

APPENDICES

Appendix A: Estimation of nutrient content of soil carried away by erosion

1. Estimation of loss of nitrogen

The total nitrogen fraction was assumed that unique in each SMU. It was converted into the Urea and then was transformed into its equivalent cost in Vnd or US\$ with current market price of 2,200 Vnd /kg Urea.

- Nitrogen is converted into urea fertilizer

$$\text{N (kg ha}^{-1}\text{)}/0.46 = \text{Urea (ka ha}^{-1}\text{)}$$
- Calculate kg of Urea /SMU and its cost considering market price of Urea as 2,200 Vnd / kg and 15,400 Vnd = 1US\$

2. Estimation of loss of phosphorus

The total phosphorus portion was assumed that unique in each SMU. It was converted into the supper phosphate and then was converted to its equivalent cost in Vnd or US\$ with current market price of 1,000 Vnd /kg phosphate fertilizer.

- Phosphorus is converted into supper phosphate fertilizer

$$\text{P}_2\text{O}_5 \text{ (kg ha}^{-1}\text{)}/0.16 = \text{supper phosphate fertilizer (kg ha}^{-1}\text{)}$$
- Calculate kg of phosphorus / SMU and its cost using market price of supper phosphate fertilizer as 1,000 Vnd/kg.

3. Estimation of quantity of potassium loss

The total potassium portion was assumed that unique in each SMU. It was converted into the KCL and then was transformed into its cost equivalent in Vnd or US\$ with price of 2,200 Vnd /kg.

- Potassium is converted into KCl fertilizer

$$\text{K}_2\text{O (kg ha}^{-1}\text{)}/0.6 = \text{KCl fertilizer (kg ha}^{-1}\text{)}$$
- Calculate kg of potassium / SMU and its equivalent cost using market price of potassium fertilizer as 2,200 Vnd/kg.

Appendix B: Monthly rainfall record for 12 years in Ba Be District,
Bac Kan province, Viet Nam

Appendix B-1 Monthly rainfall from 1990 to 1995

Month	1990	1991	1992	1993	1994	1995
January	34.1	23.5	27.8	17.4	3	29.5
February	65.9	15.3	11.41	77.6	9.5	32.1
March	251.1	41	33	11	66.4	19.4
April	119.3	15.1	21	161.2	8.2	51.4
May	220.9	165.9	283.2	255.8	169.3	108.1
June	180.8	226.9	221.5	210.2	233.5	249.2
July	370.9	246.1	374.1	270.4	482.3	188.8
August	80.2	287.2	96.1	166.3	269.7	253.4
September	257.5	61.3	114.5	139	135	93.1
October	94.5	17.2	3.6	45.6	74.5	75.9
November	63.1	65.6	1.2	28.9	12.9	30.4
December	1.8	36.5	37.2	2.4	37.8	0

Appendix B-2 Monthly rainfall from 1996 to 2001

Month	1996	1997	1998	1999	2000	2001
January	2.8	63.3	1.5	38	12.4	8.5
February	7.9	3.6	10	3.5	17.2	34
March	208.2	142.2	93.3	24.4	25.2	69
April	28.9	151.4	110.4	199.2	39.7	78
May	170.2	106.6	82.5	191.7	297.8	107.9
June	263.6	176.5	339.8	169.8	152.1	213.3
July	215.6	275.7	262.3	187.4	271.2	253.5
August	373.4	259.7	127.1	411.4	151.5	243.8
September	109.1	89	81.8	88.5	82.5	86.7
October	108.7	86	16.1	107.8	281.7	121.4
November	77.8	3.2	22.3	42.9	2.8	9.6
December	3	11.8	6.2	24.2	5.6	6

Appendix C: Estimating model variables

Appendix C-1 The soil erodibility index (USLE)

Class	Soil type	Soil erodibility
1	Granit/Liparit based yellow soil	0.07
2	Feralit based bright yellow soil	0.05
3	Meca/Philit based red soil	0.07
4	Macro/Bazic Gabro based dark-red soil	0.06
5	Acid Macma based yellow soil	0.08
6	Mica/Philit based red-yellow soil	0.09
7	Macma based neutral dark-red soil	0.13
8	Quazit based bright-yellow soil	0.12
9	Carbonate based high hill dark-red soil	0.11
10	Carbonate based low hill dark-red soil	0.11
11	Valley soil	0.08
12	Valley paddy sediment filled-up soil	0.15
13	Feralit based paddy soil	0.14
14	Carbonate based valley soil	0.16
15	Sediment soil without yearly filling-up	0.17
16	Soil mixing with rock	0.09
17	Fallow soil	0.11

Appendix C-2 Land uses and crop management factor value (USLE)

Class	Land uses	Crop management factor
1	Mature bamboo forest	0.002
2	Mature mixed forest, closed canopy	0.002
3	Mixed forest, medium canopy	0.002
4	Mixed forest, open canopy	0.001
5	Tree plantation	0.010
6	Shrub and regeneration forest	0.014
7	Mosaic shrub, cultivation and grassland	0.140
8	Lowland crop	0.109
9	Upland crop	0.130
10	Bare land and rock	1.000
11	Water bodies	0.000
12	Cloud and shadow	0.010
13	Unclassified	0.010

Appendix C-3 The soil types and K-factor values (SLEMSA)

Soil types	K-factor value
Granit/Liparit based yellow soil	20.35
Feralit based bright yellow soil	21.01
Meca/Philit based red soil	20.35
Macro/Bazic Gabro based dark-red soil	20.35
Acid Macma based yellow soil	20.35
Mica/Philit based red-yellow soil	20.35
Neutral/Bazic based Macma dark-red soil	20.35
Quazit based bright-yellow soil	20.35
Carbonate based high hill dark-red soil	20.35
Carbonate based low hill dark-red soil	21.01
Valley soil	21.70
Valley paddy sediment filled-up soil	21.01
Feralit based paddy soil	21.01
Carbonate based valley soil	21.01
Sediment soil without yearly filling-up	21.01
Soil mixing with rock	21.01
Fallow soil	21.01

Appendix C-4 Type of land use and crop management factor value (SLEMSA)

Type of land use	C-values
Mature bamboo forest	0.0033
Mature mixed forest, closed canopy	0.0028
Mixed forest, medium canopy	0.0032
Mixed forest, open canopy	0.0025
Tree plantation	0.0061
Shrub and regeneration forest	0.0051
Mosaic shrub, cultivation and grassland	0.0612
Lowland crops	0.0620
Upland crops	0.0603
Bare-soil or rock	0.0025
Water body	0.0000
Cloud, shadow	0.0055
Unclassified	0.0041

Appendix C-5 Types of land use and its typical values of A parameter (MMF)

Types of land use	Typical value of A
Mature bamboo forest	30
Mature mixed forest, closed canopy	35
Mixed forest, medium canopy	25
Mixed forest, open canopy	20
Tree plantation	22
Regeneration forest	25
Mosaic shrub, cultivation and grassland	25
Lowland crops	29.5
Upland crops	25
Bare lands or rocks	0
Water bodies	0
Cloud, shadow	15
Unclassified	15

CURRICULUM VITAE**Name:** Mr. Duong Dang Khoi**Date of Birth:** June 10, 1973**Education background:**

1991-1996 B.Sc. Agriculture (Crop Science)
 Thai Nguyen University of Agriculture and Forestry, Thai Nguyen,
 Viet Nam

2001- 2003 Graduate student, Agricultural System Program, Chiang Mai
 University, Thailand

Employment experiences:

1997-1999 Teaching Assistant, Faculty of Crop Science, Thai Nguyen
 University of Agriculture and Forestry

Sept, 1998 Training course of teaching methods in high education, School of
 Educational Management, Ministry of Education and Training,
 Viet Nam

Oct, 1999 Training course of sustainable rural research methods, National
 Institute for Rural Strategic Studies Planning, Ministry of Agriculture
 and Rural Development, Viet Nam

Scholarship:

Funded by Ford Foundation