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APPENDICES

APPENDIX A

FIGURES

1. Site selection and sampling point in the field experiment

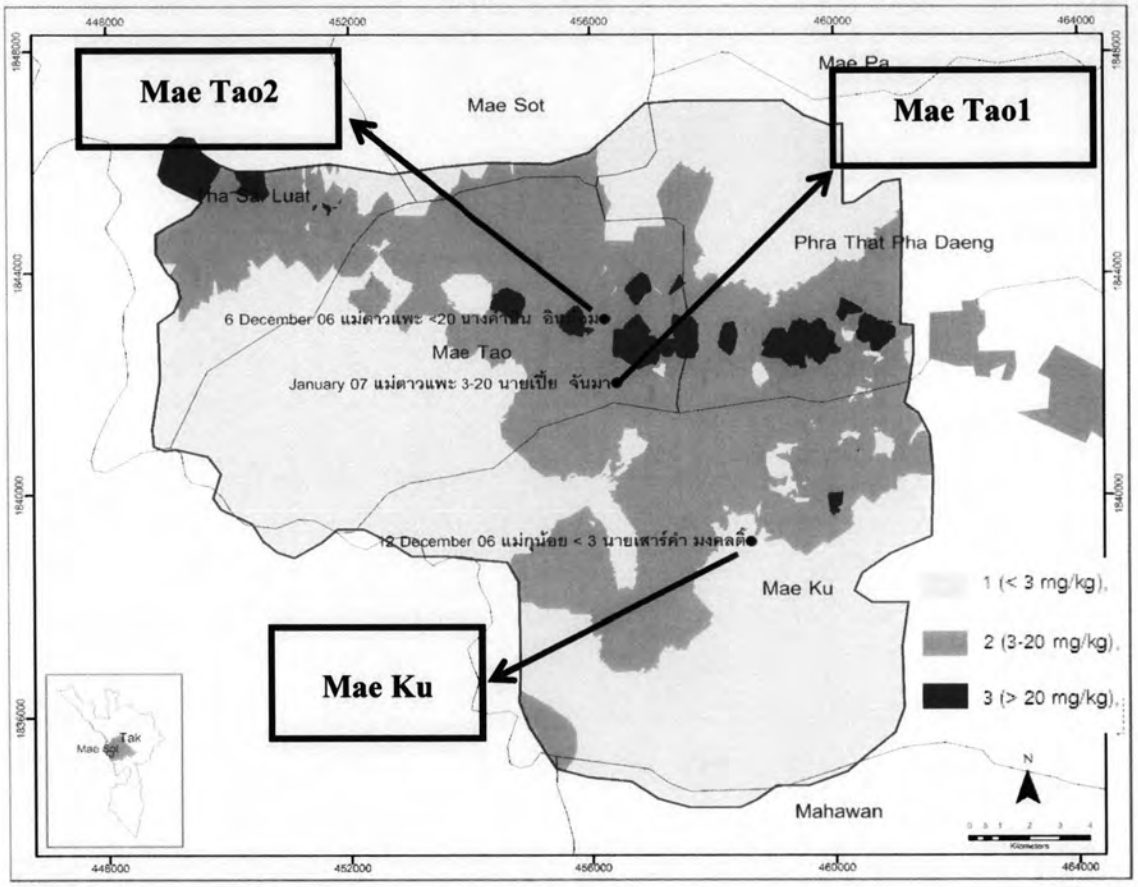
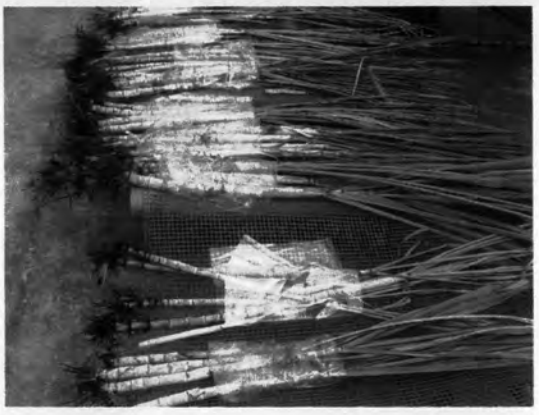


Figure A-1 The map for site selection and sampling point in the field experiment in Mae Ku (< 3 mg Cd/kg), Mae Tao1 (3-20 mg Cd/ kg) and Mae Tao2 (> 20 mg Cd/kg), Tak province



1 2 3 4 5 6	1. Site preparation and sugarcane cultivation 2. Sugarcane cultivation 3. The second months after cultivation 4. Sugarcane sample collection 5. Sample analysis: plant preparation 6. 4 parts of sugarcane (underground stem, root, stem, leave)

Figure A-2 Field experiment

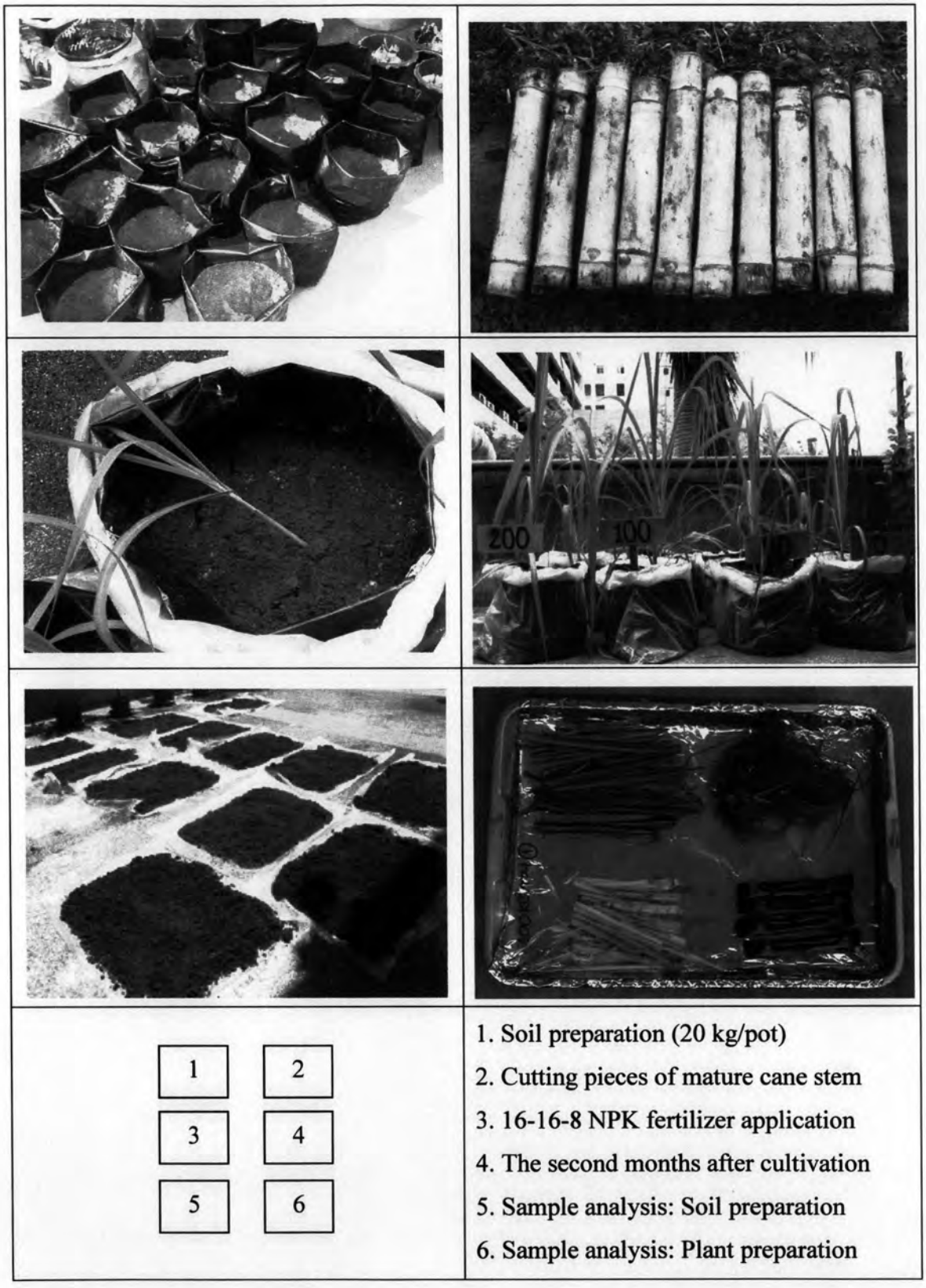
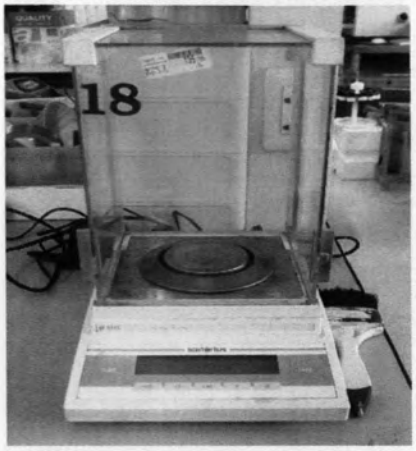
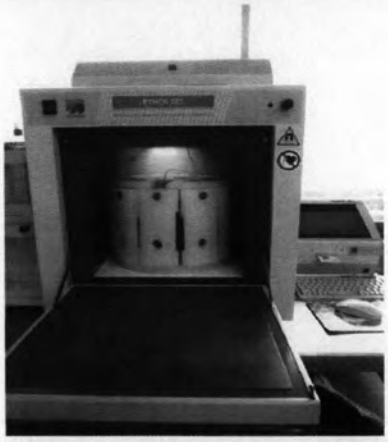
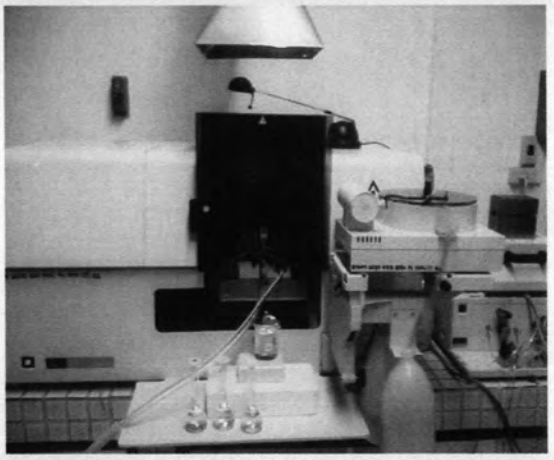
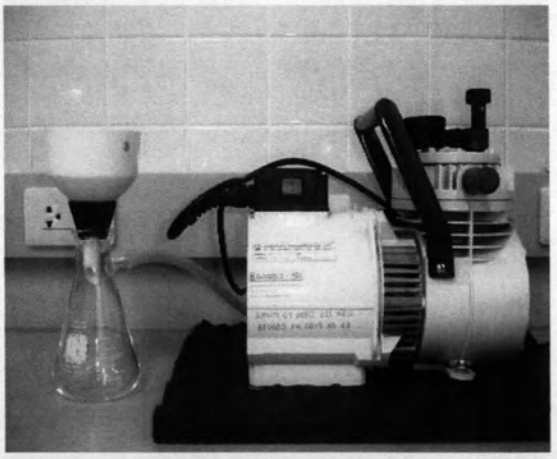


Figure A-3 Pot experiment









1 2
3 4
5 6

1. Analytical balance 4 digits
2. Hot air oven
3. Microwave
4. Atomic Absorption Spectrophotometer
5. Spectrophotometer
6. Buchner's funnel and vacuum pump

Figure A-4 Instruments used in the study

APPENDIX B
SAMPLE ANALYSIS

1. USEPA 3052 method

1.1 Analysis of total metal in soil and fertilizer samples

A representative sample of 0.5 g was digested in 9 ml 37% HCl and 3 ml 65% HNO_3. The sample and acid are placed in suitably inert polymeric microwave vessels then the vessels are sealed and heated in the microwave system. The step of temperature and time in the Microwave Digestion System was present in Table A-1. After cooling, the sample was filtrated using Whatman filter paper No. 40 (Ø 110 mm.). All samples were made up to 25 ml by deionized water and preserved at 4° C until analysis.

Table A-1 Temperature and time used for soil and fertilizer digestion

Step	Time (min)	Temperature (°C)
1	10	200
2	15	200

1.2 Analysis of total metal in sugarcane samples

A representative of 0.5 g of roots, underground stems, bagasses (stems for 2 months) and leaves was digested in 8 ml HNO_3 and 2 ml H_2O_2. Sample and acid are placed in an inert vessel then the vessels are sealed and heated in the microwave system. The step of temperature and time in the Microwave Digestion System was present in Table A-2. After cooling, the sample was filtrated using Whatman filter paper No. 40 (Ø 110 mm.). All samples were made up to 25 ml by deionized water and preserved at 4° C until analysis.

Table A-2 Temperature and time used for sugarcane sample digestion

Step	Time (min)	Temperature (°C)
1	3	85
2	9	145
3	4	200
4	14	200

2. Tri-Acid digestion

A sugarcane juice sample was digested with repeated additions (5 ml) of a mixture of acid 10:1:4 (v/v/v) (HNO_3: H_2SO_4: $HClO_4$) on the hot plate at 95±5 °C for 30 minutes. After sample cool down repeat this step again until get clear solution. After that, samples were filtrated using Whatman filter paper No. 40 (Ø 110 mm). The sample were made up to 25 ml by deionized water and preserved at 4° C until analysis.

3. DTPA extraction method

10 g sub-sample of air-dried soil was placed in the Erlenmeyer flask and added with DTPA extracted solution (the mixture of 0.005 M DTPA, 0.01 M $CaCl_2$ and 0.1 M TEA) and seal with parafilm. The flask was shaken for 2 hour at 120 rpm. After that, sample was filtrated using Buchner's funnel and vacuum pump with GF/C (Glass Micro Filters) filter paper (Ø 70 mm.). The sample was are stored in polyethylene containers and finally stored at 4 °C for analysis.

3.1 Preparation for DTPA extractant: 0.005 mol/L DTPA

The DTPA extracting solution shall be prepared containing 0.005 mol/l diethylenetriamine-pentaacetic acid (DTPA) [$C_{14}H_{23}N_3O_{10}$], 0.01 mol/l triethanolamine (TEA) [$(HOCH_2CH_2)_3N$] and adjusted to pH 7.3. To prepare 10 L of this solution, dissolve 149.2 g reagent grade TEA, 19.67 g DTPA and 14.7 g calcium chloride [$CaCl_2.2H_2O$] in approximately 200 mL distilled water. Allow sufficient time for the DTPA to dissolve and dilute to approximately 9 L. Adjust the pH to 7.3±0.5 with HCl while stirring and dilute to 10 L. This solution is stable for several months.

4. Total phosphorus (Vanadomolybdate method)

4.1 Preparation for vanadomolybdate solution

- Dissolve 20 g ammonium molybdate [$(NH_4)_6Mo_7O_{24}.4H_2O$] in 600 ml of warm deionized water.
- Dissolve 1 g ammonium metavanadate [NH_4VO_3] in 600 ml of warm deionized water.
- Mixed the cooled ammonium molybdate to ammonium metavanadate and bulk to volume of 2 L with deionized water. The solution was preserved in refrigerator at 4° C. This solution is stable for several months.

4.2 Standard Phosphorus Solution

- Standard Phosphorus Solution (P = 100 mg/L): Dissolve 0.4393 g potassium dihydrogen orthophosphate (KH_2PO_4) in 100 mL deionised water, transfer to a 1 L volumetric flask, and bulk to volume with deionized water.
- Standard Phosphorus Solution 0, 5, 10, 15 and 20 mgP/L: prepare from 100 mg/L Standard Phosphorus Solution by adding conc. $HClO_4$ (Standard P Solution: $HClO_4$ = 10:1)

- Pipett 5 ml Standard Phosphorus Solution 0, 5, 10, 15 and 20 mgP/L and placed in test tube added with 5 ml vanadomolybdate solution, mix and stand for 30 minutes. Measure and record the absorbance of reference standard at 420 nm wavelength. The standard curve was plotted between phosphorus concentration and absorbance (Figure D-1). Use the chart or equation to determine the phosphorus concentration in the sample solutions.

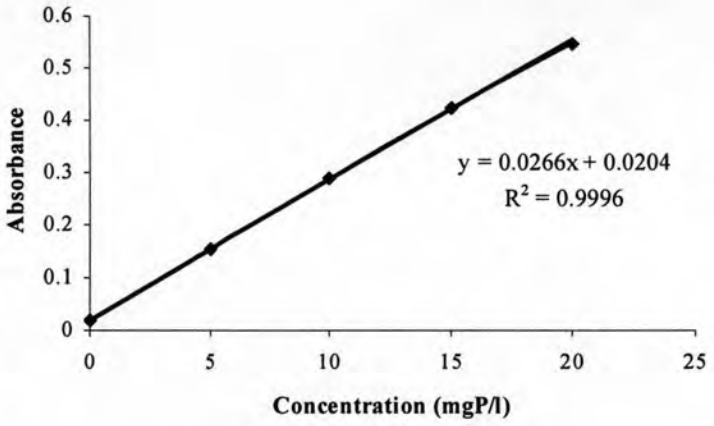


Figure D-1 Standard curve for total phosphorus

4.3 Analysis method

Sub-sample of 1 g soil was digested with repeated additions (5 ml) of a mixture of acid 1:2 (v/v) ($HClO_4$: HNO_3) on the hot plate at 200 °C. After sample cool down repeat this step again until get clear solution. After that, samples were filtrated using Whatman filter paper No. 40 (Ø 110 mm.) and make up volume to 100 ml. Pipett 5 ml sample solution and placed in test tube added with 5 ml vanadomolybdate solution, mix and stand for 30 minutes. Measure and record the absorbance of reference standard at 420 nm wavelength.

4.4 Calculation

$$\text{mgP/kg} = \frac{\text{mgP/L from standard curve x 100 ml of digested sample}}{\text{1 g (weight of soil)}}$$

5. Available phosphorus (Bray II method)

5.1 Preparation for Bray II Extracting Solution

1) Reagents

1.1 Ammonium fluoride (NH_4F) 1 N

Dissolve 37 g ammonium fluoride (NH_4F) in deionised water and transfer to a 1 L volumetric flask. The volume of solution was made up to 1 L.

1.2 Hydrochloric acid (HCl) 0.5 N

20.7 ml of 37% hydrochloric acid (HCl) was filled in 500 ml volumetric flask and bulk to volume with deionised water.

1.3 Extracting solution

Mixed 30 ml NH_4F 1 N with 200 ml HCl 0.5 N and the volume was made up to 1 L.

2) Reagent A

- Dissolve 12 g ammonium molybdate [$(NH_4)_6Mo_7O_{24}.4H_2O$] in 250 ml of warm deionized water.
- Dissolve 0.2908 g potassium antimonyl tartrate ($KSbO.C_4H_4O_6$) separately in 100 mL deionized water.
- 5 N H_2SO_4 was prepared separately by Place 500 mL deionised water in a 1 L volumetric flask, slowly add 139 ml conc. H_2SO_4.
- Add the cooled molybdate and tartrate solutions to 5 N H_2SO_4, mix, and bulk to volume of 2.5 L with deionized water. The solution was preserved in refrigerator at 4° C. This solution is stable for several months.

3) Reagent B

Dissolve 1.056 g Ascorbic Acid ($C_6H_8O_6$) in 250 ml of Reagent A. Prepare fresh a volume of this solution sufficient for the day's work by proportioning the above quantities.

4) Standard Phosphorus Solution

- Standard Phosphorus Solution (P = 50 mg/L): Dissolve 0.2196 g potassium dihydrogen orthophosphate (KH_2PO_4) in 100 mL deionised water, transfer to a 1 L volumetric flask, and bulk to volume with deionized water.
- Standard Phosphorus Solution (P = 5 mg/L): prepare from 50 mg/L Standard Phosphorus Solution.
- Prepare a set of reference standards from the 5 mg/L Standard Phosphorus Solution. Pipett 1, 2, 3, 4 and 5 ml of 5 mg/L Standard Phosphorus Solution into 25 ml volumetric flask added with Reagent B and make up volume with deionized water. Measure and record the absorbance of reference standard at 882 nm wavelength. The standard curve was plotted between phosphorus concentration and absorbance (Figure D-2). Use the chart or equation to determine the phosphorus concentration in the sample solutions.

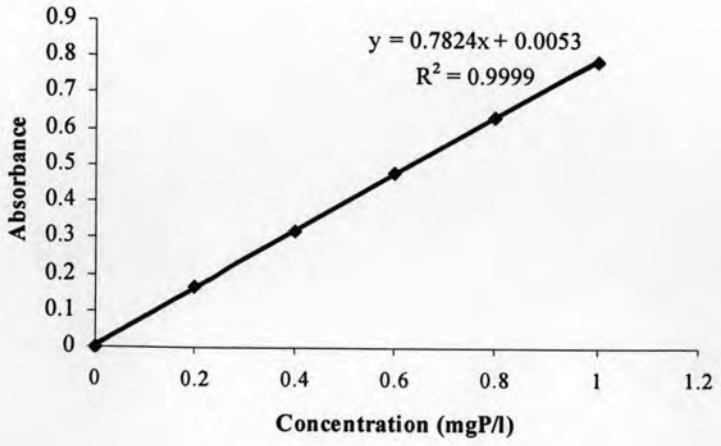


Figure D-2 Standard curve for available phosphorus

5.2 Analysis method

Sub-sample of 10 g soil was placed in the Erlenmeyer flask and added with 100 ml Bray II extracting solution (soil: extracting solution = 1: 10). The flask was shaken vigorously for 1 minute. After that, it was filtrated using Whatman filter paper No. 40. Then 5 ml of extracted sample solution was placed in 25 ml volumetric flask added with 5 ml Reagent B make up volume by deionized water and stand for 10 minutes. Measure and record the absorbance of samples at 882 nm wavelength.

5.3 Calculation

$$\text{mgP/kg} = \text{mgP/L from standard curve} \times \frac{25\ \text{ml}}{5\ \text{ml sample solution}} \times \frac{100\ \text{ml extactant}}{10\ \text{g soil sample}}$$

APPENDIX C
CALCULATION

1. Calculation for the amount of fertilizer added in pot experiment

Given	Depth of top soil	=	17.78 cm (7 inches)
	Soil density	=	1.3 g/cm^3
	1 rai	=	1,600 m^2

The amount of fertilizer added (g) equal to:

$$\frac{S \times P \times 10^2}{(1{,}600 \times 17.78) \times 1.3}$$

As given: S = Weight of soil (kg)

P = Fertilizer application rate (kg/rai)

2. Calculation for % phosphorus uptake as compare to background total phosphorus

$$\% \text{ phosphorus uptake} = \frac{\text{TP initial} - \text{TP after harvest}}{\text{Background TP}} \times 100$$

APPENDIX D

STATISTIC ANALYSIS

1. Field experiment

1.1 Concentration of total cadmium and zinc in soil

1) Cadmium

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	2.3497	
Mae Tao1 (3-20 mg/kg)	3	15.7633	
Mae Tao2 (>20 mg/kg)	3		161.0797
Sig.		.675	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	2.2277	
Mae Tao1 (3-20 mg/kg)	3	13.9811	
Mae Tao2 (>20 mg/kg)	3		153.1281
Sig.		.448	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	33.3920	
Mae Tao1 (3-20 mg/kg)	3	71.7075	
Mae Tao2 (>20 mg/kg)	3		2074.3209
Sig.		.602	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	30.2922	
Mae Tao1 (3-20 mg/kg)	3	65.7587	
Mae Tao2 (>20 mg/kg)	3		2048.7121
Sig.		.528	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

1.2 Concentration of available cadmium and zinc in soil

1) Cadmium

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	.0553	
Mae Tao1 (3-20 mg/kg)	3	.1886	
Mae Tao2 (>20 mg/kg)	3		18.5211
Sig.		.918	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	.2473	
Mae Tao1 (3-20 mg/kg)	3	.3265	
Mae Tao2 (>20 mg/kg)	3		27.5243
Sig.		.894	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	1.0795	
Mae Tao1 (3-20 mg/kg)	3	3.2583	
Mae Tao2 (>20 mg/kg)	3		154.7718
Sig.		.915	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	1.9915	
Mae Tao1 (3-20 mg/kg)	3	4.4882	
Mae Tao2 (>20 mg/kg)	3		253.9158
Sig.		.863	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

1.3 Concentration of total cadmium and zinc in sugarcane

1) Cadmium

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	3.5639	
Mae Tao1 (3-20 mg/kg)	3	4.3209	
Mae Tao2 (>20 mg/kg)	3		7.7281
Sig.		.594	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05		
		1	2	3
Mae Ku (<3 mg/Kg)	3	2.1489		
Mae Tao1 (3-20 mg/kg)	3		3.6665	
Mae Tao2 (>20 mg/kg)	3			6.0584
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Ku (<3 mg/Kg)	3	15.9206	
Mae Tao1 (3-20 mg/kg)	3	25.9237	
Mae Tao2 (>20 mg/kg)	3		63.7718
Sig.		.162	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05		
		1	2	3
Mae Ku (<3 mg/Kg)	3	42.5469		
Mae Tao1 (3-20 mg/kg)	3		73.5377	
Mae Tao2 (>20 mg/kg)	3			221.5971
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

1.4 Concentration of total cadmium and zinc in sugarcane juice

1) Cadmium

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05	
		1	2
Mae Tao1 (3-20 mg/kg)	3	.01467	
Mae Ku (<3 mg/Kg)	3	.01533	
Mae Tao2 (>20 mg/kg)	3		.08567
Sig.		.980	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

6 months

Duncan

Range of cadmium concentration in soil	N	Subset for alpha = .05
		1
Mae Ku (<3 mg/Kg)	3	3.6033
Mae Tao1 (3-20 mg/kg)	3	3.7900
Mae Tao2 (>20 mg/kg)	3	6.6517
Sig.		.054

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2. Pot experiment

2.1 Effect of fertilizer application rates on soil pH

2 months

Duncan [a]

Fertilizer application rates	N	Subset for alpha = .05			
		1	2	3	4
0 kg/rai	3	7.2033			
50 kg/rai	3		7.3133		
100 kg/rai	3			7.3800	
200 kg/rai	3				7.5033
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan [a]

Fertilizer application rates	N	Subset for alpha = .05			
		1	2	3	4
0 kg/rai	3	7.0433			
50 kg/rai	3		7.1367		
100 kg/rai	3			7.2333	
200 kg/rai	3				7.3200
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a Uses Harmonic Mean Sample Size = 3.000.

2.2 Effect of fertilizer application rates on sugarcane dry matter yield

2 months

Duncan

Fertilizer application rate (kg/rai)	N	Subset for alpha = .05	
		1	2
0 kg/rai	3	20.7033	
50 kg/rai	3	24.5367	24.5367
100 kg/rai	3	25.8733	25.8733
200 kg/rai	3		27.1433
Sig.		.093	.364

Means for groups in homogeneous subsets are displayed.

a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan[a]

Fertilizer application rate (kg/rai)	N	Subset for alpha = .05		
		1	2	3
0 kg/rai	3	119.2000		
50 kg/rai	3		177.1667	
100 kg/rai	3		184.0333	
200 kg/rai	3			199.8667
Sig.		1.000	.275	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.3 Effect of fertilizer application rates on total phosphorus in soil

2 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05
		1
0 kg/rai	3	309.3513
50 kg/rai	3	316.9715
100 kg/rai	3	324.3619
200 kg/rai	3	340.5000
Sig.		.212

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05	
		1	2
0 kg/rai	3	258.3242	
50 kg/rai	3	269.5287	269.5287
100 kg/rai	3	282.0741	282.0741
200 kg/rai	3		306.8402
Sig.		.176	.058

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.4 Effect of fertilizer application rates on available phosphorus in soil

2 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05			
		1	2	3	4
0 kg/rai	3	12.3207			
50 kg/rai	3		14.9035		
100 kg/rai	3			19.9059	
200 kg/rai	3				26.5502
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05			
		1	2	3	4
0 kg/rai	3	8.9101			
50 kg/rai	3		13.5253		
100 kg/rai	3			17.3795	
200 kg/rai	3				24.9571
		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.5 Effect of fertilizer application rates on total cadmium and zinc in soil

1) Cadmium

2 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05
		1
0 kg/rai	3	2.5628
50 kg/rai	3	2.5630
100 kg/rai	3	2.5631
200 kg/rai	3	2.5638
Sig.		.995

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

. 6 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05
		1
0 kg/rai	3	2.5456
50 kg/rai	3	2.5467
100 kg/rai	3	2.5497
200 kg/rai	3	2.5505
Sig.		.973

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05
		1
0 kg/rai	3	27.9785
50 kg/rai	3	27.9831
100 kg/rai	3	27.9942
200 kg/rai	3	27.9993
Sig.		.974

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05
		1
200 kg/rai	3	27.8531
100 kg/rai	3	27.8484
50 kg/rai	3	27.8406
0 kg/rai	3	27.8386
Sig.		.989

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.6 Effect of fertilizer application rate on available cadmium and zinc in soils

1) Cadmium

2 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05		
		1	2	3
200 kg/rai	3	.0793		
100 kg/rai	3		.1033	
50 kg/rai	3		.1193	
0 kg/rai	3			.1647
Sig.		1.000	.118	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05		
		1	2	3
200 kg/rai	3	.1492		
100 kg/rai	3		.1853	
50 kg/rai	3		.2113	
0 kg/rai	3			.2625
Sig.		1.000	.096	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05		
		1	2	3
200 kg/rai	3	.9696		
100 kg/rai	3	.9795	.9795	
50 kg/rai	3		1.1080	
0 kg/rai	3			1.552
Sig.		.867	.050	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05	
		1	2
200 kg/rai	3	1.0600	
100 kg/rai	3	1.1243	
50 kg/rai	3	1.1950	
0 kg/rai	3		1.6358
Sig.		.092	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.7 Effect of fertilizer application rate on concentration of cadmium and zinc in whole sugarcane

1) Cadmium

2 months

Duncan

Fertilizers application rates	N	Subset for alpha = .05		
		1	2	3
200 kg/rai	3	4.9551		
100 kg/rai	3		6.2437	
50 kg/rai	3		6.6500	
0 kg/rai	3			7.8727
Sig.		1.000	.164	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizers application rates	N	Subset for alpha = .05		
		1	2	3
200 kg/rai	3	2.0007		
100 kg/rai	3		2.6060	
50 kg/rai	3		2.7921	
0 kg/rai	3			4.2797
Sig.		1.000	.080	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

2 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05	
		1	2
200 kg/rai	3	11.9069	
100 kg/rai	3	12.4060	
50 kg/rai	3	12.7279	12.7279
0 kg/rai	3		14.2736
Sig.		.275	.051

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

6 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05	
		1	2
200 kg/rai	3	20.2599	
100 kg/rai	3	20.8023	
50 kg/rai	3	21.0995	
0 kg/rai	3		24.6097
Sig.		.396	1.000

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2.8 Effect of fertilizer application rate on cadmium and zinc in sugarcanejuice

1) Cadmium

6 months

Duncan

Fertilizer application rates	N	Subset for alpha = .05	
		1	2
200 kg/rai	3	.0060	
100 kg/rai	3	.0071	
50 kg/rai	3	.0111	.0111
0 kg/rai	3		.0161
Sig.		.095	.069

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

2) Zinc

6 months

Duncan

Fertilizer application rate	N	Subset for alpha = .05
		1
200 kg/rai	3	1.3486
100 kg/rai	3	1.3780
50 kg/rai	3	1.4086
0 kg/rai	3	1.7419
Sig.		.089

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 3.000.

APPENDIX E
ANALYSIS DATA

1. Field experiment

1.1 Concentration of total phosphorus in soil

Table B-1 Concentration of total phosphorus in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of total phosphorus (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	389.0846			414.2155		
<3	377.1771	396.2839	13.5947	362.7951	372.4693	37.8480
	422.5899			340.3973		
Mae Tao1	257.3286			276.1670		
3-20	369.6417	327.3353	35.2564	279.9193	306.1490	48.7169
	355.0355			362.3607		
Mae Tao2	429.9671			448.7714		
>20	351.2825	425.0490	41.2427	396.2792	404.9835	40.1497
	493.8972			369.8999		

1.2 Concentration of available phosphorus in soil

Table B-2 Concentration of available phosphorus in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of available phosphorus (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	11.9210			9.3717		
<3	10.3320	11.1356	0.4588	10.0712	10.5623	1.4977
	11.1538			12.2439		
Mae Tao1	11.5427			9.5623		
3-20	9.8813	10.1780	0.7178	8.2230	9.4576	1.1858
	9.1100			10.5876		
Mae Tao2	13.5166			13.8462		
>20	12.6252	13.6653	0.6477	13.4589	13.1603	0.8744
	14.8541			12.1757		

1.3 Concentration of total cadmium and zinc in soil

1) Cadmium

Table B-3 Concentration of total cadmium in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	2.5979			2.2899		
<3	2.5794	2.3497	0.4139	1.7943	2.2277	0.4059
	1.8719			2.5990		
Mae Tao1	16.6667			10.2362		
3-20	11.8056	15.7633	3.5923	11.7506	13.9811	5.2300
	18.8177			19.9565		
Mae Tao2	233.1745			187.5748		
>20	141.6070	161.0797	64.5985	141.0970	153.1281	30.2802
	108.4577			130.7124		

2) Zinc

Table B-4 Concentration of total zinc in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	37.3701			24.5918		
<3	35.4167	33.3920	5.2895	31.6986	30.2922	5.1435
	27.3892			34.5862		
Mae Tao1	80.3393			68.4055		
3-20	72.1230	71.7075	8.8469	55.3675	65.7587	9.3531
	62.6601			73.5033		
Mae Tao2	1915.8229			2004.3877		
>20	2207.6372	2074.3209	147.5279	2176.0731	2048.7121	111.9834
	2099.5025			1965.6755		

1.4 Concentration of available cadmium and zinc in soil

1) Cadmium

Table B-5 Concentration of available cadmium in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of available cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	0.0396			0.2739		
<3	0.0742	0.0553	0.0175	0.2240	0.2473	0.0251
	0.0522			0.2440		
Mae Tao1	0.1719			0.3399		
3-20	0.1339	0.1886	0.0647	0.2859	0.3265	0.0359
	0.2599			0.3539		
Mae Tao2	21.3829			26.3905		
>20	17.9480	18.5211	2.6226	28.7893	27.5243	1.2048
	16.2325			27.3932		

2) Zinc

Table B-6 Concentration of available zinc in field experiment soil

Range of cadmium concentration in soil (mg/kg)	Concentration of available zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	0.6836			2.4191		
<3	1.4593	1.0795	0.3881	1.7698	1.9915	0.3704
	1.0956			1.7857		
Mae Tao1	3.2178			5.0485		
3-20	2.2583	3.2583	1.0209	3.2583	4.4882	1.0665
	4.2989			5.1579		
Mae Tao2	112.3102			259.9064		
>20	156.2953	154.7718	41.7208	279.8964	253.9158	29.4367
	195.7100			221.9445		

1.5 Cadmium and zinc accumulation in sugarcane

1) Cadmium

Table B-7 Cadmium accumulation in whole sugarcane

Range of cadmium concentration in soil (mg/kg)	Cadmium accumulation (mg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	0.1598			0.4499		
<3	0.1619	0.2080	0.0816	0.4435	0.4531	0.0116
	0.3022			0.4659		
Mae Tao1	0.1290			1.1055		
3-20	0.6194	0.3041	0.2736	1.0571	1.1994	0.2060
	0.1640			1.4356		
Mae Tao2	0.3188			1.8717		
>20	0.3795	0.3786	0.0593	2.2417	2.0145	0.1989
	0.4375			1.9301		

2) Zinc

Table B-8 Zinc accumulation in whole sugarcane

Range of cadmium concentration in soil (mg/kg)	Zinc accumulation (mg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	0.8728			6.7978		
<3	0.5985	0.9411	0.3813	8.6507	9.1171	2.5842
	1.3520			11.9026		
Mae Tao1	0.6829			23.3346		
3-20	2.5820	1.6519	0.9502	20.2838	24.0089	4.1040
	1.6908			28.4083		
Mae Tao2	2.5872			68.4115		
>20	3.4631	3.1574	0.4943	79.0315	73.5601	5.3173
	3.4220			73.2372		

1.6 Concentration of total cadmium and zinc in sugarcane

1.6.1 Concentration of cadmium and zinc in whole sugarcane

1) Cadmium

Table B-9 Concentration of total cadmium in whole sugarcane

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	2.8089			2.5854		
<3	3.6625	3.5639	0.7109	1.6678	2.1489	0.4604
	4.2204			2.1936		
Mae Tao1	3.9450			3.8695		
3-20	5.8766	4.3209	1.4059	3.5870	3.6665	0.1772
	3.1412			3.5391		
Mae Tao2	9.1091			5.6073		
>20	5.5973	7.7281	1.8721	6.3377	6.0584	0.3944
	8.4779			6.2301		

2) Zinc

Table B-10 Concentration of total zinc in whole sugarcane

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	15.3386			39.0680		
<3	13.5411	15.9206	2.7176	32.5337	42.5469	12.1326
	18.8820			56.0388		
Mae Tao1	20.8835			81.6754		
3-20	24.4976	25.9237	5.8844	68.8286	73.5377	7.0764
	32.3901			70.1092		
Mae Tao2	73.9199			204.9476		
>20	51.0780	63.7718	11.6317	223.4421	221.5971	15.8080
	66.3174			236.4017		

1.6.2 Concentration of cadmium and zinc underground stems

1) Cadmium

Table B-11 Concentration of total cadmium in underground stems

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	2.8713			2.1761		
<3	4.0386	3.7740	0.8037	2.2867	2.2797	0.1003
	4.4121			2.3762		
Mae Tao1	4.0514			7.7815		
3-20	6.1947	4.9479	1.1138	4.6461	5.8161	1.7124
	4.5976			5.0207		
Mae Tao2	5.2486			4.5635		
>20	6.0711	6.1367	0.9227	5.2789	5.3890	0.8858
	7.0904			6.3247		

2) Zinc

Table B-12 Concentration of total zinc in underground stems

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	15.4455			18.0020		
<3	12.4606	16.3250	4.3710	25.7506	25.5083	7.3881
	21.0688			32.7723		
Mae Tao1	20.6522			37.0242		
3-20	22.2714	25.0026	6.1861	22.6868	35.1790	11.6794
	32.0842			45.8259		
Mae Tao2	52.8322			43.9980		
>20	38.5489	44.2115	7.5872	57.9681	49.7590	7.2997
	41.2535			47.3108		

1.6.3 Concentration of cadmium and zinc roots

1) Cadmium

Table B-13 Concentration of total cadmium in roots

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	4.1524			4.8020		
<3	3.4647	3.6017	0.4966	5.9901	5.4219	0.5958
	3.1879			5.4737		
Mae Tao1	4.0264			8.2439		
3-20	3.4383	3.9001	0.4134	7.0374	6.8809	1.4476
	4.2356			5.3614		
Mae Tao2	35.5863			28.1480		
>20	17.5743	25.2274	9.3059	28.2630	28.3526	0.2612
	22.5216			28.6469		

2) Zinc

Table B-14 Concentration of total zinc in roots

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	76.8197			41.6337		
<3	17.7688	41.2758	31.3117	55.3960	49.6767	7.1694
	29.2389			52.0004		
Mae Tao1	107.2474			116.9547		
3-20	65.4275	75.0489	28.6274	118.6516	110.8031	12.1541
	52.4716			96.8030		
Mae Tao2	398.1684			532.1265		
>20	361.3861	351.5326	52.2639	417.0756	478.9821	58.0238
	295.0433			487.7441		

1.6.4 Concentration of cadmium and zinc bagasses

1) Cadmium

Table B-15 Concentration of total cadmium in bagasses

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	2.5666			2.3711		
<3	2.8622	3.0835	0.6562	1.9732	1.9416	0.4461
	3.8217			1.4805		
Mae Tao1	3.8876			1.8317		
3-20	4.1089	3.5270	0.8237	4.3069	3.1175	1.2404
	2.5845			3.2140		
Mae Tao2	17.3077			6.0492		
>20	6.6706	11.8583	5.3233	4.8115	5.0251	0.9358
	11.5967			4.2146		

2) Zinc

Table B-16 Concentration of total zinc in bagasses

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	11.8954			45.2480		
<3	15.3474	14.0277	1.8640	44.4455	49.8182	8.6202
	14.8402			59.7612		
Mae Tao1	28.9573			101.7822		
3-20	47.4257	37.3895	9.3381	96.8812	92.9386	11.3411
	35.7853			80.1523		
Mae Tao2	128.6982			307.4177		
>20	95.3803	110.7935	16.7981	374.5040	361.1827	48.4965
	108.3018			401.6263		

1.6.5 Concentration of cadmium and zinc leaves

1) Cadmium

Table B-17 Concentration of total cadmium in leaves

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	1.5801			2.7635		
<3	2.3116	2.4868	1.0058	0.7430	1.9601	1.0719
	3.5686			2.3739		
Mae Tao1	3.3537			3.6706		
3-20	4.0099	3.0477	1.1463	1.7378	2.6295	0.9750
	1.7794			2.4802		
Mae Tao2	7.8109			3.5644		
>20	4.5744	5.9840	1.6582	3.3663	3.8702	0.7081
	5.5666			4.6798		

2) Zinc

Table B-18 Concentration of total zinc in leaves

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	12.7889			33.1623		
<3	17.1159	12.2812	5.1074	16.9903	35.1811	19.2796
	6.9389			55.3907		
Mae Tao1	13.7601			65.8234		
3-20	25.9406	20.1533	6.1128	45.5313	57.5547	10.6544
	20.7592			61.3095		
Mae Tao2	36.2189			94.2079		
>20	34.5565	32.5216	5.0334	71.7822	71.6026	22.6956
	26.7893			48.8177		

1.6.6 Concentration of cadmium and zinc sugarcane juice

1) Cadmium

Table B-19 Concentration of total cadmium in sugarcane juice

Range of cadmium concentration in soil (mg/kg)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	-			0.0215		
<3	-	-	-	0.0131	0.0152	0.0056
	-			0.0110		
Mae Tao1	-			0.0131		
3-20	-	-	-	0.0194	0.0147	0.0042
	-			0.0116		
Mae Tao2	-			0.1229		
>20	-	-	-	0.1113	0.0858	0.0546
	-			0.0231		

2) Zinc

Table B-20 Concentration of total zinc in sugarcane juice

Range of cadmium concentration in soil (mg/kg)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
Mae Ku	-			2.8000		
<3	-	-	-	3.4200	3.6033	0.9090
	-			4.5900		
Mae Tao1	-			2.8200		
3-20	-	-	-	5.9500	3.7900	1.8738
	-			2.6000		
Mae Tao2	-			7.1000		
>20	-	-	-	7.9500	6.6517	1.5712
	-			4.9050		

2. Pot experiment

2.1 Sugarcane dry matter yield

Table B-21 Sugarcane dry matter yield

Fertilizer application rates (kg/rai)	Sugarcane dry matter yield (mg/pot)					
	2 months	Average	SD	6 months	Average	SD
0	21.31 20.83 19.97	20.70	2.07	109.60 123.70 124.30	119.20	8.32
50	23.56 22.72 27.33	24.54	2.46	169.50 181.20 180.80	177.17	6.64
100	30.66 26.25 20.71	25.87	4.99	177.80 179.40 194.90	184.03	9.45
200	28.99 28.80 23.64	27.14	3.04	200.10 198.00 201.50	199.87	1.76

2.2 Concentration of total phosphorus in soil

Table B-22 Concentration of total phosphorus in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of total phosphorus (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	305.9104 327.9786 294.1650	309.3513	17.1674	242.1790 260.9756 271.8179	258.3242	14.9963
50	336.1698 297.9669 316.7780	316.9715	19.1022	257.4314 264.3035 286.8512	269.5287	15.3902
100	324.0732 343.4679 305.5447	324.3619	18.9632	264.8309 301.8905 279.5008	282.0741	18.6633
200	324.3638 339.3121 357.8241	340.5000	16.7618	328.5348 290.3357 301.6501	306.8402	19.6213

2.3 Concentration of available phosphorus in soil

Table B-23 Concentration of available phosphorus in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of total phosphorus (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	11.9174 12.6819 12.3629	12.3207	0.3840	8.0196 8.9008 9.8100	8.9101	0.8952
50	14.0298 14.8623 15.8184	14.9035	0.8950	14.1018 12.9514 13.5227	13.5253	0.5752
100	20.0285 19.1421 20.5472	19.9059	0.7105	17.3572 18.5098 16.2716	17.3795	1.1193
200	27.5103 25.5366 26.6038	26.5502	0.9879	24.4397 24.9613 25.4704	24.9571	0.5154

2.4 Concentration of total cadmium and zinc in soil

1) Cadmium

Table B-24 Concentration of total cadmium in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	2.5819 2.4343 2.5723	2.5628	0.1967	2.3876 2.6255 2.5238	2.5456	0.1700
50	2.5695 2.4306 2.5890	2.5630	0.1812	2.5712 2.4800 2.4890	2.5467	0.1019
100	2.5358 2.6796 2.4738	2.5631	0.1056	2.4330 2.4876 2.6217	2.5474	0.1534
200	2.5260 2.4258 2.6394	2.5638	0.1106	2.5378 2.4277 2.6860	2.5505	0.1296

2) Zinc

Table B-25 Concentration of total zinc in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	27.0941 28.3710 27.9703	27.9785	0.8885	26.4624 28.0387 28.0582	27.8531	1.3003
50	27.2943 28.1250 28.2245	27.9831	0.6246	28.0994 28.0609 26.1848	27.8484	1.4573
100	27.2971 28.2813 27.9042	27.9942	0.7461	27.0606 27.4627 28.0984	27.8406	1.0227
200	28.1479 27.9097 27.4402	27.9993	0.6088	28.2122 27.8448 26.9598	27.8386	0.8762

2.5 Concentration of available cadmium and zinc in soil

1) Cadmium

Table B-26 Concentration of available cadmium in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of available cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	0.1723 0.1559 0.1659	0.1647	0.0083	0.2639 0.2758 0.2479	0.2625	0.0140
50	0.1160 0.1139 0.1279	0.1193	0.0076	0.1959 0.2300 0.2079	0.2113	0.0173
100	0.0880 0.1059 0.1159	0.1033	0.0142	0.2022 0.1859 0.1679	0.1853	0.0171
200	0.0760 0.0680 0.0940	0.0793	0.0133	0.1279 0.1559 0.1639	0.1492	0.0189

2) Zinc

Table B-27 Concentration of available zinc in pot experiment soil

Fertilizer application rates (kg/rai)	Concentration of available zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	1.4354 1.6371 1.5834	1.5520	0.1045	1.7113 1.5367 1.6594	1.6358	0.0896
50	1.0855 1.1770 1.0614	1.1080	0.0610	1.1275 1.3118 1.1457	1.1950	0.1016
100	0.9656 1.0074 0.9656	0.9795	0.0241	1.1477 1.1976 1.0276	1.1243	0.0873
200	0.9037 0.9917 1.0135	0.9696	0.0581	1.0212 1.0616 1.0972	1.0600	0.0380

2.6 Cadmium and zinc accumulation in sugarcane

1) Cadmium

Table B-28 Cadmium accumulation in whole sugarcane

Fertilizer application rates (kg/rai)	Cadmium accumulation (mg)					
	2 months	Average	SD	6 months	Average	SD
0	0.1743 0.1573 0.1575	0.1630	0.0098	0.4844 0.5344 0.5095	0.5094	0.0250
50	0.1565 0.1592 0.1722	0.1626	0.0084	0.4913 0.4768 0.5146	0.4942	0.0191
100	0.1941 0.1665 0.1254	0.1620	0.0346	0.4723 0.4703 0.4950	0.4792	0.0137
200	0.1408 0.1324 0.1279	0.1337	0.0066	0.4077	0.3999	0.0069

2) Zinc

Table B-29 Zinc accumulation in whole sugarcane

Fertilizer application rates (kg/rai)	Zinc accumulation (mg)					
	2 months	Average	SD	6 months	Average	SD
0	0.3073 0.3108 0.2692	0.2958	0.0231	2.7359 2.9978 3.0618	2.9318	0.1726
50	0.2792 0.2887 0.3724	0.3134	0.0513	3.8100 3.8311 3.5577	3.7329	0.1522
100	0.3416 0.3429 0.2695	0.3180	0.0420	3.7100 3.8041 3.9635	3.8259	0.1281
200	0.3582 0.3311 0.2806	0.3233	0.0394	4.2584 3.7486 4.1441	4.0504	0.2675

2.7 Concentration of total cadmium and zinc in sugarcane

2.7.1 Concentration of total cadmium and zinc in whole sugarcane

1) Cadmium

Table B-30 Concentration of total cadmium in whole sugarcane

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	8.1803 7.5518 7.8860	7.8727	0.3144	4.4197 4.3201 4.0992	4.2797	0.1640
50	6.6406 7.0074 6.3021	6.6500	0.3527	2.8985 2.6314 2.8464	2.7921	0.1416
100	6.3314 6.3437 6.0560	6.2437	0.1627	2.6565 2.6214 2.5400	2.6060	0.0598
200	4.8580 4.5957 5.4116	4.9551	0.4166	2.0376 1.9943 1.9703	2.0007	0.0341

2) Zinc

Table B-31 Concentration of total zinc in whole sugarcane

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	14.4214 14.9204 13.4790	14.2736	0.7320	24.9628 24.2342 24.6321	24.6097	0.3648
50	11.8500 12.7084 13.6255	12.7279	0.8879	22.4781 21.1430 19.6773	21.0995	1.4009
100	11.1415 13.0612 13.0152	12.4060	1.0953	20.8664 21.2047 20.3358	20.8023	0.4379
200	12.3555 11.4961 11.8690	11.9069	0.4310	21.2816 18.9322 20.5661	20.2599	1.2043

2.7.2 Concentration of cadmium and zinc in underground stems

1) Cadmium

Table B-32 Concentration of total cadmium in underground stems

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	9.0403 8.1030 8.6224	8.5886	0.4696	4.2013 4.4191 4.4546	4.3583	0.1371
50	7.3154 7.2563 6.7327	7.1015	0.3207	3.5615 4.0307 3.7483	3.7802	0.2362
100	6.9940 7.5319 6.9389	7.1550	0.3276	3.8339 3.2210 3.4503	3.5017	0.3097
200	4.9431 4.3000 5.2626	4.8352	0.4903	2.6802 2.4631 2.0333	2.3922	0.3292

2) Zinc

Table B-33 Concentration of total zinc in underground stems

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	11.1762 12.3285 10.8028	11.4358	0.7953	12.8015 10.0794 12.4728	11.7846	1.4858
50	7.5118 10.0510 9.9010	9.1546	1.4247	7.9640 11.9427 8.7789	9.5618	2.1017
100	7.2917 9.1281 10.4832	8.9677	1.6018	8.6138 9.2170 7.9357	8.5889	0.6410
200	7.6393 8.5000 9.4924	8.5439	0.9273	8.4376 8.7685 8.3317	8.5126	0.2279

2.7.3 Concentration of cadmium and zinc in roots

1) Cadmium

Table B-34 Concentration of total cadmium in roots

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	9.8500 10.1940 10.1594	10.0678	0.1894	6.0336 5.6908 5.5005	5.7416	0.2702
50	8.3582 8.0901 8.7413	8.3965	0.3273	4.3538 4.0410 3.7284	4.0411	0.3127
100	8.0182 8.6105 7.7767	8.1351	0.4290	3.3564 3.8891 3.5211	3.5889	0.2728
200	6.9240 7.2787 7.6014	7.2680	0.3388	2.7883 2.1825 2.4171	2.4627	0.3054

2) Zinc

Table B-35 Concentration of total zinc in roots

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	35.1000 32.7098 34.0637	33.9579	1.1986	41.9881 38.8955 40.0892	40.3243	1.5597
50	29.1045 28.7373 26.1239	27.9886	1.6253	37.2551 31.8845 29.8767	33.0054	3.8148
100	26.0344 29.7902 27.3180	27.7142	1.9090	33.2675 31.8109 29.9544	31.6776	1.6606
200	26.9102 27.8273 27.6232	27.4536	0.4815	31.1691 28.9187 31.6693	30.5857	1.4652

2.7.4 Concentration of cadmium and zinc in bagasses

1) Cadmium

Table B-36 Concentration of total cadmium in bagasses

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	7.2521 6.9278 7.0177	7.0659	0.1674	4.0959 4.3599 3.4667	3.9742	0.4589
50	6.1765 6.7487 5.7907	6.2387	0.4820	2.3706 2.5158 2.7723	2.5529	0.2034
100	5.0990 5.1404 6.2722	5.5039	0.6657	2.3627 2.2348 2.6342	2.4106	0.2040
200	4.6813 3.8446 5.3540	4.6266	0.7561	2.1363 2.7385 1.9916	2.2888	0.3961

2) Zinc

Table B-37 Concentration of total zinc in bagasses

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	19.7198 21.1324 20.2070	20.3531	0.7175	28.7209 26.6052 24.3166	26.5476	2.2027
50	16.8858 17.4176 19.1693	17.8243	1.1948	25.7309 28.6602 24.3564	26.2492	2.1982
100	17.1966 18.5844 16.2485	17.3432	1.1748	24.7588 27.4136 26.4414	26.2046	1.3431
200	16.4841 16.9065 18.0944	17.1617	0.8349	28.3188 23.3519 26.6879	26.1195	2.5317

2.7.5 Concentration of cadmium and zinc in leaves

1) Cadmium

Table B-38 Concentration of total cadmium in leaves

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	6.7860 6.1901 6.5045	6.4935	0.2981	3.8439 3.0815 3.3149	3.4134	0.3906
50	5.5610 6.5114 5.2968	5.7898	0.6388	2.2273 1.7389 2.0265	1.9975	0.2455
100	5.6052 5.0049 4.4739	5.0280	0.5660	1.9751 1.8401 1.7409	1.8520	0.1175
200	3.8606 4.5310 5.0049	4.4655	0.5749	1.2453 1.2403 1.5968	1.3608	0.2044

2) Zinc

Table B-39 Concentration of total zinc in leaves

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	8.8021 9.7344 10.4270	9.6545	0.8154	15.4248 13.3698 14.8427	14.5457	1.0592
50	7.2343 9.0766 10.4437	8.9182	1.6106	10.6910 11.3623 10.1819	10.7450	0.5921
100	7.4901 9.7154 8.6529	8.6195	1.1130	8.4436 10.7917 11.5897	10.2750	1.6355
200	10.9384 7.0703 7.6546	8.5544	2.0852	10.1614 10.2203 9.4311	9.9376	0.4396

2.7.6 Concentration of cadmium and zinc in sugarcane juice

1) Cadmium

Table B-40 Concentration of total cadmium in sugarcane juice

Fertilizer application rates (kg/rai)	Concentration of total cadmium (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	- - -	-	-	0.0150 0.0218 0.0115	0.0161	0.0052
50	- - -	-	-	0.0123 0.0108 0.0102	0.0111	0.0011
100	- - -	-	-	0.0079 0.0089 0.0046	0.0071	0.0022
200	- - -	-	-	0.0035 0.0052 0.0092	0.0060	0.0029

2) Zinc

Table B-41 Concentration of total zinc in sugarcane juice

Fertilizer application rates (kg/rai)	Concentration of total zinc (mg/kg)					
	2 months	Average	SD	6 months	Average	SD
0	-	-	-	1.8097	1.7419	0.4091
	-			1.3031		
	-			2.1129		
50	-	-	-	1.5486	1.4086	0.2201
	-			1.1549		
	-			1.5223		
100	-	-	-	1.3609	1.3780	0.0378
	-			1.3517		
	-			1.4213		
200	-	-	-	1.3911	1.3486	0.0455
	-			1.3005		
	-			1.3543		

BIOGRAPHY

Suchera Ruangkhum was born on the 2nd of August 1984 in Chonburi. She started to study at King Mongkut's Institute of Technology Ladkrabang in 2002 and graduated the Bachelor Degree of Science in the major of Environmental Resources Chemistry in 2006 from Department of Chemistry, Faculty of Science. Then, she continued her further education for Master degree at International Post-graduated Program in Environmental Management, a joint program of Nation Center of Excellence for Environmental and Hazardous Waste Management (NCE-EHWM) in May 2006.

Publication:

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