
	Candiota	0.10	5	1	16
L30-3	Santana da Boa Vista	0.50	40	20	
	Pinheiro Machado	0.50	16	8	
	Piratini	0.50	504	252	
	Encruzilhada do Sul	0.50	160	80	
	Cangucu	0.67	2,500	1,675	
	Amaral Ferrador	1.00	1	1	
	Dom Feliciano	0.67	6	4	
	Chuvisca	1.00	0	0	
	Sao Jeronimo	0.20	35	7	2,047
L30-4	Camaqua	0.50	6	3	
	Cristal	1.00	1	1	
	Sao Lourenco do Sul	0.33	20	7	11
L30-5	Barao do Triunfo	0.33	0	0	
	Cerro Grande do Sul	1.00	4	4	
	Sentinela do Sul	0.80	10	8	
	Tapes	0.95	0	0	
	Camaqua	0.25	6	2	
	Arambare	1.00	0	0	14
L30-6	Sao Lourenco do Sul	0.67	20	13	
	Camaqua	0.25	6	2	
	Turucu	0.70	0	0	
	Arroio do Padre	0.45	0	0	
	Pelotas	0.10	4,900	490	505
L-20	Viamao	0.40	15	6	
	Sta. Antonio da Patrulha	0.33	2	1	
	Osorio	0.20	1	0	
	Cidreira	0.10	0	0	
	Balnearo Pinhal	0.10	0	0	
	Parmares do Sul	0.98	1	1	
	Mostardas	1.00	0	0	
	Tavares	1.00	0	0	
	Sao Jose do Norte	0.45	0	0	8
L40-9	Parmares do Sul	0.00	1	0	
	Mostardas	0.00	0	0	
	Tavares	0.00	0	0	
	Sao Jose do Norte	0.55	0	0	0
L40-1	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.55	0	0	
	Chui	0.45	0	0	0
L40-2	Rio Grande	0.20	0	0	0
L40-3	Rio Grande	0.40	0	0	
	Santa Vitoria do Palmar	0.45	0	0	
	Chui	0.55	0	0	0
L40-4	Acegua	0.60	0	0	
	Hulha Negra	0.75	5	4	
	Candiota	0.90	5	5	
	Pedras Altas	1.00	0	0	
	Herval	0.50	0	0	
	Jaguarao	0.60	0	0	8
L40-5	Herval	0.50	0	0	
	Jaguarao	0.40	0	0	
	Arroio Grande	1.00	400	400	
	Pedro Osorio	1.00	40	40	440
L40-6	Pinheiro Machado	0.50	16	8	
	Piratini	0.50	504	252	
	Cangucu	0.17	2,500	425	
	Cerrito	1.00	0	0	
	Capao do Leao	0.20	20	4	689
L40-7	Morro Redondo	0.80	520	416	
	Capao do Leao	0.80	20	16	
	Pelotas	0.25	4,900	1,225	1,657
L40-8	Cangucu	0.16	2,500	400	
	Pelotas	0.65	4,900	3,185	3,585
Total				9,000	9,000

Source: Economy and Statistic Foundation (CEE) /SCP

RIV-T-14

Varieties and Input Pattern of Agricultural Chemicals

Annex RIV-T-14 Varieties and Input Pattern of Agricultural Chemicals (1/2)

Crop	Cropping Period		Agricultural chemical	Name of agro-chemical	Chemical type	Active ingredient	Toxicological group	Application volume	Application period
	Seeding	Hervesting							
Paddy	Oct.	Apr	Herbicide	FACET PM	Quinoline	Qinclorac	III	0,5-0,7 kg/hectare	1x/Pos emerg. Stage
				GLIFOSATO	Glycine	Glyphosate	IV	4,0-5,0 l/hectare	1x/Pre seeding rice
				PROPANIL 360 PM	Chloroanilide	Propanil	II	8,0-10 kg/hectare	1x/Pos emerg. Stage
				SIRIUS 250 SC	Sulphonilurea	Pyrazosulphuron-Ethyl	IV	0,06-0,1 l/hectare	1x/Pos emerg. Stage
			Insecticide	FURADAN 50 G	Carbamate	Carbofuran	I	15 kg/hectare	1x/after irrigation
				KARATE 50 CE	Pyretroid	Lambdacyhalothrin	II	0,15 l/hectare	1x/After emergence
				ARRIVO 200 CE	Pyretroid	Cypermethrin	III	0,12 l/hectare	1x/After emergence
			Fungicide	BIM 500 SC	Benzothiazole	Triciclazole	III	0,375 l/hectare	1x/Veg.&bloom stage
				HINOSAN 500 CE	Organic Phosphate	Edifenphos	I	1,0 l/hectare	1x/Veg.&bloom stage
Soybean	Oct.	May	Herbicide	TRIFLURALINA	Dinitroaniline	Trifluralin	II	1,5-2,5 l/hectare	1x/Pre Seeding
				ROUNDUP	Glycine	Glyphosate	IV	5,0 l/hectare	1x/Pre Seeding
				DUAL 960 CE	Acetanilide	Metholachlor	II	3,5 l/hectare	1x/Pre Seeding
				POAST	Cyclo Hexene	Sethoxydim	II	1,25 l/hectare	1x/Pos Emerg.soybean
			Insecticide	KARATE 50 CE	Pyretroid	Lambdacyhalothrin	II	0,1 l/hectare	1-2xvegetative stage
				NUVACRON 400	Organic Phosphate	Monocrotophos	II	0,5 l/hectare	1x/vegetative stage
				DECIS 25 CE	Pyretroid	Deltamethrin	III	0,2 l/hectare	1-2xvegetative stage
			Fungicide						
Potato First Harvest.	Aug.	Dec.	Herbicide	FUZILADE 125	Propionate	Fluazifop-Butil	II	1,0 l/hectare	1x/Pos em/growth stage
				GRAMOXONE 200	Bipyridinium	Paraquat	II	2,0 l/hectare	1x/Pre Maturity stage
			Insecticide	TAMARON BR	Organic Phosphate	Methamidophos	II	0,2 l/hectare	2x/pest presence
				GRANUTOX	Organic Phosphate	Phorate	I	25 kg/hectare	1x/on soil at seeding
				FURADAN	Carbamate	Carbofuran	I	30 kg/hectare	1x/on soil at seeding
			Fungicide	DITHANE PM	Dithiocarbamate	Mancozeb	III	2-3 kg/hectare	1-3x/on 1st symptom
				CURZATE M + ZINCO	Acetamide+Dithiocarbamate	Cymoxamil+Maneb+Zn	II	1,5-2,0kg/hectare	1-2x/on 1st symptom
				RIDOMIL MANCOZEB BR	Alaninate+Dithiocarbamate	Methalaxyl+Mancozeb	II	2,0 kg/hectare	1-2x/on 1st symptom

Source: EMATER-RS Research places: 1) Paddy=>Barra do Ribeiro; Camaquã; Capivari do Sul; Cristal; Dom Pedrito; Palmares do Sul. 2) Soybean=>Cristal; Dom Pedrito. 3) Potato=>Cristal; Morro Redondo and Pelotas.

Annex RIV-T-14 Varieties and Input Pattern of Agricultural Chemicals (2/2)

Crop	Cropping Period		Agricultural	Name of	Chemical type	Active	Toxicological	Application	Application
	Seeding	Hervesting	chemical	agro-chemical		ingredient	group	volume	period
Onion	Apr	Jan	Herbicide						
			Insecticide	DECIS 25 CE	Pyretroid	Deltamethrin	III	0,5 l/hectare	1x/pest incidence
			Fungicide	DITHANE PM	Dithiocarbamate	Mancozeb	III	1,5 l/hectare	1x/vegetative growth
				RIDOMIL-MANCOZEB BR	Alaninate+Dithiocarbamate	Methalaxyl+Mancozeb	II	2,0 l/hectare	1x/vegetative growth
				VANOX 500 SC	Ftalonitrile	Chlorothalonil	I	2,0 l/hectare	1x/vegetative growth
Maize	Ago	Jun	Herbicide	PRIMESTRA SC	Triazine+Acetanilide	Atrazine+Metholachlor	II	5-6 l/hectare	1x/Pre emerg.weeds
				SANSON 40 SC	Sulfonilureas	Nicosulfuron	IV	1,25-1,5l/hectare	1x/Pos emerg. Weeds
				GESAPRIM 500	Triazine	Atrazine	III	5-6 l/hectare	1x/Pre/Pos emergence
				DUAL 960 CE	Acetanilide	Metholcachlor	II	2,5-3,0 l/hectare	1x/Pre emerg.weeds
			Insecticide	ORTHENE 750 BR	Organic Phosphate	Acephate	III	1,0 kg/hectare	1x/Pest incidence
				DECIS 25 CE	Pyretroid	Delthamethrin	III	0,2 l/hectare	1x/Pest incidence
				KARATE 50 CE	Pyretroid	Lambdacyhalothrin	II	0,15 l/hectare	1x/Pest incidence
			Fungicide						
Peach	Jun	Jan	Herbicide	ROUNDUP	Glycin	Glyphosate	IV	2-6 l/hectare	1x/Pos emerg.weeds
				GRAMOXONE 200	Bipyridinium	Paraquat	II	2,0 l/hectare	1x/Pos emerg.weeds
				ZAPP	Glycin	Sulfozate	IV	2,0 l/hectare	1x/Pos emerg.weeds
			Insecticide	LEBAYCID 500	Organic Phosphate	Fenthion	II	0,4-0,5 l/hectare	1x/on Pest incidence
				DIMETOATO	Organic Phosphate	Dimethoate	I	0,6 l/hectare	1-3x/ Pest incidence
				MALATHION	Organic Phosphate	Malathion	III	1,0 l/hectare	1x/ Monitoring Pest
			Fungicide	IMPACT	Triazol	Flutriafol	III	0,3-2,0 l/hectare	1-2x at 1st symptom
				DEROSAL 500 SC	Benzimidazole	Carbendazim	III	0,5-2,0 l/hectare	1-2x at 1st symptom

Source: EMATER-RS Research places: 1) Onion=>Pelotas; 2) Maize=>Arroio Grande; Camaquã; Cerrito; Cristal; Dom Pedrito; Osório. 3) Peach=>Morro Redondo and Pelotas.

RIV-T-15 River Structures and Irrigation Facilities

1. **Number of River Structures and Irrigation Facilities in the Mirim Lake Basin**
2. **Water Demand for Main Sector in the Mirim Lake Basin**
3. **Dam Storage Volume in the Mirim Lake Basin**
4. **Irrigation Area in the Mirim Lake Basin**

1. Number of River Structures and Irrigation Facilities in the Mirim Lake Basin

Symbol	Sub-basin	Pump Station				Dam/Weir				Well				Total			
		Irrigation	Domestic	Industry	Total	Irrigation	Domestic	Industry	Total	Irrigation	Domestic	Industry	Total	Irrigation	Domestic	Industry	Total
L40-1	Mirim Eastern Coast	102	1	0	103	7	0	0	7	0	13	2	15	109	14	2	125
L40-2	Rio Grande	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L40-3	Mangueira	65	0	6	71	8	0	0	8	0	8	15	23	73	8	21	102
L40-4	Jaguarão	37	6	3	46	60	4	3	67	0	5	0	5	97	15	6	118
L40-5	Mirim Western Coast	66	2	1	69	59	0	0	59	0	0	0	0	125	2	1	128
L40-6	Piratini	9	4	1	14	8	0	1	9	0	4	0	4	17	8	2	27
L40-7	West São Gonçalo	5	5	4	14	14	2	1	17	0	0	2	2	19	7	7	33
L40-8	Pelotas	12	3	2	17	3	0	0	3	0	2	1	3	15	5	3	23
	Total	296	21	17	334	159	6	5	170	0	32	20	52	455	59	42	556

Source: Levatamento Cadastral dos Usuario da Agua na Bacia Hidrografica da Lagoa Mirim, Notadamente Irrigantes e Tomada de Agua para Abastecimento Publico e Industrial

Note: M-3 included number of M-2

2. Water Demand for Main Sector in the Mirim Lake Basin

Symbol	Sub-basin	Irrigation Water (m3/s)				Domestic Water (m3/s)				Industrial Water (m3/s)				Total (m3/s)			
		Pump Sta.	Dam/Weir	Well	Total	Pump Sta.	Dam/Weir	Well	Total	Pump Sta.	Dam/Weir	Well	Total	Pump Sta.	Dam/Weir	Well	Total
L40-1	Mirim Eastern Coast	105.676	1.199	0.000	106.875	2.052	0.000	0.095	2.147	0.000	0.000	0.005	0.005	107.728	1.199	0.100	109.027
L40-2	Rio Grande	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L40-3	Mangueira	60.635	1.309	0.000	61.944	0.000	0.000	0.054	0.054	1.910	0.000	0.183	2.093	62.545	1.309	0.237	64.091
L40-4	Jaguarão	13.585	11.378	0.000	24.963	0.914	0.046	0.021	0.981	0.105	0.002	0.000	0.107	14.604	11.426	0.021	26.051
L40-5	Mirim Western Coast	58.517	33.208	0.000	91.725	0.069	0.000	0.000	0.069	0.003	0.001	0.000	0.004	58.589	33.209	0.000	91.798
L40-6	Piratini	7.316	2.283	0.000	9.599	0.193	0.008	0.011	0.212	0.001	0.000	0.000	0.001	7.510	2.291	0.011	9.812
L40-7	West São Gonçalo	5.767	5.918	0.000	11.685	0.555	0.632	0.000	1.187	0.129	0.000	0.003	0.132	6.451	6.550	0.003	13.004
L40-8	Pelotas	10.217	0.496	0.000	10.713	0.572	0.490	0.001	1.063	0.010	0.000	0.003	0.013	10.799	0.986	0.004	11.789
	Total	261.713	55.791		317.504	4.355	1.176	0.182	5.713	2.158	0.003	0.194	2.355	268.226	56.970	0.376	325.572

Source: Levatamento Cadastral dos Usuario da Agua na Bacia Hidrografica da Lagoa Mirim, Notadamente Irrigantes e Tomada de Agua para Abastecimento Publico e Industrial

Note: M-3 included water demand of M-2

3. Dam Storage Volume in the Mirim Lake Basin

No.	Sub-basin	Irrigation (x 1000m3)	Domestic (x 1000m3)	Industry (x 1000m3)	Total (x 1000m3)
L40-1	Mirim Eastern Coast	8,350	0	0	8,350
L40-2	Rio Grande	-	-	-	-
L40-3	Mangueira	9,114	0	0	9,114
L40-4	Jaguarão	79,211	505	15,780	95,496
L40-5	Mirim Western Coast	231,199	0	0	231,199
L40-6	Piratini	15,893	0	150	16,043
L40-7	West São Gonçalo	41,198	9,040	580	50,818
L40-8	Pelotas	3,450	0	0	3,450
	Total	388,415	9,545	16,510	414,470

Source: Levatamento Cadastral dos Usuario da Agua na Bacia Hidrografica da Lagoa Mirim, Notadamente Irrigantes e Tomada de Agua para Abastecimento Publico e Industrial

4. Irrigation Area in the Mirim Lake Basin

Symbol	Sub-basin	by Pomp Station (ha)	by Dam/Weir (ha)	Total (ha)
L40-1	Mirim Eastern Coast	55,586	1,590	57,176
L40-2	Rio Grande	-	-	-
L40-3	Mangueira	23,024	832	23,856
L40-4	Jaguarão	6,235	5,084	11,319
L40-5	Mirim Western Coast	30,196	14,547	44,743
L40-6	Piratini	2,035	2,318	4,353
L40-7	West São Gonçalo	3,030	3,785	6,815
L40-8	Pelotas	2,526	770	3,296
	Total	122,632	28,926	151,558

Source: Levatamento Cadastral dos Usuario da Agua na Bacia Hidrografica da Lagoa Mirim, Notadamente Irrigantes e Tomada de Agua para Abastecimento Publico e Industrial

RIV-T-16 Water Resources State System (SERH)

RIO GRANDE DO SUL WATER RESOURCES STATE SYSTEM

What is it?

The *Sistema Estadual de Recursos Hídricos – SERH*
(Water Resources State System)

is an instrument for water management

as public property,

natural resource of vital importance,

both as an environmental component, indispensable to life,

and as an economic resource

What is new in SERH?

The SERH of Rio Grande do Sul State is based on

- a real experience of more than 10 years acquired by working

- with Sinos and Gravataí committees – first state river basins management committees in Brazil;
- articulately with an inter-institutional action of governmental and non-governmental agencies assembled in a Consultive Commission of the Water Resources Council.

- a doctrine formulated both from such experience and knowledge out of external examples, supported by studies and reflections technically and scientifically grounded

Experience and doctrine articulately formed
the *legal base* of SERH
through a political and institutional action:
article 171 of Rio Grande do Sul State Constitution,
Law 10,350 of December 30th, 1994
(Law of Waters).

SEHR is an *innovative experience* in terms of democracy based on popular participation.

The basic jurisdiction for the citizen participation in the SERH are the HYDROGRAPHIC BASIN MANAGEMENT COMMITTEES.

The Hydrographic Basin Management Committee
is a plural organism **officially** established by the State Government
making up a system with normative, operational, executive authorities
for technical and financial support and control and inspection.
The Committee plays a deliberative role
taking decisions legally enforced.

The qualitative composition of the Committees takes into consideration the roles and interests of the protagonists in relation to the public resource, which is the object of the management:

- users, with economical and social interests in using the resource;
- population of the region (hydrographic basin), with diffuse interests linked to local or regional social and economical development, cultural or political aspects, environmental protection, etc;
- public power holding domain (and corresponding custody) over the resource.

The quantitative composition of the Committees
provides **wide majority** to the society representatives (users and population) over the public power representatives
and establishes a **balance** between the users and population representatives.

The Committee formation process counts on the
organized society participation
considering original and local peculiarities.
The institutional regional leaders are in charge of its coordination.
The State participates providing technical and ideological assistance.
The process is widely open and public, making use of all formal and informal means of communication, information and advertising.

The Hydrographic Basin Management Committee
makes possible the **discussion** and **deliberation** on **common interest subjects,** involving, however, **complex aspects** concerning both knowledge and decision making.

Such complexity requires a **professional approach** with **technical and scientific support to make the deliberations eligible**.

Interaction between participants from different social classes, professions and sectors,
with distinct levels of information, motivation and issues **enhances and enforces the decisions.**

The Hydrographic Region Agency
- state technical entity –
at the Committees disposal and working according to their rules, offers **technical, scientific and operational assistance** in order to make the Committees deliberations eligible and effect the water use taxation and the financial management of the fund arising from it to each basin.

SERH is an innovative model of environmental management

SERH adopts a view of environment resource management which goes beyond the traditional action of the "control-mandate" (rigorous legislation regulating the conservation and use of the resource associated to state licensing, supervision and control over society, having as basic instrument the infraction penalty).

SERH performance is based on integrated planning (planning carried out by those involved – users and citizens – with state assistance) of conservation and rational use of water resources, integrated to its environmental and social surroundings.

The starting point of such planning is the legal fitting of the waters belonging to a hydrographic basin water bodies.

SERH adopts instruments which privilege participation of those involved and the mutual control between the several protagonists, supported by legally enforced decisions collectively taken:

- **water use granting**, through which the State regulates, based on decisions taken by those involved, the sharing among the users of a scarce (limited) resource, ensuring both the preservation of environmental and ecological requirements and the obedience to priorities of socially established uses;

- **water use taxation**

(both at the impounding of water from water bodies and the discharge of effluents on them), through which users are compelled to acknowledge the costs charged on the common use of an economic resource (limited, scarce), being encourage to:

rationing (not wasting) and **rationalization** (improvement of use methods) by paying a value approved both by themselves and the community, including an amount intended to form a **financial fund** to be applied in purposes set forth by them which shall result in benefits from the water resources good use.

The use of water control and inspection are of **common interest**, being each individual encouraged socially and economically to play his/her own role and care for the others performance. There are both technical/financial facilities and the appropriate authority to operate them (the Basin Committee).

The **environmental legislation enforcement**, observing the respective rules such as environmental licensing, and the fulfillment of issuing patterns are now fitted in a more rational and acceptable context.
The repression and punishment are then extreme measures intended to restrain the effective and manifested contravention.

The water resources management in a hydrographic basin can be compared to the **administration of a joint domain**, where the Committee plays the role of the joint owners assembly, with the difference that, in the case of water, it is a public property.

Which are the fundaments of SERH?

= Water is an **environmental resource**, it is an integral part inseparable from the environmental context, in spite of its specificity;

= Water, in our historical context, is an **economic resource**, because it presents characteristics of potential or real **scarcity**, in terms of its uses confronted to its availability, both in quantity and in quality;

= Water is a **public property**, because of its environmental, social and economical importance associated to natural characteristics[1], what prevent it to be considered a private property[2].

= The State is in charge of the **custody** of a public property, in the name of society. The State must insure its conservation, preventing the risks which may affect water quality, quantity and availability to all legitimate users, arbitrating the conflicts on its use and promoting its rationalization.

= The Federal Constitution of Brazil establishes that water is a **state property**. So the federal level and the state members must be responsible for such prerrogative.

= The legal and administrative responsibility for the water property in national and state territories implies promoting the resource **conservation** management and **rationalization of its uses**.

= Such management, having as its object a resource shared by multiple and sometimes conflicting uses, must have a **systemic approach**, integrating public and private involved ones, keeping sector attributions and responsibilities.

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[1] Permanent and dynamic natural hydrological cycle, which associates fluidity, changes in physical state and interaction with other means or substances – absorption, capillarity, dispersion, dissolution.

[2] Private property is characterized by the principals of competition in consumption (only one consumer being able to make use of the resource, by turn) and exclusion (those who do not pay may be excluded from the benefit).

= The management system must address the **direct participation** of the several social protagonists in all phases of planning and action processes, due to both the universal aspect of the several water resources and the implications that its management has with the most varied activities of society.

= The **hydrographic basin**, as the physical unity of water distribution in nature, is the management unity to be addressed by the system.

= The management instrument which makes effective the public control over water sharing by the different users is the state **use granting** to the users.

= The acknowledgment of the water economic value makes possible to apply the **taxation on water use** as an instrument of use rationing and rationalization (and control), with concurrent income generation to be invested in actions aiming water resources management[3] **in the own hydrographic basin where they are arisen**.

= The water resources management base is the water resources conservation **planning** (protection, reclamation and preservation) and improvement (compatibilization, maximization and fosterage) expressed in the Hydrographic Basin Plans and the Water Resources State Plan.

[3] The so-called User-Payer Principle.

Which are the institutional components of SERH?

Conselho de Recursos Hídricos do Rio Grande do Sul (Rio Grande do Sul State Water Resources Council) Such entity represents the State within the whole System, constitutionally responsible for the custody of the policy determined by the Law of Waters (Law 10,350/94). The council acts as the superior deliberative authotiry of the System. It is made up by State Secretaries and representatives both of Basin Committees and Water Resources and Environment National Systems.
Comitês de Gerenciamento de Bacias Hidrográficas (Hydrographic Basins Management Committees) They are being formed in the 22 basins (hydrographic unities), and are established by a government decree. Such committees present the following composition: 40 % are representatives of water users; 40 % are representatives of the hydrographic basin population; and 20 % are representatives of state and federal direct administration institutions. They are the *"water parliaments"* in each basin. Their functions are established by the Law of Waters.
Agências de Regiões Hidrográficas (Hydrographic Regions Agencies) They are technical institutions of the indirect administration to be established in the three Hydrographic Regions set forth by the Law of Waters (Guaíba, Uruguai and Litorânea). They shall support the committees, both technically and in the financial management of the resources rising from the water use taxation.
Departamento de Recursos Hídricos (Water Resources Department) It is an institution of the direct administration in charge of granting both the water use and the technical support to the System, particularly concerning the Water Resources State Plan.
Fundação Estadual de Proteção Ambiental (State Foundation for Environmental Protection) It is a State environmental institution, acknowledged by the Law of Waters as a component of SERH, with specific attributions related to its interfaces with the Environment State System.

- SERH is not hierarchically framed,
it is based, however, on the systemic articulation of its basic institutions
and also of all those participating in the management process.

Luiz Antonio T. Grassi – Feb/99

RIV-T-17 Master Plan

1. Assumption of Slope Steepness in Cangucu Region (L30-3, L40-6)

	Sub-basin	10	20	30	sub-total	Remarks
Pasture-1 (artificial)	L30-3	164.4	89.3	22.5	276.2	
	L40-6	300.5	61.6	0.0	362.1	
	sub-total	464.9	150.9	22.5	638.3	
		4649.0	3018.0	675.0	**13.1**	Average slope steepness (%)
Pasture-2 (natural)	L30-3	1378.7	712.2	522.9	2613.8	
	L40-6	1797.8	389.2	0.0	2187.0	
	sub-total	3176.5	1101.4	522.9	4800.8	
		31765.0	22028.0	15687.0	**14.5**	Average slope steepness (%)
Upland crop	L30-3	560.7	286.9	0.0	847.6	
	L40-6	218.8	40.6	0.0	259.4	
	sub-total	779.5	327.5	0.0	1107.0	
		7795.0	6550.0	0.0	**13.0**	Average slope steepness (%)
Forestation	L30-3	190.0	183.1	58.6	431.7	
	L40-6	237.3	53.0	0.0	290.3	
	sub-total	427.3	236.1	58.6	722.0	
		4273.0	4722.0	1758.0	**14.9**	Average slope steepness (%)
Forest	L30-3	1294.3	894.1	427.6	2616.0	
	L40-6	1711.6	393.9	0.0	2105.5	
	sub-total	3005.9	1288.0	427.6	4721.5	
		30059.0	25760.0	12828.0	**14.5**	Average slope steepness (%)

Source: JICA Study Team

2. Assumption of Slope Steepness in Sutil and Duro Region (L30-3, L30-4)

		10	20	30	sub-total	Remark
Pasture-1 (artificial)	L30-3	164.4	89.3	22.5	276.2	
	L30-4	0.0	0.0	0.0	0.0	
	sub-total	164.4	89.3	22.5	276.2	
		1644.0	1786.0	675.0	**14.9**	Average slope steepness (%)
Pasture-2 (natural)	L30-3	1378.7	712.2	522.9	2613.8	
	L30-4	530.8	333.6	13.2	877.6	
	sub-total	1909.5	1045.8	536.1	3491.4	
		19095.0	20916.0	16083.0	**16.1**	Average slope steepness (%)
Upland crop	L30-3	560.7	286.9	0.0	847.6	
	L30-4	84.8	45.3	0.0	130.1	
	sub-total	645.5	332.2	0.0	977.7	
		6455.0	6644.0	0.0	**13.4**	Average slope steepness (%)
Forestation	L30-3	190.0	183.1	58.6	431.7	
	L30-4	32.5	43.0	0.9	76.4	
	sub-total	222.5	226.1	59.5	508.1	
		2225.0	4522.0	1785.0	**16.8**	Average slope steepness (%)
Forest	L30-3	1294.3	894.1	427.6	2616.0	
	L30-4	454.6	619.5	10.6	1084.7	
	sub-total	1748.9	1513.6	438.2	3700.7	
		17489.0	30272.0	13146.0	**16.5**	Average slope steepness (%)

Source: JICA Study Team