



Appendices

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Appendices - A

The layout of experimental design

Rep I		Farmer I	Rep II	
P1 M2	P2 M2		P2 M2	P1 M2
P1 M1	P2 M1		P2 M3	P1 M3
P1 M4	P2 M4		P2 M4	P1 M4
P1 M3	P2 M3		P2 M1	P1 M1

Rep I		Farmer II	Rep II	
P2 M2	P1 M2		P1 M2	P2 M2
P2 M1	P1 M1		P1 M3	P2 M3
P2 M4	P1 M4		P1 M4	P2 M4
P2 M3	P1 M3		P1 M1	P2 M1

Farmer III			
Rep I		Rep II	
P1 M1	P2 M1	P1 M3	P2 M3
P1 M2	P2 M2	P1 M2	P2 M2
P1 M3	P2 M3	P1 M1	P2 M1
P1 M4	P2 M4	P1 M4	P2 M4

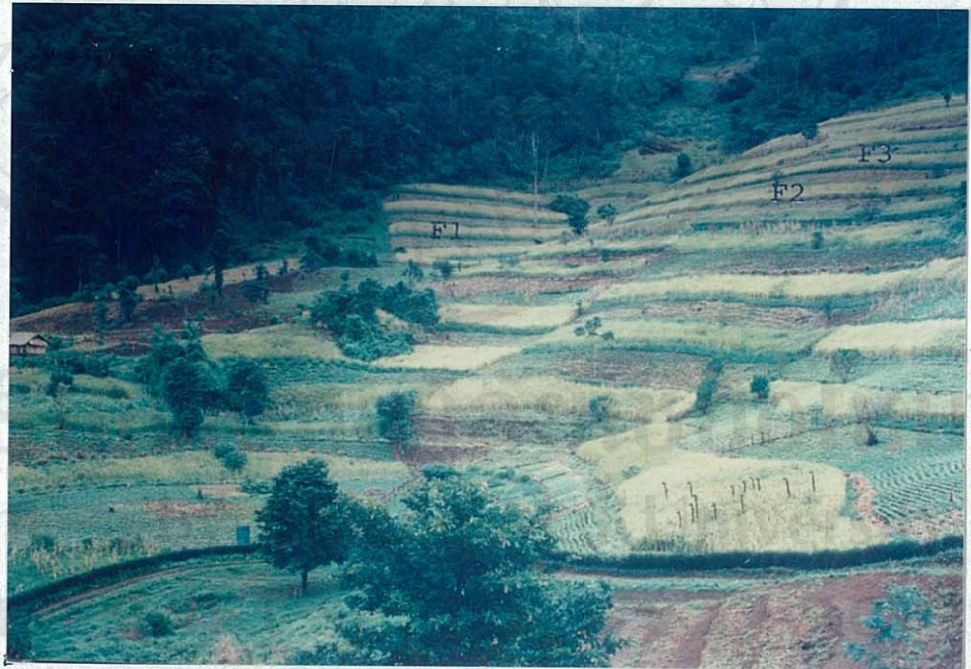


Figure A-1 Overview of the positions of intensive trials on the farmer fields (F1 F2 F3 are intensive farmer fields).

Table B-3 Kinetic energy and erosivity index of Jabo station, Pangmapha district, Maehongson Province, 1989

Date	Time			Rain		KE ton-m/ha-cm	Total KE ton-m/ha	Erosivity Index
	Start	End	min	mm	Intensity cm/hr			
20/05	1.23	1.50	27	10.0	2.2	240.9	240.9	9.2
	4.55	5.02	7	5.5	4.7	269.9	148.5	
	5.02	5.30	28	1.5	0.3	166.1	24.9	
	TOTAL			17.0	7.3	676.9	414.2	
28/05	18.30	18.40	10	4.5	2.7	248.4	111.8	5.0
	18.40	20.40	120	5.0	0.3	156.4	78.2	
	20.40	24.00	195	1.0	0.0	75.4	7.5	
	24.00	1.30	90	14.0	0.9	207.3	290.3	
	1.30	7.00	330	4.3	0.1	111.5	47.9	
TOTAL			28.8	4.0	799.1	535.7		
29/05	19.27	20.12	45	13.0	1.7	231.3	300.6	6.0
	20.12	23.30	198	3.6	0.1	124.4	44.8	
	TOTAL			16.6	1.8	355.6	345.4	
02/06	22.20	23.10	50	15.0	1.8	232.7	349.1	8.6
	23.10	23.35	25	1.5	0.4	170.5	25.6	
	23.35	24.35	60	5.5	0.6	186.9	102.8	
	TOTAL			22.0	2.7	590.1	477.4	
08/06	17.19	18.09	50	27.5	3.3	256.1	704.4	24.9
	18.09	20.10	121	3.5	0.2	142.3	49.8	
	TOTAL			31.0	3.5	398.5	754.2	
29/06	17.50	18.10	20	3.0	0.9	205.9	61.8	14.7
	19.30	19.38	8	3.2	2.4	243.8	78.0	
	20.10	21.00	50	11.0	1.3	220.7	242.8	
	21.10	21.50	40	13.8	2.1	238.1	328.6	
	TOTAL			31.0	6.7	908.6	711.2	
06/07	20.15	21.03	48	2.0	0.3	156.4	31.3	14.5
	22.40	23.20	40	19.0	2.9	250.5	475.9	
	TOTAL			21.0	3.1	406.9	507.2	
11/07	20.06	22.20	134	50.0	2.2	241.2	1205.8	30.3
	22.25	23.50	85	6.2	0.4	178.1	110.4	
	23.50	1.00	70	2.5	0.2	150.5	37.6	
	TOTAL			58.7	2.9	569.7	1353.8	

Table B-3(cont.) Kinetic energy and erosivity index of Jabo station, Pangmapha district, Maehongson Province, 1989

Date	Time		min	Rain		KE ton-m/ha-cm	Total KE ton-m/ha	Erosivity Index
	Start	End		mm	Intensity cm/hr			
13/07	13.17	13.40	23	3.6	0.9	207.6	74.7	10.6
	14.30	15.10	40	7.2	1.1	213.0	153.3	
	20.20	20.30	10	3.7	2.2	240.8	89.1	
	20.45	20.50	5	1.0	1.2	217.0	21.7	
	21.00	21.55	55	14.5	1.6	227.7	330.2	
			TOTAL	30.0	7.0	1106.1	669.1	
14/07	9.40	10.10	30	10.0	2.0	236.8	236.8	5.4
	10.10	14.00	230	3.0	0.1	111.5	33.5	
			TOTAL	13.0	2.1	348.3	270.2	
18/07	17.20	18.00	40	20.0	3.0	252.5	504.9	16.4
	1.80	20.00	120	3.0	0.2	136.7	41.0	
			TOTAL	23.0	3.2	389.1	545.9	
25/07	8.40	20.50	730	10.0	0.1	113.3	113.3	6.7
	20.50	21.20	30	9.5	1.9	234.8	223.1	
	21.20	24.10	170	1.5	0.1	96.4	14.5	
			TOTAL	21.0	2.0	444.6	350.9	
30/07	12.15	13.00	45	2.0	0.3	158.9	31.8	12.0
	13.48	14.15	27	3.8	0.8	203.5	77.3	
	17.57	18.02	5	1.4	1.7	230.1	32.2	
	19.02	19.25	23	9.8	2.6	246.3	241.4	
	22.00	23.24	84	5.0	0.4	170.2	85.1	
			TOTAL	22.0	5.7	1008.9	467.8	
31/07	10.44	11.30	46	3.0	0.4	173.7	52.1	2.2
	12.55	13.00	5	1.0	1.2	217.0	21.7	
	15.52	21.00	308	1.0	0.0	57.8	5.8	
	21.00	21.20	20	3.0	0.9	205.9	61.8	
	21.35	23.40	125	1.7	0.1	113.1	19.2	
	23.40	24.50	70	7.3	0.6	191.9	140.1	
	3.10	4.27	77	3.0	0.2	153.8	46.1	
			TOTAL	20.0	3.5	1113.3	346.8	
05/08	15.00	15.32	32	13.8	2.6	246.7	340.5	13.4
	15.32	16.50	78	1.6	0.1	129.0	20.6	
	21.24	21.52	28	5.0	1.1	212.7	106.3	
	22.10	24.30	140	3.6	0.2	137.8	49.6	
			TOTAL	24.0	3.9	726.2	517.1	

Table B-3(cont.) Kinetic energy and erosivity index of Jabo station,
Pangmapha district, Maehongson Province, 1989

Date	Time			Rain		KE ton-m/ha-cm	Total KE ton-m/ha	Erosivity Index
	Start	End	min	mm	Intensity cm/hr			
14/08	8.30	12.14	224	6.0	0.2	139.3	83.6	5.5
	12.50	19.00	370	2.5	0.0	86.1	21.5	
	12.45	1.13	28	8.5	1.8	233.2	198.2	
			TOTAL	17.0	2.0	458.6	303.3	
16/08	13.36	15.00	84	40.0	2.9	250.6	1002.3	29.8
	3.50	6.02	132	3.0	0.1	133.0	39.9	
			TOTAL	43.0	3.0	383.6	1042.2	
21/08	19.20	20.10	50	15.0	1.8	232.7	349.1	6.3
			TOTAL	15.0	1.8	232.7	349.1	
24/08	18.15	18.30	15	6.2	2.5	245.1	152.0	8.9
	19.35	5.52	617	2.6	0.0	67.9	17.6	
	8.30	8.45	15	1.2	0.5	181.6	21.8	
	8.45	9.10	25	8.8	2.1	238.9	210.2	
	9.10	9.20	20	1.2	0.4	170.5	20.5	
			TOTAL	20.0	5.5	904.0	422.1	
25/08	8.30	8.50	20	2.0	0.6	190.3	38.1	52.7
	8.50	9.10	20	20.5	6.2	280.2	574.4	
	9.10	9.46	36	2.2	0.4	171.2	37.7	
	12.40	13.50	70	7.3	0.6	191.9	140.1	
	15.55	16.00	5	2.0	2.4	243.8	48.8	
	19.20	19.35	15	1.0	0.4	174.6	17.5	
			TOTAL	35.0	10.5	1252.0	856.4	
28/08	23.08	23.20	12	1.0	0.5	183.2	18.3	8.6
	23.39	24.00	21	9.2	2.6	247.4	227.6	
	24.32	4.12	220	5.8	0.2	138.7	80.5	
			TOTAL	16.0	3.3	569.3	326.3	
30/08	10.08	13.00	172	1.0	0.0	80.3	8.0	4.3
	21.46	22.36	50	12.0	1.4	224.1	268.9	
	23.08	23.40	32	1.5	0.3	161.0	24.1	
			TOTAL	14.5	1.8	465.4	301.1	

Table B-3(cont.) Kinetic energy and erosivity index of Jabo station,
Pangmapha district, Maehongson Province, 1989

Date	Time		Rain			KE ton-m/ha-cm	Total KE ton-m/ha	Erosivity Index
	Start	End	min	mm	Intensity cm/hr			
07/09	14.00	14.08	8	4.8	3.6	259.5	124.6	9.9
	14.20	14.55	35	11.7	2.0	236.9	277.2	
	17.35	17.43	8	2.0	1.5	225.7	45.1	
	23.30	23.53	23	2.5	0.7	193.5	48.4	
			TOTAL	21.0	7.8		915.6	
09/09	15.00	15.14	14	4.3	1.8	233.6	100.5	12.8
	20.46	21.30	44	3.7	0.5	183.6	67.9	
	24.20	24.50	30	10.0	2.0	236.8	236.8	
	24.50	2.30	110	12.0	0.7	193.6	232.3	
			TOTAL	30.0	5.0		847.6	
15/09	13.20	13.50	30	14.0	2.8	249.8	349.7	10.9
	13.50	14.05	15	2.0	0.8	201.4	40.3	
			TOTAL	16.0	3.6		451.2	
22/09	22.20	22.55	35	2.4	0.4	175.7	42.2	32.8
	1.10	1.40	30	20.6	4.1	264.7	545.3	
	1.40	2.28	48	5.8	0.7	197.6	114.6	
	3.06	4.10	64	5.2	0.5	182.2	94.8	
			TOTAL	34.0	5.7		820.2	
23/09	15.05	15.12	7	1.3	1.1	214.2	27.8	69.8
	18.52	19.15	23	25.0	6.5	282.5	706.2	
	19.15	22.45	210	18.2	0.5	184.7	336.2	
			TOTAL	44.5	8.2		681.4	
29/09	21.53	23.50	117	35.5	1.8	233.2	827.7	15.1
			TOTAL	35.5	1.8		233.2	
03/10	8.30	18.30	540	2.0	0.0	62.9	12.6	35.2
	7.29	7.40	11	14.7	8.0	290.5	427.0	
			TOTAL	16.7	8.0		353.3	
14/10	16.10	16.32	22	16.5	4.5	268.1	442.4	26.3
	16.54	17.12	18	4.0	1.3	221.1	88.4	
	19.48	3.00	408	5.0	0.1	109.1	54.6	
			TOTAL	25.5	5.9		598.4	
						TOTAL		508.7

Table B-4 Cover percentage by crop residue

Treatment	Collection date											
	1	2	3	4	5	6	7	8	9	10	11	12
Early planting												
No-mulch	0.0	1.8	0.9	0.0	1.7	3.3	6.3	-	-	-	73.3	76.0
Rice straw	77.3	37.2	26.0	14.8	13.2	11.5	4.7	-	-	-	61.8	66.0
Corn/lablab	79.2	27.7	20.2	12.7	12.8	12.8	6.7	-	-	-	73.0	72.8
Corn/red bean	63.3	22.8	16.8	10.8	10.3	9.8	7.8	-	-	-	71.7	75.8
Average	55.0	22.4	16.0	9.6	9.5	9.4	6.4	-	-	-	70.0	72.7
Regular planting												
No-mulch	0.0	2.3	1.2	0.0	1.6	3.2	9.5	-	-	-	65.7	72.7
Rice straw	77.7	40.2	27.6	15.0	13.2	11.3	10.7	-	-	-	64.2	67.3
Corn/lablab	74.3	28.3	21.9	15.5	12.8	10.0	3.3	-	-	-	70.2	74.2
Corn/red bean	62.7	27.2	20.8	14.5	11.3	10.0	6.7	-	-	-	63.7	70.8
Average	53.7	24.5	17.9	11.3	9.7	8.6	7.5	-	-	-	65.9	71.3

N.B. 1 = 3 May 2 = 30 May 3 = 16 Jun 4 = 5 Jul
5 = 24 Jul 6 = 14 Aug 7 = 1 Sep 8 = 15 Sep
9 = 2 Oct 10 = 17 Oct 11 = 1 Nov 12 = 29 Nov

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Table B-5 Cover percentage by crop canopy

Treatment	Date of collection								
	1	2	3	4	5	6	7	8	9
Early planting									
No-mulch	2.2	24.0	20.1	52.6	76.9	70.1	81.0	81.4	86.2
Rice straw	1.2	23.0	10.8	49.1	61.9	63.5	79.3	77.9	85.7
Corn/lablab	4.5	62.7	3.6	44.2	39.0	43.9	79.1	85.4	88.5
Corn/red bean	4.7	59.0	7.9	42.4	74.7	69.7	91.1	78.9	90.3
Average	3.1	42.2	10.6	47.1	63.1	61.8	82.6	80.9	87.7
Regular planting									
No-mulch	0.0	23.3	20.3	58.5	78.8	78.6	87.9	87.3	89.8
Rice straw	0.0	20.4	11.6	54.9	69.4	68.0	84.3	86.0	89.7
Corn/lablab	0.0	36.5	6.9	35.4	52.9	60.8	88.5	89.1	89.7
Corn/red bean	0.1	47.1	10.3	44.4	61.5	59.0	80.3	90.8	94.6
Average	0.0	31.8	12.3	48.3	65.6	66.6	85.2	88.3	90.9

Note 1 = 30 May 2 = 16 Jun 3 = 5 Jul
 4 = 24 Jul 5 = 14 Aug 6 = 1 Sep
 7 = 15 Sep 8 = 2 Oct 9 = 17 Oct

Table B-6 ANOVA of accumulated soil loss as measured by staking technique and estimated by USLE modeling

Source of Variation	df	Staking		USLE	
		MS	P	MS	P
Farmer (A)	2	1704.30	0.790	243.27	0.568
Mulching (C)	3	31445.00	0.035	25429.00	0.000
Rep (B)					
A x B	3	3083.70	0.732	284.57	0.573
A x C	6	4060.60	0.742	996.25	0.108
A x B x C	9	7051.70		403.76	
Planting Date (D)	1	8326.90	0.147	807.54	0.095
A x D	2	6673.90	0.190	8.30	0.943
A x B x D	3	2197.80		139.60	
C x D	3	1876.60	0.631	812.73	0.010
A x C x D	6	8921.10	0.071	409.56	0.043
A x B x C x D	9	3125.30		114.45	

Table B-7 Top soil loss from observed upland rice fields (t/ha) by USLE modeling and staking technique

Farmer No.	Slope %	Length of Slope (m)	USLE Modeling	Staking technique
1	13.40	29.50	193.07	412.38
2	12.20	21.00	137.67	234.35
3	22.60	53.00	499.09	59.95
4	19.50	42.80	308.80	14.53
5	34.90	67.70	870.46	156.23
6	28.80	63.00	767.88	49.05
7	38.50	33.80	674.33	-43.60
8	34.10	29.50	593.05	243.43
9	41.70	22.70	504.13	243.43
10	42.90	93.00	1427.99	18.17
11	39.00	39.20	814.03	390.58
12	36.90	20.40	530.38	248.88

Table B-8 The C-value for each crop stage period of observed fields.

Farmer No.	C-value											
	1	2	3	4	5	6	7	8	9	10	11	12
Period F (Rough fallow) before planting (Apr to May 8.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Period SB From planting to 10 % canopy cover (May 8. to Jul 5.)	0.33	0.34	0.33	0.33	0.32	0.33	0.33	0.33	0.34	0.34	0.33	0.33
Period 1 (Establishment) From 10 to 50% cover (Jul 5. to Jul 27.)	0.07	0.08	0.05	0.07	0.09	0.07	0.06	0.04	0.07	0.08	0.09	0.08
Period 2 (Development) From 50 to 75% cover (Jul 27. to Sep 8.)	0.06	0.07	0.03	0.04	0.07	0.07	0.03	0.03	0.06	0.06	0.08	0.06
Period 3 (Maturing crop) From 75% to harvesting (Sep 8. to Oct 17.)	0.26	0.21	0.15	0.20	0.17	0.35	0.21	0.15	0.15	0.16	0.18	0.25
Average	0.71	0.70	0.56	0.64	0.65	0.82	0.64	0.54	0.62	0.64	0.67	0.72

Table B-9 The C-Value for each crop stage period on different residue management

Treatment	Early planting			Regular planting		
	NONE	RICE-MUL	C/LL C/RB	NONE	RICE-MUL	C/LL C/RB
Period F (Rough fallow) Before planting (Apr to May 8.)	0.00	0.00	0.00 0.00	0.00	0.00	0.00 0.00
Period SB From planting to 10 % canopy cover (May 8. to Jul 5.)	0.31	0.14	0.16 0.18	0.31	0.14	0.17 0.17
Period 1 (Establishment) From 10 to 50% cover (Jul 5. to Jul 27.)	0.06	0.05	0.05 0.05	0.06	0.04	0.04 0.05
Period 2 (Development) From 50 to 75% cover (Jul 27. to Sep 8.)	0.04	0.05	0.04 0.04	0.04	0.04	0.04 0.05
Period 3 (Maturing crop) From 75% to harvesting (Sep 8. to Oct 17.)	0.14	0.15	0.13 0.13	0.12	0.12	0.12 0.13
Average	0.55	0.38	0.39 0.41	0.52	0.34	0.37 0.40

Appendices - C

Estimating Percentage of Mulch Cover

"Mulch cover percentage" is the percentage of the field area that is covered by pieces of mulch lying on the surface. A simple method of estimating mulch cover on a field is with a cord, preferably not shorter than 50 ft, that has 100 equally spaced knot or other readily visible markings. The cord is stretched diagonally across several rows, and the knots that contact a piece of mulch are counted. This procedure is repeated at randomly selected spots on the field, and the data are averaged to obtain a representative value for the field.



Figure C-1 Estimating percentage of mulch cover

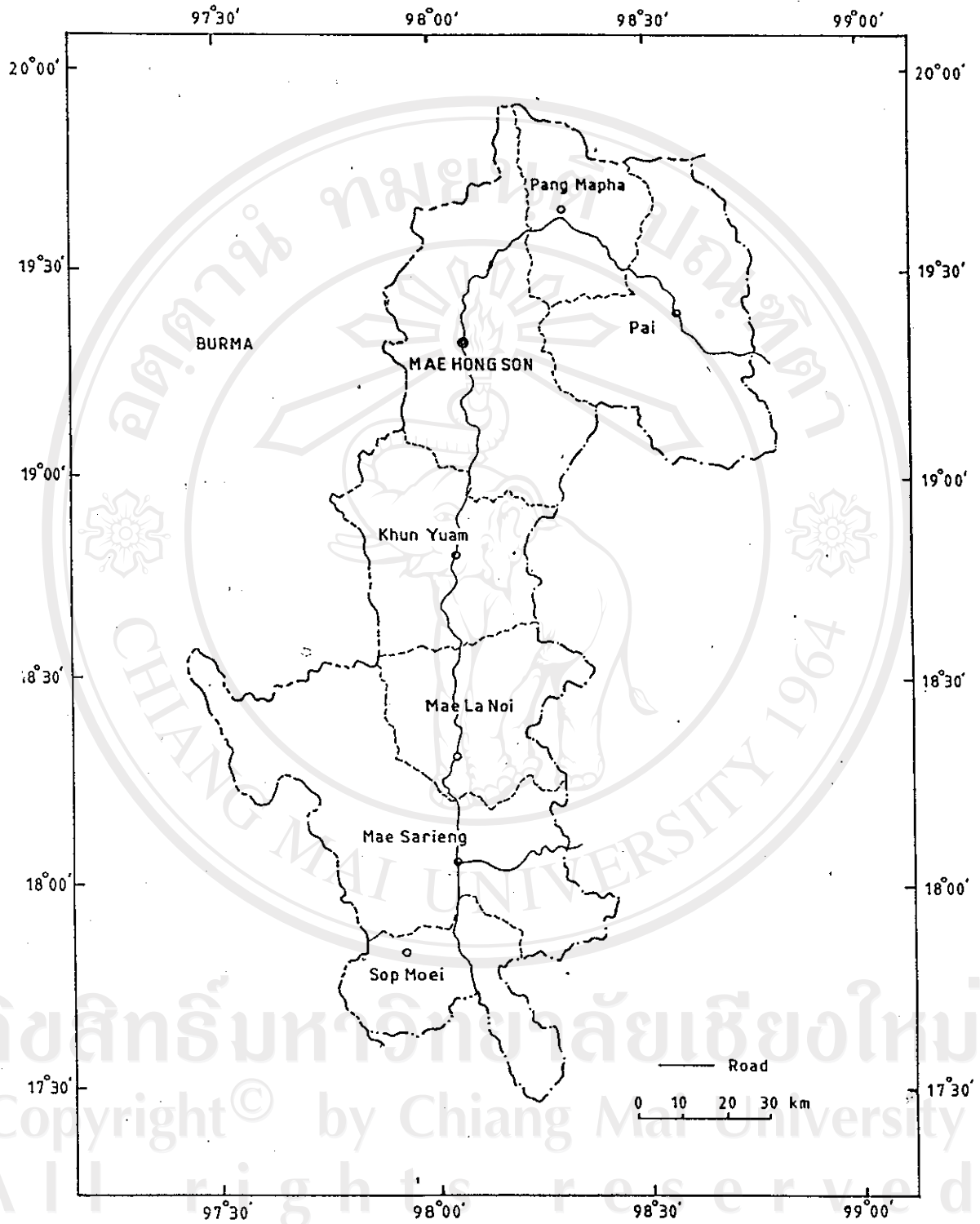


Figure C-2 Map of Mae Hong Son Province

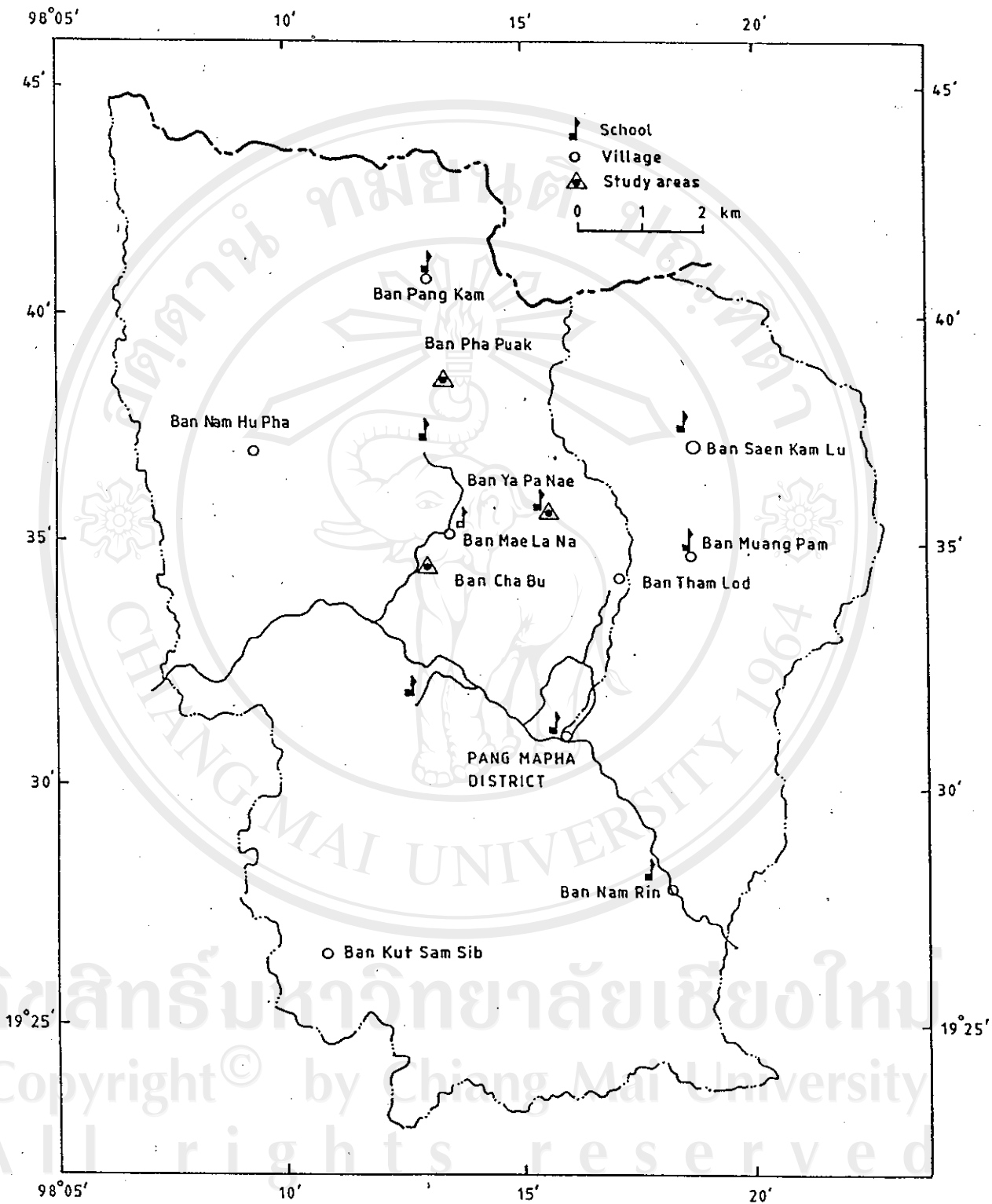


Figure C-3 Map of Pang Ma Pha District

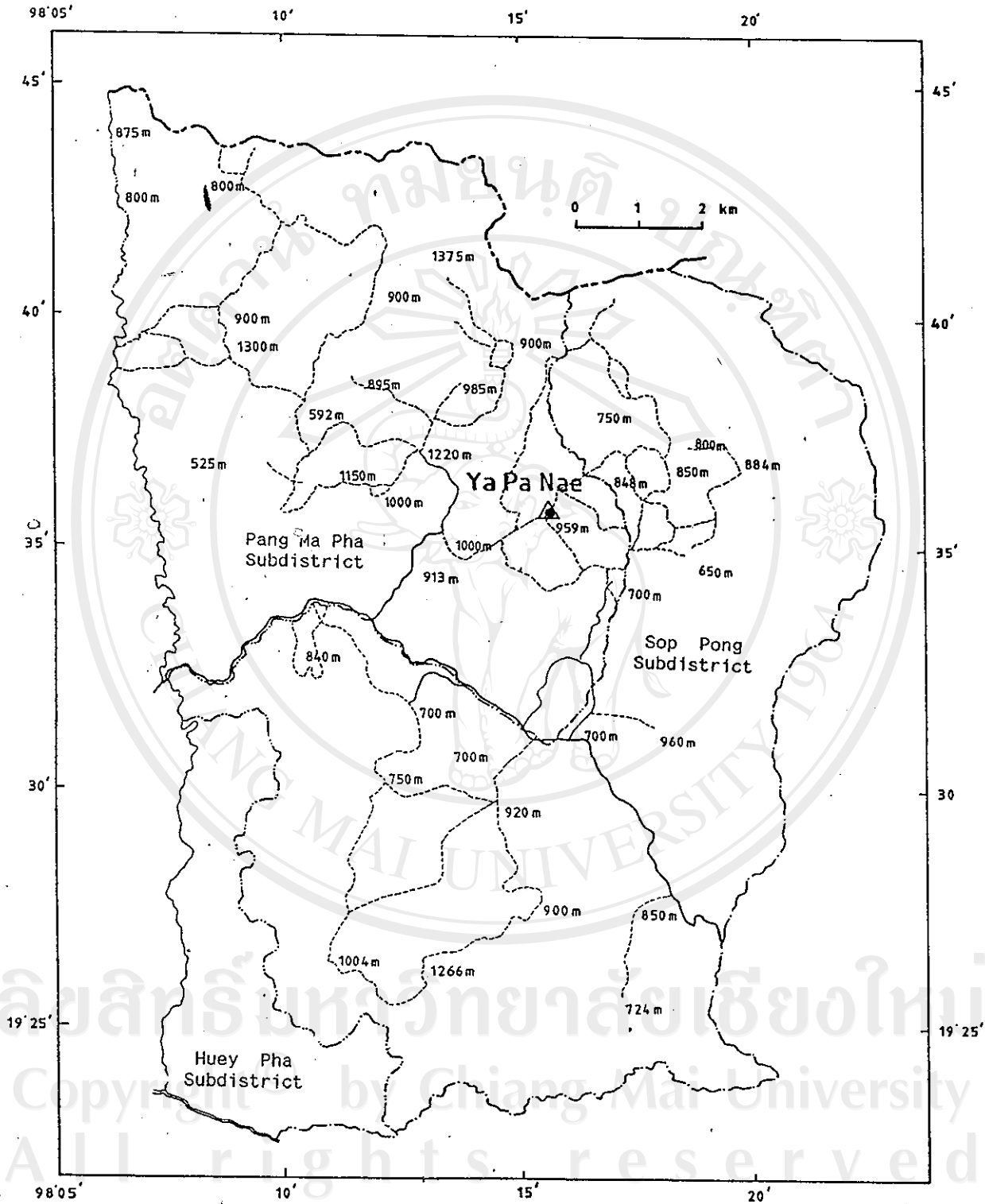


Figure C-4 Map of road and altitude of Pang Ma Pha District

Curriculum Vitae

Name : Sanan Peukrai (Mr.)

Date of Birth : August 15, 1956

Place of Birth : Pasang, Lumphun, THAILAND

Educational Background

1975-1979 : B.Sc. (Agriculture ; Soil Science)
: Chiang Mai University
: Chiang Mai, THAILAND

1987-1987 : Certificate
: Resources Management Training Course
: International Crops Research Institute
: for the Semi-Arid Tropics
: Andhra Pradesh, INDIA

1988-1990 : M.Sc. (Agricultural Systems)
: Chiang Mai University
: Chiang Mai, THAILAND

Employment Experience

1979-1980 : Agronomist
: Land Use Planning Division
: Department of Land Development

1980-1984 : Soil Conservationist
: Division of Soil & Water Conservation
: and Management
: Department of Land Development

1984- : Soil Conservationist
: Technical Section
: Office of Land Development Region 6
: Department of Land Development

Notification

- 1985 : Certificate of Outstanding in Reserch
 : Thai-Australia and World Bank Land
 : Development Project
 : Department of Land Development
- 1985 : Certificate for Workshop in Research
 : Procedures for Technical Assistance
 : Thai-Australia and World Bank Land
 : Development Project
 : Department of Land Development

Scholarships/Grants

- 1988-1990 : The Ford Foundation (thru the Agricultural
 : Systems Program, Multiple Cropping Center,
 : Faculty of Agriculture, Chiang Mai
 : University)
- 1989-1990 : Rockefeller Brothers Fund (thru Southeast
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