COMMUNAUTE FRANÇAISE DE BELGIQUE
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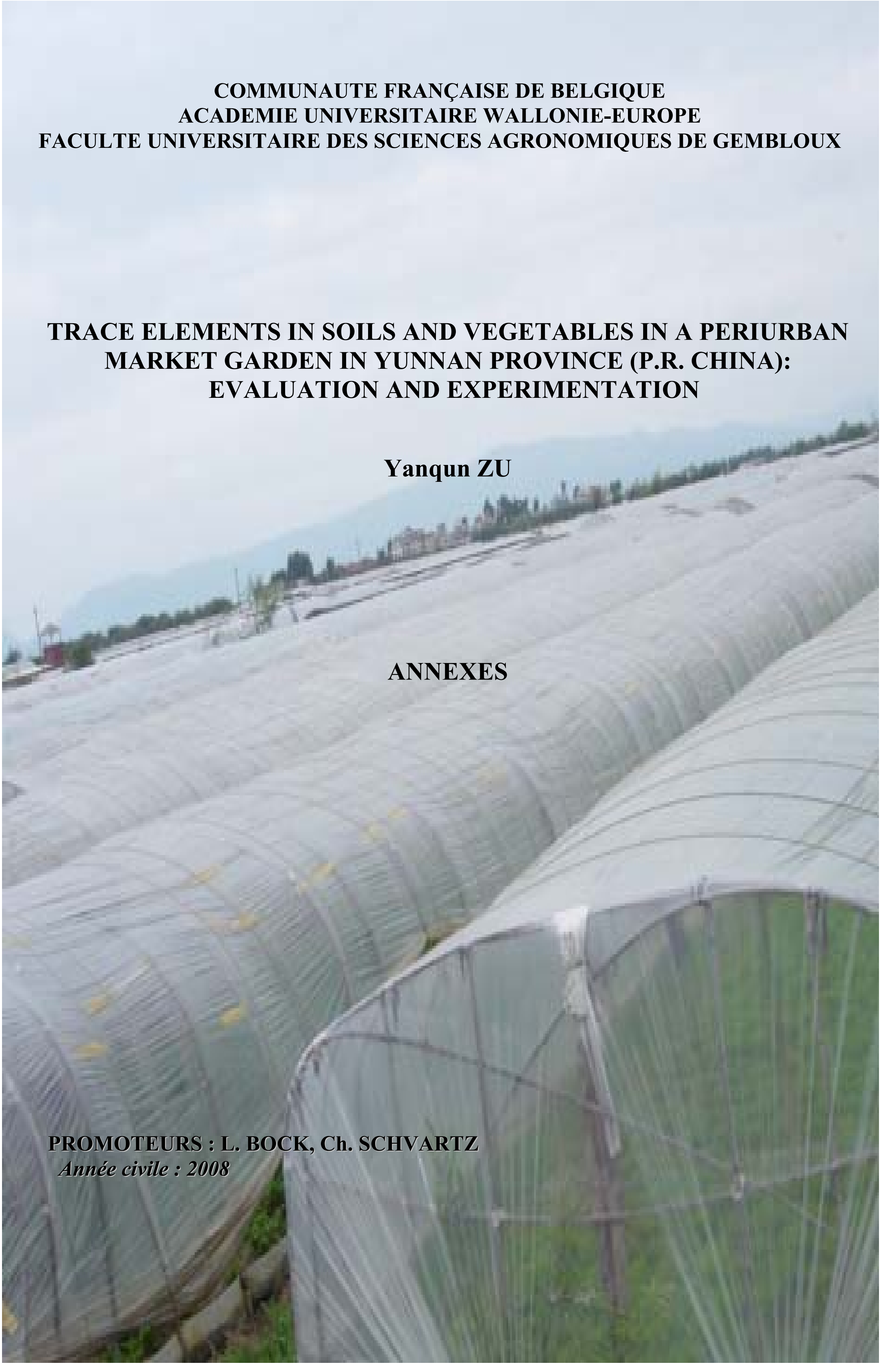
TRACE ELEMENTS IN SOILS AND VEGETABLES IN A PERIURBAN MARKET GARDEN IN YUNNAN PROVINCE (P.R. CHINA): EVALUATION AND EXPERIMENTATION

Yanqun ZU



ANNEXES

PROMOTEURS : L. BOCK, Ch. SCHVARTZ

Année civile : 2008

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Yunnan Agricultural University

Organic carbon contents are determined by wet oxidation according to the Walkley-Black procedure with heating. The principle is the same as the procedure employed in GAU, but the procedure is slightly different. Exact 0.100-0.500 g of air-dried soil with particle size of <0.25 mm is weighed into a glass tube. Exactly 10 ml of 0.4 N $K_2Cr_2O_7$-H_2SO_4 is added to each tube. A small funnel is put to cover the opening of each tube. The tubes are placed in a pot containing boiling plant oil with a temperature of ~170-180 °C. When the liquid in the tubes boiled, the time is noted and the liquid is boiled for a further 5 minutes. The tubes are taken out and the solution is transferred into a 250 ml flask using about ~60-70 ml of distilled water. 2-3 drops of indicator solution are added and the solution is titrated with standard ~0.2 N Fe_2SO_4 expressed to four decimal places. Volume of Fe_2SO_4 used is recorded to calculate the organic carbon %. The equation is:

Soil Organic Carbon (%)=$[(V_0-V) \times N)] \times. 13 \times 0.04 / W \times 100\%$

Where: V_0: the volume of Fe_2SO_4 used to titrate the blank (ml)

V: the volume of Fe_2SO_4 used to titrate the sample (ml)

N: Normal concentration of Fe_2SO_4 (N)

W: Dry weight of soil (g)

1.13: Calibration factor for oxidation.

Soil total Nitrogen

Gembloux Agricultural University

Total N is measured according to the regular Macro-Kjeldahl Method. The digestion of 0.5-2.5 g of <0.25 mm crushed sample is performed until discoloration occurred by heating in a Bucchi tube with 2.5 g of Na_2SO_4, 2.5 g of Selenium (Wieninger's mixture) and 20 ml of concentrated H_2SO_4.

$OM + H_2SO_4 \rightarrow (NH_4)_2SO_4 + CO_2 + ...$

After distillation under alkaline conditions, ammonium-N is trapped by H_3BO_3 4% and titrated with HCl 0.1 N (burette of 25 ml graduated at 0.05 ml) in the presence of Tashiro indicator.

$(NH_4)_2SO4 + 2NaOH \rightarrow Na_2SO_4 + NH_3 + H_2O$

$NH_3 + H_3BO_3 \rightarrow NH_4H_2BO_3$

$NH_4H_2BO_3 + HCl \rightarrow NH_4Cl + H_3BO_3$

Results are expressed as % to 2 decimal places.

Yunnan Agricultural University

The method employed to measure total N is the Micro Kjeldahl Method. The procedure consists of three main steps:

(a) Digestion: 0.500-1.000 g of air-dried soil with particle size of <0.25 mm is weighed into a 50 ml digestion tube. Some drops of distilled water along with 1.85 g $K_2SO_4.CuSO_4.Se$ mixed catalyst (ratio of 100:10:1, w/w/w) and 5 ml 36 N H_2SO_4 are added and mixed thoroughly. A tiny funnel is put on the opening of the tube. Tube is heated in a far-infrared digestion oven. A further 30 minutes boiling is maintained after the solution becomes clear blue-green. The liquid is cooled and graduated to 50 ml with distilled water for distillation.

(b) Distillation: A 125 ml Erlenmeyer flask containing 5 ml 2% H_3BO_3 with indicator is placed under the condenser of the distillation apparatus to absorb the ammonia. 20 ml of the above described digestion solution is transferred into the apparatus. ~20 ml of 10 N NaOH is added to liberate the NH_3. When ~50 ml of distillate is collected, the distillation is stopped.

(c) Titration: Ammonium-N in the distillate is determined along with a blank by titration with 0.02N sulphate acid. The colour changed at the end point from green-grey to brown-red. Percent N is calculated as follows:

$$\text{Total N (\%)} = [(V-V_0)\, N \times 0.014/W] \times 50/20 \times 100\%$$

Where: V: Volume of H_2SO_4 used to titrate the sample (ml)

V_0: Volume of H_2SO_4 used to titrate the blank (ml)

N: Normal concentration of H_2SO_4

W: Dry weight of soil (g)

50/20: Fraction factor for distillation.

Cation Exchange Capacity (CEC)

Gembloux Agricultural University

A sample of 5 g air-dried soil (<2 mm) and 33 ml 1 N NH_4OAC at pH 7.0 are vibrated for 2 hours. The suspension is centrifuged at 4000 revolutions per minute for 10 minutes and this process is repeated three times to replace cations at the soil exchange sites with NH_4^+ (the supernatants are collected for measuring exchangeable bases). The excess NH_4OAC is washed out using concentrated ethyl alcohol. Then NH_4^+ is replaced with NaOH and the supernatant collected. The supernatant is distilled in an alkaline medium and the distillate collected. The distillate is titrated with ~0.1 N HCl and the volume of HCl recorded for calculation of CEC. The CEC is calculated as follows:

CEC (meq/100g) = $[(V-V_0)\ N/W] \times 100$

Where: V: Volume of HCl used to titrate the sample (ml)

$V_{0:}$ Volume of HCl used to titrate the blank (ml)

N: Normal concentration of HCl

W: Dry weight of soil (g)

<u>Yunnan Agricultural University</u>

1.00 g air-dried soil (<1 mm) is weighed into centrifuge tube, and 20-25 ml 1N $BaCl_2$ added and mixed thoroughly. The solid residue is separated from solution by centrifugation at 3000 g for 20 min. 20-25 ml 1N $BaCl_2$ is added to the residue and mixed thoroughly. After separating by centrifugation at 3000 g for 20 min again, 20-30 ml distilled water is added to the residue and mixed thoroughly, then certrifuged again and the liquid discarded. The tube and residue are weighed to estimate the water content in the residue (X).

Exact 25 ml 0.05 N H_2SO_4 is added to the residue and mixed. After standing for several minutes, the extract from the residue is separated by centrifugation at 3000 g for 20 min. 10 ml of the suspension is pippeted to a bottle and 1 drop of indicator added. Then H_2SO_4 is determined with 0.1 N NaOH along with 10 ml H_2SO_4 as a blank. CEC is calculated as follows:

$$CEC\ (meq/100g\ dry\ soil) = \frac{(V_{NaOH\ CK} \times 2.5 - V_{NaOH} \times (25+X)/10\ ) \times C_{NaOH}}{W_{soil}} \times 100$$

Where: $V_{NaOH\ CK}$: Volume of NaOH used to 10 ml H_2SO_4 as a blank (ml)

V_{NaOH}: Volume of NaOH used to sample (ml)

X: The water content in soil

C_{NaOH} : Normal concentration of NaOH (N)

W_{soil} : Weight of soil (g DM)

ANNEX 3.1: LABORATORY METHODS

Soil parameters analysed in the laboratory included pH, soil organic carbon (SOC), total nitrogen, cation exchange capacity (CEC), physical clay content (<0.01 mm), total trace element contents, sequential extraction fraction contents of trace element and available contents of trace elements.

Soil pH

Gembloux Agricultural University

Soil pH_{H2O} is measured by potentiometry after a 2 h rotative shaking of a 2/5 soil suspension (20 g of <2 mm fine earth with 50 ml of H_2O) and a 10 minutes centrifugation at 4,000 rpm. Results in pH units are expressed to 1 decimal place.

Yunnan Agricultural University

Soil pH is measured using a Whatman pH meter. 10 g of air-dried soil with a particle size <1 mm is weighed into a 50 ml glass beaker and 25 ml of distilled water added. The soil and liquid are mixed thoroughly and allow to stand for 10 minutes. The pH meter is calibrated using buffer solutions of pH 4 and 7, then the pH probe is inserted into the beaker and the soil suspension is stirred by swirling the electrodes slightly. Immediately after, the pH value is read on the standardized pH meter.

Soil Organic Carbon (SOC)

Gembloux Agricultural University

The oxidation of organic matter for a 0.1-1.0 g sample (0.25 mm crushed soil) is performed with 2.000 g $K_2Cr_2O_7$ and 40 ml H_2SO_4 (56%) for exactly 10 minutes by heating at 160°C.

$3C + 2\ K_2Cr_2O_7 + 8\ H_2SO_4 \rightarrow 2Cr_2(SO4)_3 + 2K_2SO_4 + 8H_2O + 3CO_2$

The excess of $K_2Cr_2O_7$ is then titrated with $Fe(NH_4)_2(SO_4)_2.6H_2O$ 0.1 N (Mohr's salt) in the presence of NaF and diphenylamine (burette of 50 ml graduated at 0.1 ml) and the calculation made by carrying out a blank determination and subtracting the difference. Results are expressed as % with 1 decimal place.

$K_2Cr_2O_7 + 6\ Fe(NH_4)_2(SO_4)_2 + 7\ H_2SO_4 \rightarrow K_2SO_4 + 6(NH_4)_2SO_4 + Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 7H_2O$

Soil physical clay content

Yunnan Agricultural University

To determine the clay content in soil, the hydrometer method is used, based on Stoke's Law according to which settling velocity of particulates in water has a proportional relationship with the square radius of the granule.

Pre-treatment of the <1 mm part of the soil consists in making it react with NaOH 0.5 *M* for 15 min, before passing it through a 0.25 mm sieve when transferring it to a 1L graduated cylinder (Table 1). Once the settling time for <0.01 mm particles (physical clay) has elapsed, one just has to read the mark on the hydrometer. Normally pure sand or pure water is used for the control (CK).

$$\text{Clay content (\%)} = \frac{\text{The mark in the hydrometer - the mark in CK}}{\text{Weight of soil}} \times 100$$

Table 1 Settling time for the soil particulates (<0.01 mm) according to temperature

Temperature (ºC)	Delay (mins)	Temperature (ºC)	Delay (mins)	Temperature (ºC)	Delay (mins)
8	37	18	27	27	22
9	36	19	27	28	21
10	35	20	26	29	21
11	34	21	26	30	20
12	33	22	25	31	19
13	31	23	24	32	19
14	31	24	24	33	19
15	30	25	23	34	18
16	29	26	23	35	18
17	28				

Soil total trace element contents

Gembloux Agricultural University: *Aqua Regia mineralization (NF ISO 11466)*

3g of soil samples (<0.200 mm) are put to stand overnight in 250 ml glass beakers along with 30 ml of aquae regia (3/4 HCl + 1/4 HNO_3). The mixture is heated and left boiling during 2 hours under a vapour cooling system. The soils and extracting solutions are then filtered through paper filters and the filtrate volume is adjusted to 100 ml in glass flasks.

Element contents (Cd, Cu, Pb and Zn) in the extracting solutions are measured by atomic absorption with a Varian 220 device.

Yunnan Agricultural University

The methods used for analysing the trace element contents of soils are those laid down by Chinese authorities within the context of the regulations on public health protection and food quality control.

Aqua regia – $HClO_4$ methods: trace element contents of soils is determined as followed:

Add 10-20 ml aqua regia to 1-5 g of air-dried soil (<0.25mm） in an acid washed 50 ml beaker, covered with glass funnel, heating on electric plate and keep it boiling until the brown smoke dispersed, cooling the solution and add 2-10 ml $HClO_4$, heating again, until the particle become grey-white, after cooled, and add 1% HNO_3 to solution, then filtration to 50 ml flask and dilution with deionized water.

Analyse the filtrate using AAS (graphite furnace atomic absorption spectrophotometer), or ICP ((inductively coupled plasma).

Soil sequential extraction fraction contents of trace elements

Yunnan Agricultural University

Weigh 1 g sample of 1 mm dry soil, add 40 ml of solution A (0.11 mol/L acetic-acid extractable TE fraction) in a 100 ml centrifuge tube, extract by shaking for 16 h at 22 ± 5 °C. Separate the extract from the solid residue by centrifugation at 3000 g for 20 min and decantation of the supernatant liquid into a polyethylene container, store in a refrigerator at ~4 °C prior to analysis.

Wash the residue by adding 20 ml distilled water, shaking for 15 min on the end-over-end shaker and centrifuging for 20 min at 300 g, decant the supernatant and discard.

Add 40 ml of freshly prepared solution B (0.5 mol/L hydroxyl ammonium chloride extractable trace element fraction) to the residue from the above step in the centrifuge tube. Resuspend by manual shaking, extract by mechanical shaking for 16 h at 22 ± 5 °C. Separate the extract from the solid residue by centrifugation at 3000 g for 20 min and decantation of the supernatant liquid into a polyethylene container, store in a refrigerator at ~4 °C prior to analysis of the contents.

Wash the residue by adding 20 ml distilled water, shaking for 15 min on the end – over - end shaker and centrifuging for 20 min at 3000 g, decant the supernatant and discard.

Add 10 ml of solution C (8.8 mol/l (30%) hydrogen peroxide extractable trace element fraction) to the residue in the centrifuge tube. Cover the vessel loosely with its cap and digest at room temperature for 1 h with occasional manual shaking. Continue the digestion for 1 h at 85 ± 2 °C, with occasional manual shaking for the first 1/2 hour, in a water bath, and then reduce the volume to <3 ml by the further heating the uncovered tube. Add a further aliquot of 10 ml of solution C. Heat the covered vessel again to and digest for 1 h, with occasional manual shaking for the first 1/2 hour. Remove the cover and the residue the volume of liquid to ~1 ml.

Add 50 ml of solution D (1.0 mol/L ammonium acetate) to the cool moist residue and shake for 16 h at 22 ± 5 °C. Separate the extract from the soil residue by centrifugation and decantation as above. Stopper and retain for analysis the C- fraction contents of trace elements.

The supernatants are measured by ICP or AAS (atomic absorption spectrophotometer).

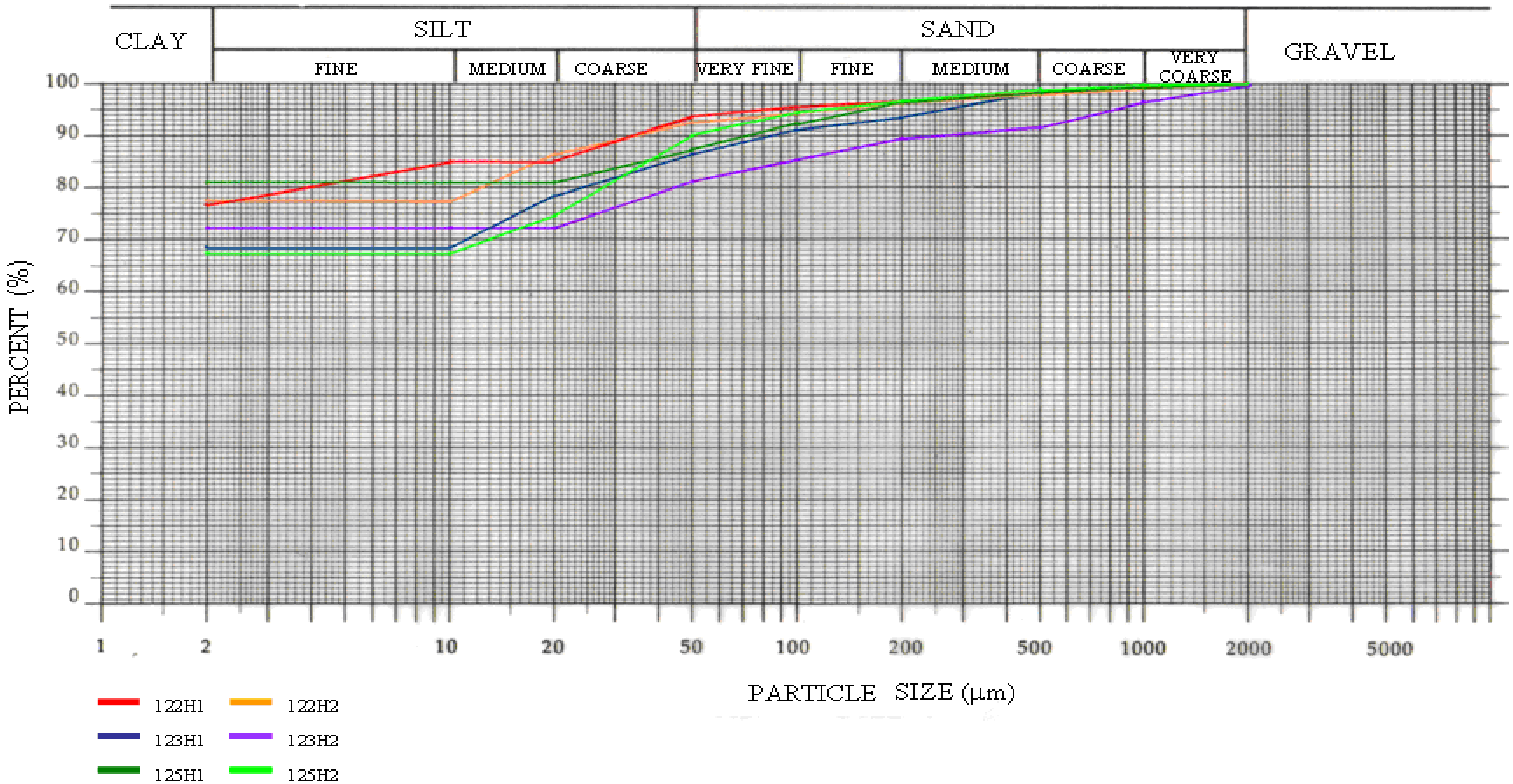
Soil available contents of trace elements

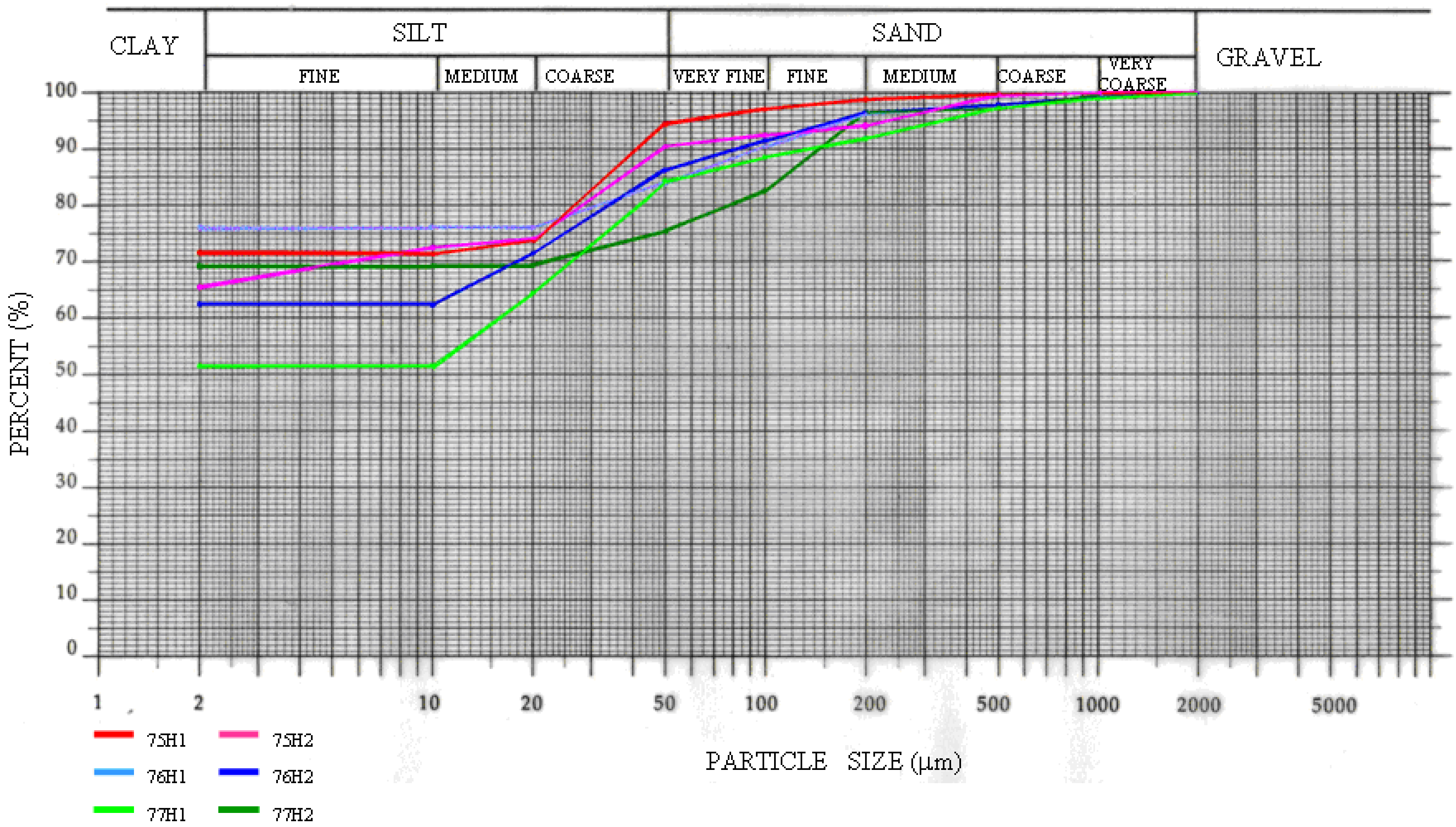
Gembloux Agricultural University: *Ammonium acetate–EDTA extraction*

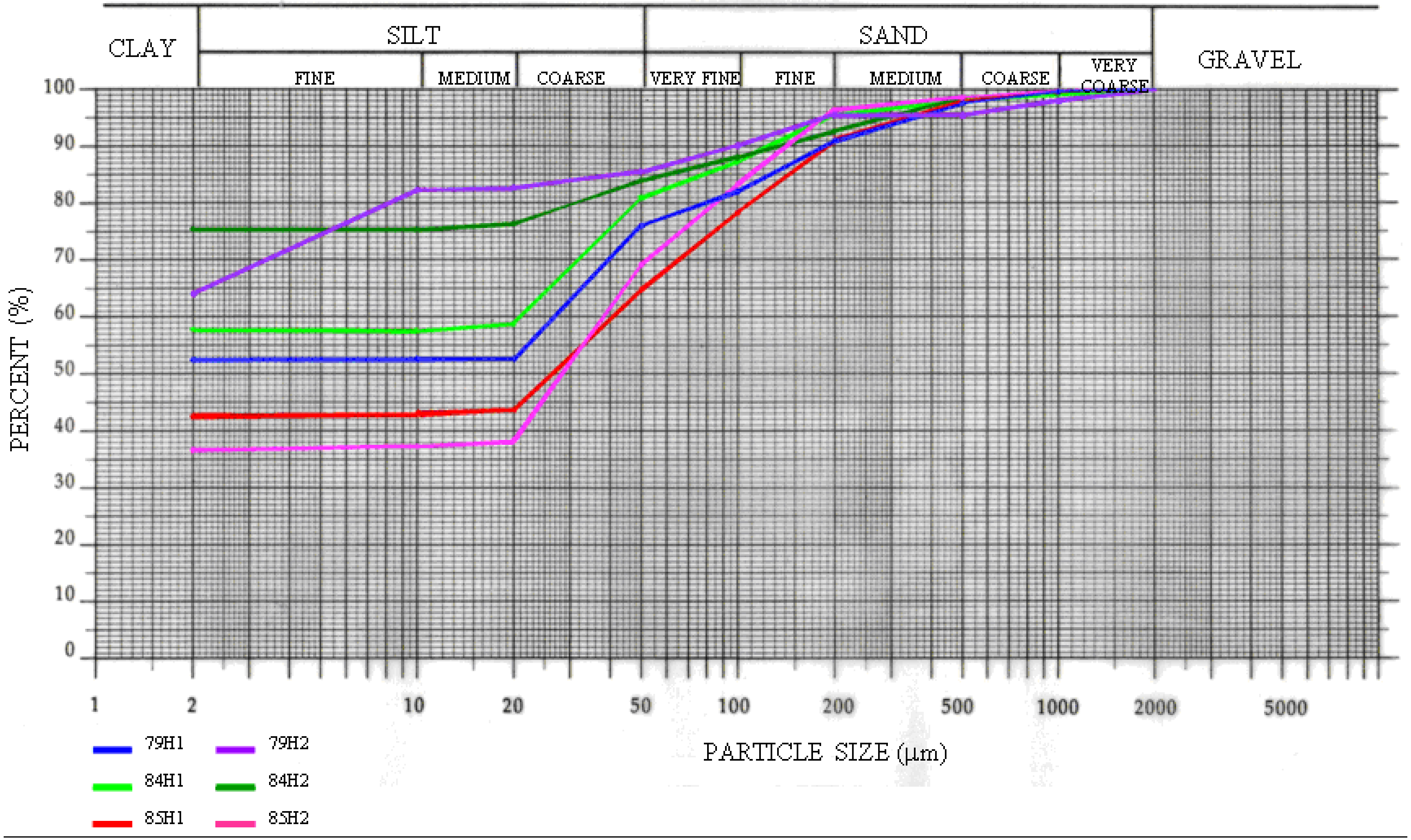
10 g of soil (<2.000 mm) are end-over-end shaken during 1/2 h with 50 ml of a mixture of 0.5 N ammonium acetate + 0.02 M EDTA, adjusted at pH 4.65. The mixtures are then filtered through paper filters.

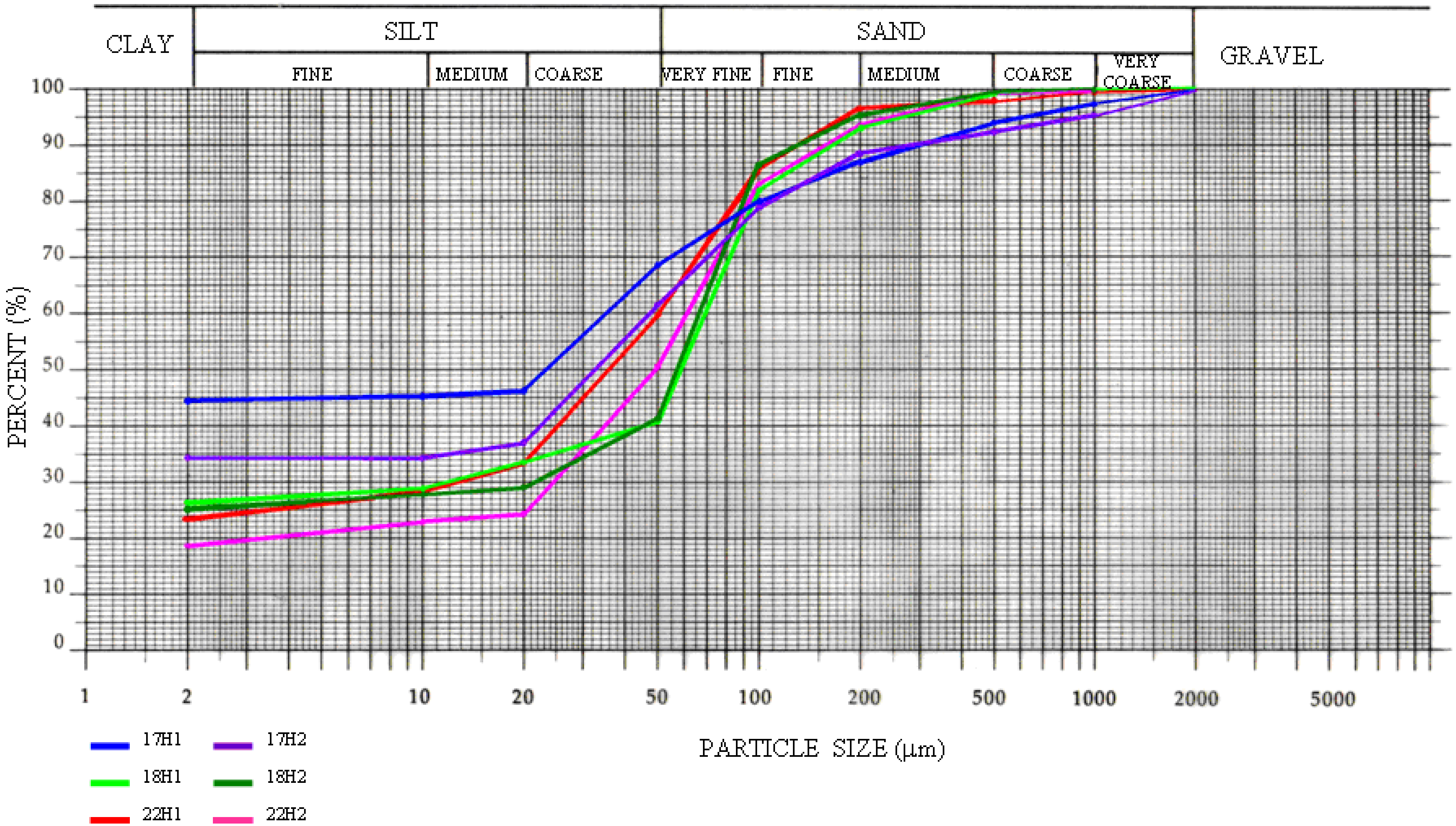
Element contents (Cd, Cu, Pb and Zn) in the extracting solutions are measured by atomic absorption with a Varian 220 device

ANNEX 4.1: PARTICLE SIZE DISTRIBUTION OF TOPSOIL (H1) AND SUBSOIL (H2)




CLAY
SILT
SAND
GRAVEL
FINE
MEDIUM
COARSE
VERY FINE
FINE
MEDIUM
COARSE
VERY COARSE
PERCENT (%)
100
90
80
70
60
50
40
30
20
10
0
1
2
10
20
50
100
200
500
1000
2000
5000
PARTICLE SIZE (µm)
75H1
75H2
76H1
76H2
77H1
77H2


CLAY
SILT
FINE
MEDIUM
COARSE
SAND
VERY FINE
FINE
MEDIUM
COARSE
VERY COARSE
GRAVEL
PERCENT (%)
100
90
80
70
60
50
40
30
20
10
0
1
2
10
20
50
100
200
500
1000
2000
5000
PARTICLE SIZE (µm)
79H1
79H2
84H1
84H2
85H1
85H2


CLAY
SILT
SAND
GRAVEL
FINE
MEDIUM
COARSE
VERY FINE
FINE
MEDIUM
COARSE
VERY COARSE
PERCENT (%)
100
90
80
70
60
50
40
30
20
10
0
1
2
10
20
50
100
200
500
1000
2000
5000
PARTICLE SIZE (µm)
17H1
17H2
18H1
18H2
22H1
22H2

ANNEX 4.2. GENERAL REGIONAL DATA ANALYSIS

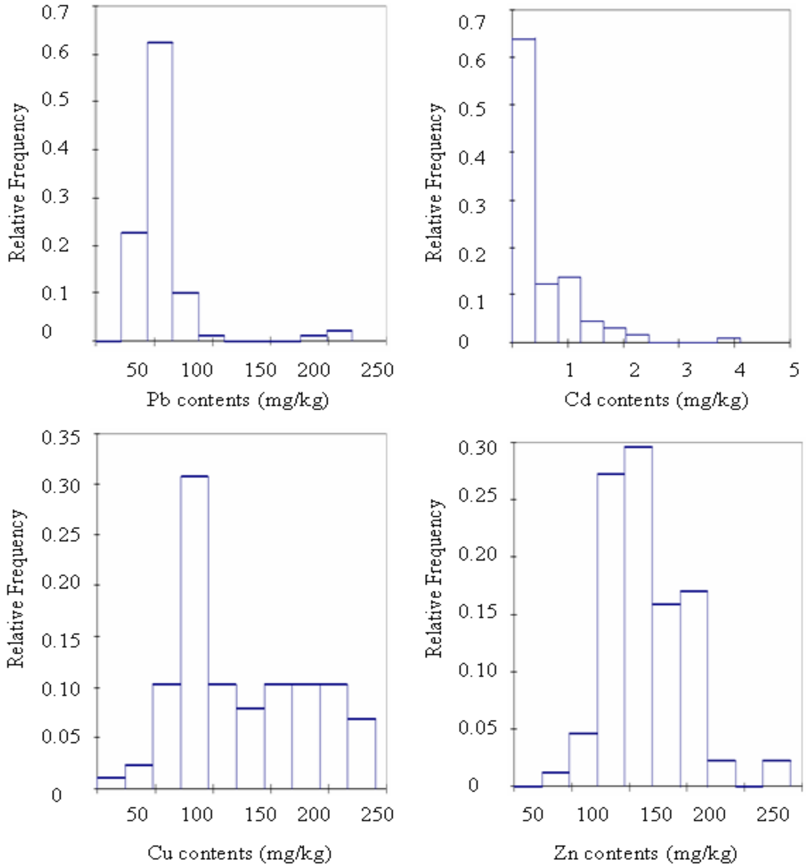
unit	No.	Latitude	Longitude	Altitude (m)	Position + % slope	Soil colour*	Texture	Mottles	Stoniness	pH	CEC (cmol/kg)	OM (%)	SOC (%)	Clay (<0.01mm)	T-N (g/kg)	C/N	T-Pb (mg/kg)	T-Cd (mg/kg)	T-Cu (mg/kg)	T-Zn (mg/kg)
Lacustrine	1	N24º54’04’’	102º47’25’’							5.5	20.8	4.35	2.52	46			53.9	0.847	19.7	109.8
	2	N24º53’48’’	102º46’50’’							6.3	25.9	6.17	3.57	49			74	0.819	44.7	123.4
	3	N24º53’36’’	102º47’10’’							5.9	27	5.97	3.46	48			86.3	0.992	67.5	194.8
	4	N24º52’00’’	102º47’30’’							6.4	29.6	3.28	1.90	31			116.5	0.712	187.5	220.7
	5	N24º50’12’’	102º47’40’’							6.6	35.6	4.06	2.35	43			178	0.146	130.9	172
	6	N24º52’08’’	102º47’30’’							7.3	39.7	3.73	2.16	42			197.4	0.438	172.6	192.5
	7	N24º54’16’’	102º47’40’’							5.3	13.7	4.12	2.38	41			47.1	0.569	26.9	95.6
	8	N24º54’24’’	102º47’50’’							5.9	20.6	4.41	2.55	48			81.5	0.76	49.9	119.2
	9	N24º52’32’’	102º48’30’’							5.5	30.4	6.09	3.53	59			143.7	0.114	92.3	170.8
	10	N24º52’00’’	102º48’35’’							4.8	17.3	5.22	3.0278	57			99.5	0.884	87.5	172.8
	11	N24º51’12’’	102º49’50’’							4.7	17.3	4.23	2.45	53			160.5	0.211	62.7	134.8
	12	N24º51’44’’	102º48’20’’							4.8	20	3.68	2.13	40			60.6	1.101	43.7	156.3
	13	N24º52’16’’	102º48’25’’							5.4	20.9	3.99	2.31	40			86.4	0.891	53	142.9
	14	N24º54’04’’	102º47’50’’							7.2	29.9	4.65	2.69	53			60.4	1.005	29.5	88.7
	15	N24º50’32’’	102º48’20’’							6.9	39	3.31	1.92	44			51.3	0.557	168.5	215.7
	16	N24º53’55’’	102º47’20’’	1895	Plain-flat	10YR4-4	Loam clay	Few	<15%: Fe-Mn	6.3		5	2.90				55.7	0.1	96.8	104.5
	17	N24º53’43’’	102º47’04’’	1890	Plain-flat	10YR3-3	Sandy clay	Mainly salt	<15%	6.3	31.6	5.52	3.20	44.3	2.9	11	62	1.7	103.6	106.7
	18	N24º53’12’’	102º46’25’’	1888	Plain-flat	5YR4-4	Sandy clay	No	<15%	7.7	32.7	2.76	1.60	26.3	1.9	9	37.4	1.2	75.1	79.9
	19	N24º53’14’’	102º46’20’’	1885	Plain-close to Lake	5YR3-2	Loam clay	Many	<15%	7.8		1.9	1.10				28.4	0.1	68.8	62.1
	20	N24º52’39’’	102º48’02’’	1895	Plain-flat	10YR4-3	Loam clay	Few	<15%: sandstone	6.5		5	2.90				37.4	0	61.2	77.1
	21	N24º52’18’’	102º47’09’’	1890	Plain-flat	10YR3-3	Sandy clay	Many	<15%	7.3		3.28	1.90				205.3	0.71	53.9	116.4
	22	N24º52’12’’	102º47’02’’	1885	Plain-close to Lake	7.5YR3-4	Sandy clay	No	<15%	7.5	36	4.12	2.38	23.4	2.5	12	212.4	1.9	86.3	129.5
	23	N24º51’28’’	102º47’47’’	1895	Plain-flat	10YR4-4	Loam clay	Few, Weathering	<15%: sandstone	6.4		2.59	1.50				42.3	0	91	100.1
	24	N24º51’13’’	102º47’38’’	1892	Plain-flat	7.5YR3-4	Loam clay	No	<15%	4.1		3.45	2.00				47.5	0	91.1	92.1
	25	N24º51’03’’	102º47’33’’	1900	Side(terrace)-8%NE	5YR4-6	Sandy clay	Few	<15%	4.9		2.24	1.29				36.4	0	44.8	65.8
	26	N24º50’37’’	102º47’03’’	1885	Plain-flat	10YR3-4	Loam clay	Many	<15%	6.7		3.45	2.00				44.4	0.01	194	155.8
	27	N24º50’39’’	102º47’07’’	1889	Foot of slope	7.5YR3-3	Loam clay	Few, Weathering	<15: sandstone	7		4.14	2.40				27	0	48.2	76.4
	28	N24º51’43’’	102º48’14’’	1910	Slope(terrace)-30%W	5YR4-6	Loam sand	No	<15%: sandstone	4.9	8.58	1.26	0.73	28	0.67	10.8	35. 2	0	20. 7	52. 8
	29	N24º52’28’’	102º46’42’’	1879	Plain-close to Lake	5YR3-6	Loam	Few	<15%: shell	7.65	26.02	0.9	0.52	24	0.76	6.8	35. 2	0	85. 6	90. 2
	30	N24º52’55’’	102º47’31’’	1890		7.5YR4-3	-			6.73	20.43	3.41	1.97	64	2.62	7.5	59. 7	0	151. 7	113. 4
	31	N24º52’53’’	102º47’41’’	1880	Plain-flat	10YR4-3	Loam clay	No	<15%	6.6	15.27	3.7	2.14	60	1.8	11.84	58. 7	0. 07	92. 2	97. 9
	32	N24º52’57’’	102º47’30’’	1885	Plain-flat	10YR4-4	Clayish loam	Few	<15%	7.36	30.06	4.04	2.34	60	2.41	9. 7	46. 7	0. 37	122. 8	108. 8
	33	N24º52’55’’	102º47’31’’	1890		10YR4-4	-			7.76	24.9	3.19	1.85	56	2.68	6.8	62. 8	0. 27	145. 2	131. 9
	34	N24º52’43’’	102º47’05’’	1893		10YR4-4	-			6.65	15.19	3.69	2.14	64	2.47	8.6	48. 6	0. 24	142. 1	148. 6
	35	N24º52’30’’	102º46’51’’	1888		5YR3-4	-			7.46	26.31	2.19	1.27	28	2.18	5.8	44. 7	0. 1	122. 3	112. 4
	36	N24º52’13’’	102º47’07’’	1888		7.5YR4-3	-			7.43	39.33	2.3	1.33	32	1.14	11.6	43. 1	0. 12	95. 9	107
	37	N24º51’55’’	102º47’15’’	1888		7.5YR3-4	-			7.33	43.81	2.31	1.33	32	2.41	5.5	35. 4	0. 27	89. 3	129. 5
	38	N24º52’20’’	102º48’10’’	1890		7.5YR3-3	-			7.16	29.05	3.46	2.01	56	1.9	10.5	45. 2	0. 12	80. 2	109. 7
	39	N24º51’50’’	102º47’34’’	1890	Plain-flat	7.5YR3-3	-			5.66	13.1	2.31	1.34	60	1.94	6.8	49. 9	0. 94	110. 3	238. 5
	40	N24º52’33’’	102º48’08’’	1897	Plain-flat	10YR4-4	-	Few	<15%: sandstone	7.07	29.05	3.93	2.27	64	2.28	9.9	47. 3	0. 04	83. 5	117. 1

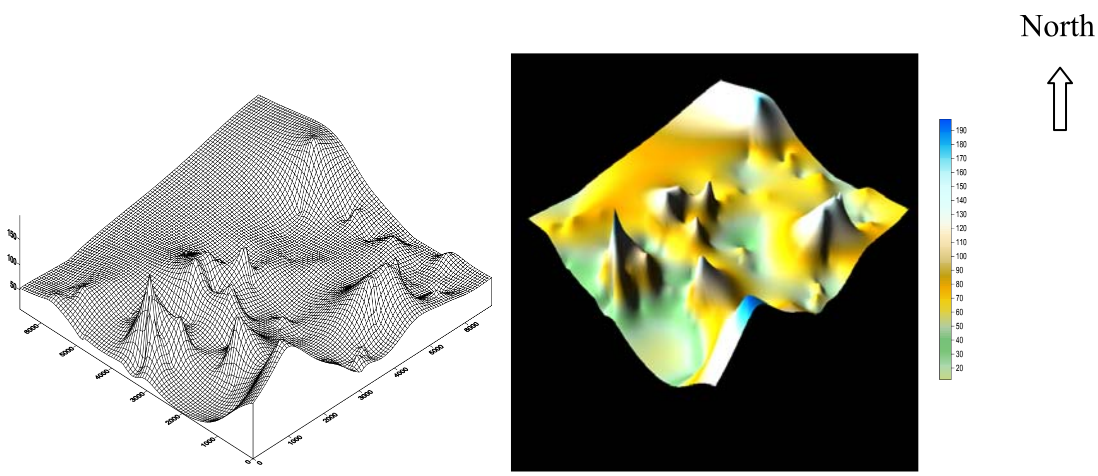
	41	N24º51'43''	102º47'44''	1885	Plain-flat	7.5YR4-3	-	Few	<15%: sandstone	6.63	29.53	3.02	1.75	52	2.12	8.2	47. 1	0	88	82. 2
	42	N24º52'19''	102º46'54''	1884	Plain-close to Lake	7.5YR4-4	-			7.48	41.62	1.83	1.06	28	0.96	10.9	37. 6	0	92. 3	105. 5
	43	N24º52'14''	102º46'56''	1885	Plain-close to Lake	7.5YR3-4	-			7.41	60.14	1.89	1.09	20	1.63	6.7	39. 6	0	90. 4	113. 5
	44	N24º52'49''	102º47'27''	1881		10YR3-4				6.55	30.64	4.21	2.44	68	0.98	24.7	48. 6	0. 04	105. 4	97
	45	N24º52'54''	102º47'30''	1888		7.5YR5-4	Loam			7.06	17.91	2.91	1.68	52	1.34	12.5	60. 4	0. 15	102. 6	104. 8
	46	N24º52'10''	102º46'49''	1887		5YR4-4	Loam			7.7	88.46	1.41	0.82	20	0.84	9. 7	48. 4	0	90. 3	103. 7
Transition	47	N24º52'16''	102º51'50''							6.8	25.6	3.08	1.78	52			44.9	1.723	159.7	167.1
	48	N24º51'28''	102º52'10''							5.3	24.2	3.48	2.02	55			43.9	2.095	149.8	171.5
	49	N24º51'00''	102º51'01''							4.8	14.8	4.04	2.34	58			49.3	1.008	36.7	97.7
	50	N24º52'40''	102º49'11''							6.7	24.4	4.75	2.76	53			85.5	0.874	54.7	134.3
	51	N24º52'44''	102º49'20''							4.9	13.9	4.84	2.81	34			81.9	0.617	50.2	150.3
	52	N24º50'28''	102º51'30''							5.8	25.8	3.02	1.75	62			51.2	0.626	148.5	260.1
	53	N24º51'56''	102º48'35''							5	25	5.94	3.45	38			110.7	0.362	110.4	162.8
	54	N24º52'02''	102º47'40''							6.2	32	4.7	2.72	41			123.3	0.376	87.2	156.6
	55	N24º52'04''	102º48'45''							4.8	18.2	6.26	3.63	54			86.6	0.837	37.4	105.6
	56	N24º52'32''	102º49'30''							5.8	25	4.81	2.79	58			48.3	0.101	42.6	104.6
	57	N24º52'36''	102º48'55''							5.6	19.7	4.04	2.34	32			128.1	0.4	79	182.2
	58	N24º52'20''	102º49'25''							6.2	18	2.69	1.56	35			144.4	0.393	60.1	124.4
	59	N24º52'16''	102º49'50''							6.7	18.7	2.78	1.61	52			75.9	0.843	50.7	125.6
	60	N24º51'28''	102º51'50''							5.5	25.9	3.99	2.31	49			79.1	1.63	221.3	207
	61	N24º50'12''	102º50'05''							5.1	14.5	3.22	1.86	45			59.8	0.972	47.9	139.5
	62	N24º52'12''	102º49'45''							4.8	20.2	5.51	3.19	61			62.8	1.035	24.5	128.8
	63	N24º52'12''	102º51'50''							4.9	20.8	5.45	3.16	60			86.4	1.047	36.6	159.6
	64	N24º50'44''	102º50'50''							4.7	12.7	2.39	1.38	66			158.2	0.259	40.8	130.7
	65	N24º50'32''	102º50'30''							4.6	11	2.47	1.43	58			159.7	0.124	38.8	156.1
	66	N24º50'28''	102º50'05''							4.8	12.3	2.35	1.36	58			158.6	0.373	45.8	132.6
	67	N24º50'24''	102º49'50'							5.9	20.1	2.96	1.71	35			72.4	1.016	22.8	109.3
	68	N24º50'08''	102º49'20''							4.4	13.8	3.81	2.21	46			71.3	0.959	30.4	107.3
	69	N24º50'56''	102º52'20''							5.5	24.5	2.72	1.58	57			49.2	0.543	170.2	193.6
	70	N24º50'44''	102º52'10''							6.6	30.2	2.05	1.19	47			76.6	0.794	200.4	242.1
	71	N24º50'28''	102º51'45''							4.6	15.1	3.16	1.83	50			53	0.43	89.4	156.8
	72	N24º50'24''	102º50'05''							4.6	16.8	2.9	1.68	55			77.8	0.731	106.1	242.7
	73	N24º50'12''	102º49'35''							4.7	9.7	2.39	1.38	37			71.9	0.42	52.9	144.2
	74	N24º50'44''	102º50'49''	1932	Plain	7.5YR4-4	Loam clay	Organic matter	No	6.4		4.83	2.80				45	0	219.9	148.7
	75	N24º50'32''	102º50'55''	1930	Plain	10YR3-4	Clay	Few	<15%: Colluvium	6.4	33.2	3.62	2.09	71.6	1.9	11	68	1.8	190.5	123.4
	76	N24º50'14''	102º51'19''	1955	Summit of side	5YR4-8	Sandy clay	Few, Weathering	<15%	5.3	22.7	1.9	1.10	76	0.9	12	82.8	1.5	167.7	77.6
	77	N24º50'28''	102º50'57''	1932	Foot of slope	10YR4-4	Loam clay	Many	<15%: Colluvium	5.8	38.1	2.7	1.56	51.6	1.8	6	66.9	1.5	149.1	102.6
	78	N24º50'53''	102º50'48''	1946	Plain-flat	5YR4-6	Loam clay	Few, Weathering	<15%: sandstone	5.1		2.59	1.50				60.3	0	105.2	101
	79	N24º51'51''	102º50'32''	1950	Plain-flat	5YR3-6	Loam clay	No	<15%	5.1	21.7	2.4	1.39	52.8	1.4	10	70.1	1.4	73.4	92.1
	80	N24º51'42''	102º50'07''	1933	Foot of slope	5YR3-6	Loam clay	No	<15%: sandstone	6.4		2.24	1.29				50.1	0	88	82.4
	81	N24º51'57''	102º49'40''	1920	Slope (terrace)-5%SW	10YR4-4	Loam clay	Many	No	5.4		2.93	1.69				49.3	0	86.5	82.4

	82	N24º52'43''	102º51'00''	1940	Slope (terrace)-10%NE	7.5YR5-6	Loam clay	Few	<15%: sandstone	6.8		1.9	1.10				47.1	0	141.1	97.4
	83	N24º52'43''	102º50'38''	1939	Side (terrace)-3%S	2.5YR3-6	Loam clay	No	<15%	6.6		2.24	1.29				54.3	0	88.9	93
	84	N24º52'52''	102º50'06''	1920	Slope-2%W	5YR3-6	Loam clay	No	<15%	7	20.4	2.9	1.68	57.7	1.4	9	68.9	1.4	84.9	107.4
	85	N24º52'52''	102º49'26''	1928	Slope-5%SW	10YR4-4	Loam clay	Many, Weathering	<15%: sandstone	5.6	18.8	5.17	2.99	42.4	1.9	16	58.1	1	70.3	72
	86	N24º52'24''	102º49'30''	1920	Plain-flat	5YR3-6	Clay	No	<15%	6.8		2.41	1.39				70.7	0	66	101.5
	87	N24º52'19''	102º49'56''	1928	Plain-flat	10YR4-6	Loam clay	No	No	5.4		2.76	1.60				65.6	0	85.7	94.7
	88	N24º52'15''	102º50'26''	1939	Slope (terrace)-8%SW	5YR3-6	Loam clay	Few:Fe-Mn	<15%: Fe-Mn	6.5		3.45	2.00				51.4	0	74.9	96.4
	89	N24º51'19''	102º49'22''	1923	Slope (terrace)-60%E	5YR3-4	Clay			5.39	14.74	1.63	0.94	60	0.95	9.8	54.6	0	99.2	100.7
	90	N24º51'21''	102º49'22''	1883	Bottom of valley	7.5YR4-4	Clay	No	<15%	5.2	11.54	1.93	1.11	48	1.64	6.7	49.6	0	88.2	89.9
	91	N24º50'28''	102º49'40''	1920		7.5YR3-4	-			5.73	24.64	2.53	1.46	72	1.23	11.8	46.2	0.01	191.7	152.8
	92	N24º50'10''	102º49'37''	1909		5YR3-6	-			5.23	22.87	2.81	1.62	64	1.72	9.4	45	0.02	204.2	153.4
	93	N24º51'07''	102º49'11''	1910		7.5YR3-4	-			6.18	25.5	2.99	1.73	48	2.41	7.1	40.5	0.15	179.6	151.4
	94	N24º50'10''	102º49'09''	1916		7.5YR3-4	-			6.11	26.7	2.75	1.59	76	2.46	6.4	45.5	0.16	179.3	134.4
	95	N24º50'14''	102º49'20''	1899		7.5YR4-4	-			6.09	22.63	2.72	1.57	84	2.45	6.3	46.1	0	213.5	185.9
	96	N24º51'55''	102º47'15''	1888		5YR3-4	-			6.16	26.01	2.66	1.54	52	1.93	7.9	44.7	0.14	210.6	158.2
	97	N24º51'59''	102º47'45''	1916		7.5YR3-4	-			5.79	28.3	2.41	1.39	60	1.79	7.7	43.7	0.16	231.7	163
	98	N24º50'59''	102º51'48''	1934		7.5YR4-4	-			6.06	29.53	1.39	0.80	76	2.57	3.1	43.2	0	211.6	147
	99	N24º50'48''	102º51'30''	1942		7.5YR4-4	-			4.66	20.78	2.64	1.53	64	1.94	7.8	44.9	0.08	210	159.5
	100	N24º50'00''	102º49'15''	1915	Slope (terrace)-15%W	5YR4-4	Loam	Many	<15%	4.95	21.29	1.75	1.01	72	1.15	8.7	45.5	0.05	174.7	133.5
	101	N24º50'13''	102º49'22''	1915	Bottom of valley	7.5YR4-6	Loam	Few	No	5.18	25.21	2.52	1.46	56	1.16	12.5	44.4	0	216.4	156.1
	102	N24º50'10''	102º49'26''	1919	Slope (terrace)	10YR4-3	Clay	Few	<15%	5.51	21.55	3.53	2.04	64	2.29	8.8	54.3	0	160.9	123.8
	103	N24º50'25''	102º49'30''	1918	Slope (terrace)	5YR4-6	Clay			6.48	20.64	1.77	1.02	48	0.86	11.8	57.4	0	97.5	90
	104	N24º51'25''	102º49'24''	1927	Slope (terrace)-valley	10YR4-6	Loam	No	<15%	6.28	13.75	1.46	0.84	40	0.85	9.8	41.5	0	51.5	66.5
	105	N24º51'32''	102º49'27''	1931	Slope (terrace)-valley	5YR5-6	Clay	Few	<15%: shell	4.84	8.93	1.45	0.84	40	0.66	12.6	30.9	0	25	43.1
	106	N24º51'26''	102º49'13''	1924	Slope (terrace)-valley	7.5YR4-4	Clay loam	No	No	4.84	12.19	1.85	1.07	52	1.34	7.9	63	0	60.4	78.9
	107	N24º51'47''	102º48'52''	1913	Slope (terrace)-valley	10YR4-4	Clay loam	Few	<15%	6.09	15.65	2.03	1.17	52	1.2	9.7	53.7	0	63	89.1
	108	N24º51'55''	102º48'52''	1902	Slope (terrace)-valley	7.5YR4-3	Loam	Few	<15%	5.59	19.9	2.43	1.41	44	1.15	12.1	53.9	0	90.9	97.1
	109	N24º51'17''	102º51'35''	1976	Slope (terrace)-160%E	5YR4-8	Loam/Clay	No	<15%	5.46	17.76	1.56	0.95	80	0.87	10.3	67.5	0	90.5	86.1
	110	N24º51'09''	102º51'34''	1950	Bottom of valley	7.5YR4-4	Loam	Few	<15%	5.25	19.16	2.95	1.71	68	1.78	9.5	59.3	0	211.1	158.4
	111	N24º50'50''	102º51'24''	1944		10YR4-4	Clay			7.1	30.52	2.21	1.28	64	1.54	8.2	55.2	0.22	179.9	143.5
	112	N24º50'47''	102º51'14''	1935		7.5YR3-4	-			6.19	26.59	2.32	1.34	84	1.06	12.6	60.7	0.11	192	161.4
	113	N24º50'31''	102º51'19''	1956	Slope (terrace)	7.5YR5-6	Loam	Few	No	5.01	13.89	1.26	0.73	52	0.57	12.7	51.1	0	157	113.9
	114	N24º52'23''	102º48'46''	1898	Bottom of valley	7.5YR4-4	Loam	Few	<15%: shell	5.41	12.82	3.64	2.11	72	2.45	8.5	62.3	0.27	82.2	108.5
	115	N24º50'06''	102º49'14''	1923		7.5YR4-4	Loam			6.43	26.82	2.63	1.52	68	2.25	6.7	42.1	0.31	180.6	148.2
	116	N24º51'46''	102º51'34''	1944		7.5YR4-4	Loam			6.18	18.27	1.5	0.87	72	0.91	9.4	29.8	0	221.3	77.2
	117	N24º51'21''	102º49'20''	1925		5YR5-6	Clay			5.56	12.13	3.22	1.86	40	2.84	6.5	49.7	0	86.5	77
	127	N24º51'51''	102º51'49''	1960	Slope (terrace)-80%W	7.5YR4-4	Loam	Few	<15%: shell	5.9	37.1	1.59	0.92	32	0.99	9.2	49.2	0	216.9	162.8
	128	N24º51'51''	102º51'42''	1941	Slope (terrace)-50%W	7.5YR4-4	Loam clay	Few	<15%	5.9	28.99			64	1.46	5.5	47.7	0	217.5	142.7
	129	N24º51'49''	102º51'35''	1973	Slope (terrace)-20%W	2.5YR4-4	Clay	Few	No	6.9	25.66	0.93	0.53	68	0.83	6.5	58.4	0	212.5	141.4
Mountain	118	N24º50'22''	102º51'37''	1995	Foot of slope	5YR4-3	Clay	Few	<15%	6.3		2.24	1.29				40.7	0	157.6	123.7

	119	N24º50'28''	102º51'38''	1955	Plain-flat	5YR4-6	Loam Clay	Few	<15%	5.1		1.9	1.10		0.4	27	47.9	0	77	73
	120	N24º50'36''	102º51'40''	1960	Foot of slope	5YR3-4	Sandy Clay	No	No	7.7		2.59	1.50		0.8	15	51.3	0	184.8	125.8
	121	N24º50'33''	102º51'57''	1975	Side-8%SW	5YR3-6	Sandy Clay	No	<15%	7.8		6.38	3.70				52.5	0	161.9	87.9
	122	N24º52'54''	102º51'44''	1950	Side(terrace)-30%W	2.5YR4-6	Clay	Many, Weathering	<15%	4.4	31.9	1.55	0.89		0.4	27	181.6	4	177.6	220.3
	123	N24º52'52''	102º51'40''	1940	Foot of slope	2.5YR3-6	Clay	Few, Weathering	<15%: Limestone	7.7	27.6	2.24	1.29		0.8	15	104.2	2.3	129.3	173.4
	124	N24º52'48''	102º51'32''	1940	Foot of slope	2.5YR3-6	Clay	No	15%~50%; Limestone	7.3		2.41	1.39				63.2	0.49	145.4	140.4
	125	N24º52'50''	102º51'26''	1960	Plain	2.5YR3-6	Clay	Few, Weathering	<15%: Limestone	6.2	29	3.28	1.90		1.2	16	87.6	1.6	132.9	82
	126	N24º52'51''	102º51'33''	1950		2.5YR3-6	Clay			4.7		1.55	0.89				53.7	0	107.2	85.4
	130	N24º50'11''	102º51'16''	1950		5YR4-6	Loam clay			5.71	17.87	1.36	0.78		0.77	10.1	74.5	0.68	127.1	127.6

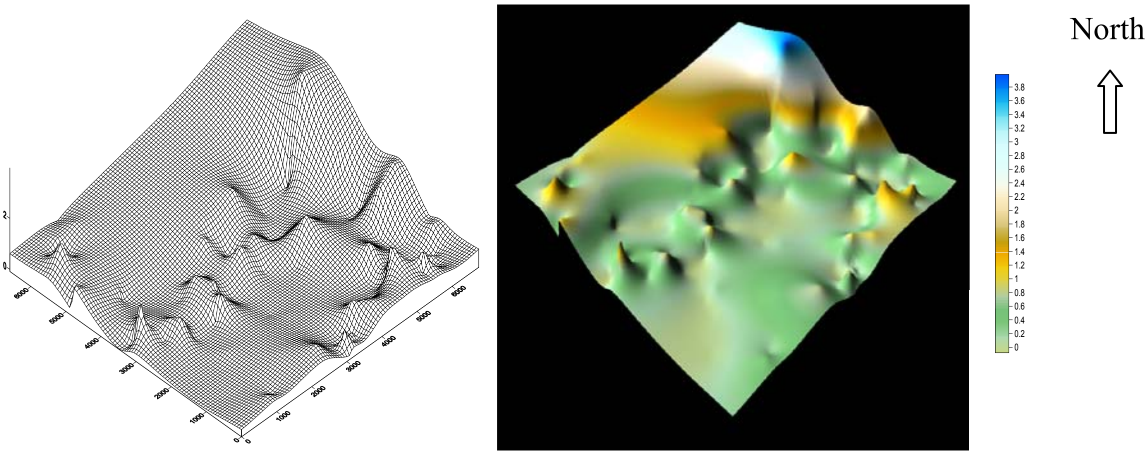
ANNEX 4.3: DISTRIBUTION OF TOPSOIL TRACE ELEMENT CONTENTS IN REGIONAL APPROACH



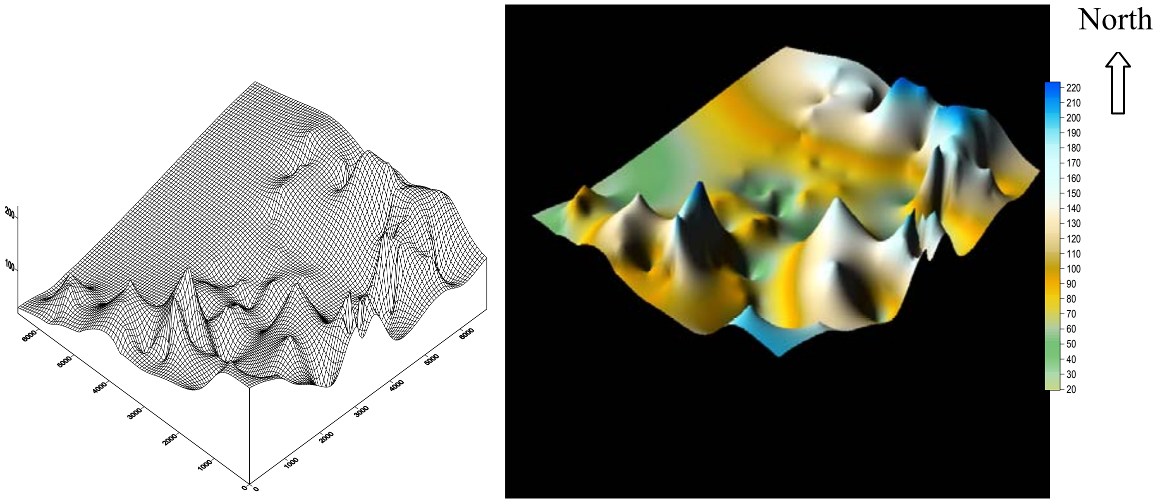


Wire-frame map Surface map

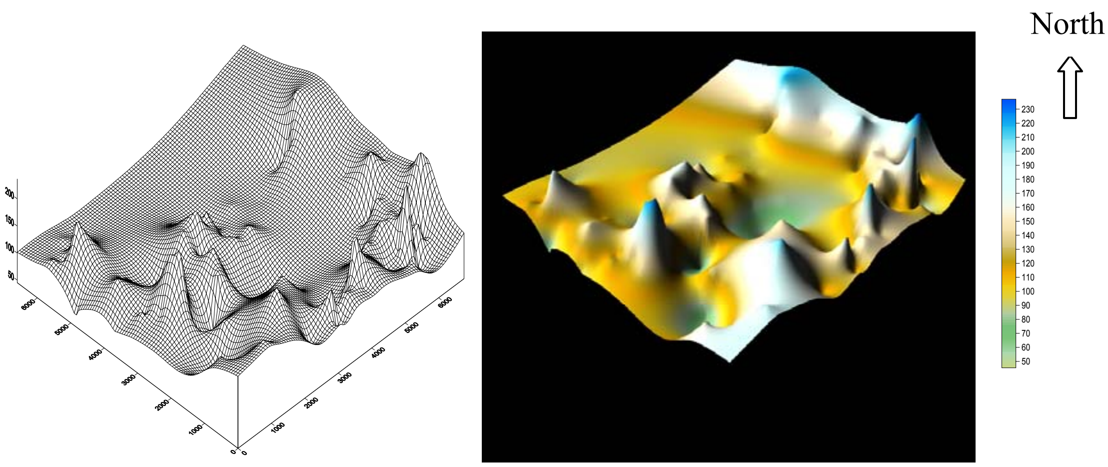
Distribution of Pb contents in topsoil samples in regional approach (Kriging as gridding method)



Distribution of Cd contents in topsoil samples in regional approach (Kriging as gridding method)

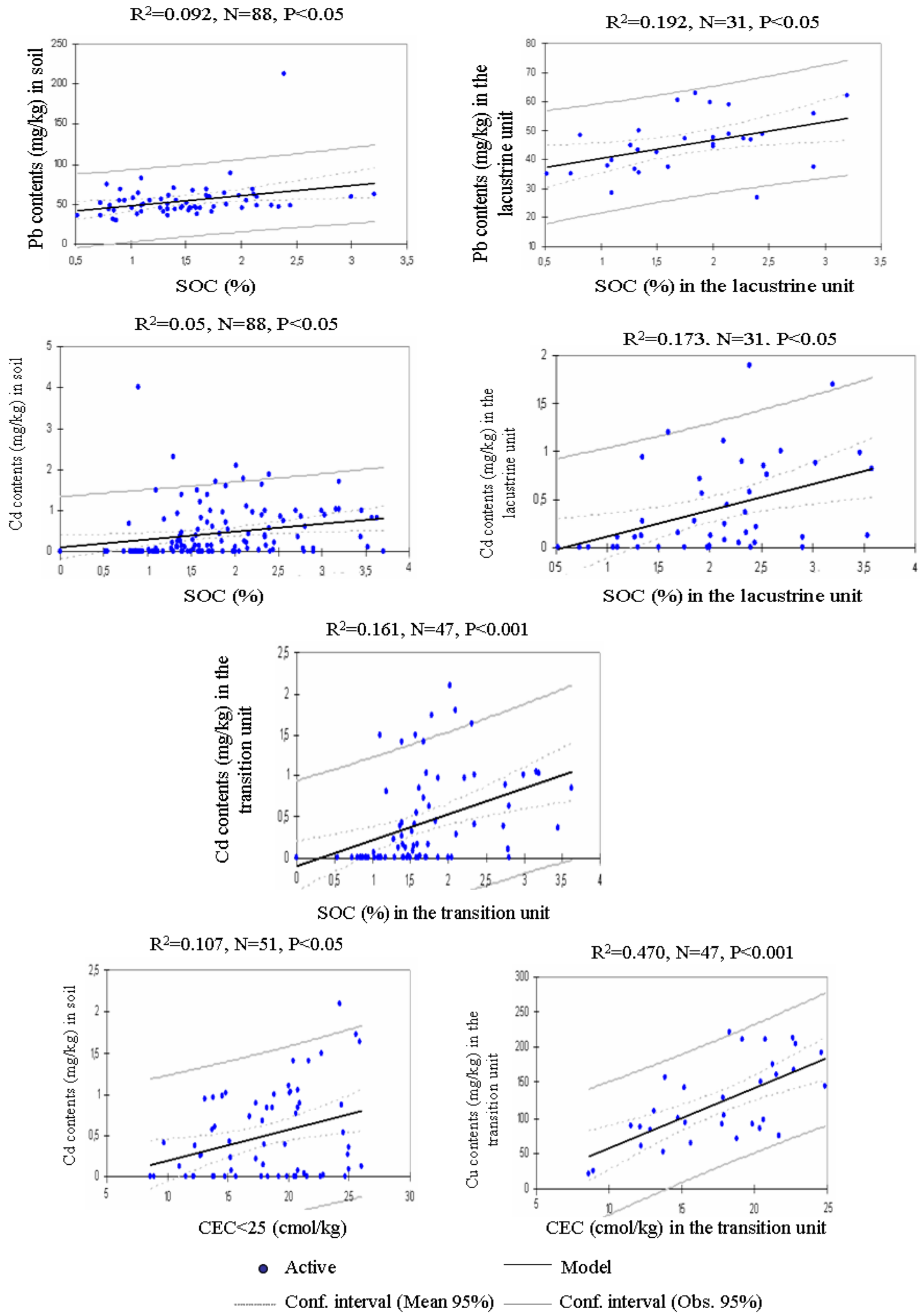


Distribution of Cu contents in topsoil samples in regional approach (Kriging as gridding method)

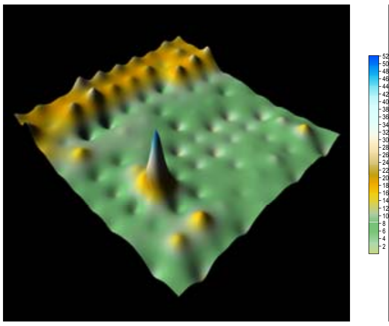
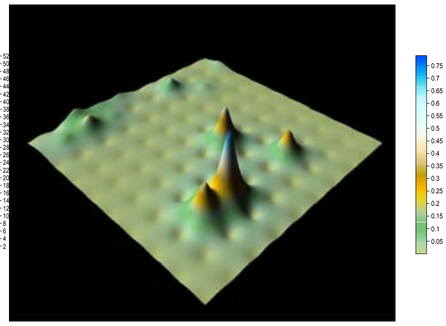


Distribution of Zn contents in topsoil samples in regional approach (Kriging as gridding method)

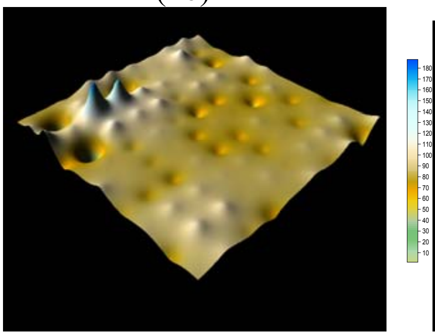
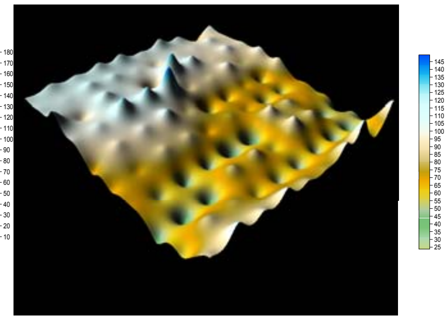
ANNEX 4.4: RELATIONSHIPS BETWEEN TRACE ELEMENT CONTENTS AND SOIL CHARACTERISTICS



ANNEX 4.5: DISTRIBUTIONS OF TOTAL TRACE ELEMENT CONTENTS IN DETAILED APPROACH

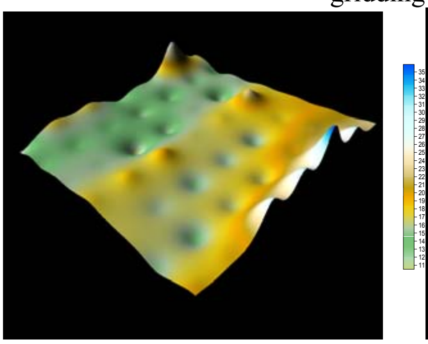
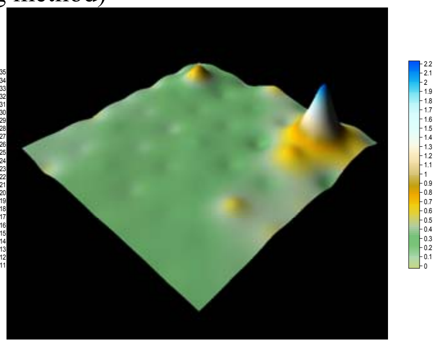



(Pb) (Cd)

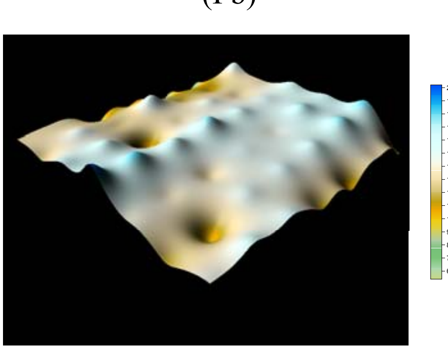
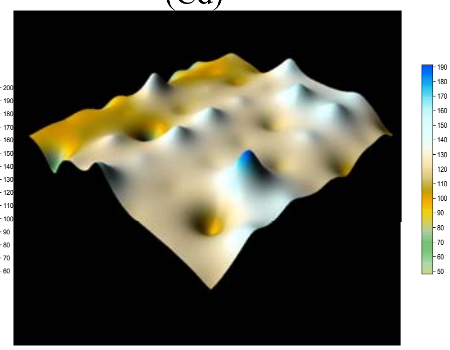



(Cu) (Zn)

Surface maps of TE contents in topsoil in detailed approach in the lacustrine unit (Kriging as gridding method)

(Pb) (Cd)

(Cu) (Zn)

Surface maps of TE contents in topsoil in detailed approach in the transition unit (Kriging as gridding method)

ANNEX 4.6: VERTICAL DISTRIBUTION OF TRACE ELEMENTS

Annex 4.6a: TE contents (mg/kg) in topsoil and subsoil

Unit	Content	Pb		Cd		Cu		Zn	
		Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil
Lacustrine	Median	53.1	43.6	0.69	0.72	88.3	82.4	101.9	69.4
	Mean	69.5	44.14	0.84	0.66	86.9	81.3	99	70.48
	Min	35.2	33.4	0	0	61.2	37.8	77.1	42.7
	Max	212.4	57	1.90	1.20	103.6	105.8	129.5	91.7
Transition	Median	54.6	53.4	0.68	0.74	157.0	160.8	113.9	94.8
	Mean	85.5	56.9	0.75	0.79	142.8	147.6	112.3	101.7
	Min	30.9	41.1	0	0	25	26.8	43.1	15.7
	Max	82.8	91.0	1.80	1.80	217.5	218.2	162.8	158.2
Mountain	Median	104.2	104.9	2.30	2.30	132.9	114.8	173.4	155
	Mean	124.5	79.7	2.63	2.10	146.6	126.9	158.6	135.3
	Min	87.6	89.2	1.60	1.80	129.3	107.8	82	74.6
	Max	181.6	116.8	4	2.30	177.6	158.3	220.3	176.3
All	Median	57.9	53.3	0.71	0.76	115.4	117.8	105.8	89.2
	Mean	85.1	58.2	1.01	0.89	129.2	129.1	113.3	97
	Min	30.9	33.4	0	0	25	26.8	43.1	15.7
	Max	669	116.8	4	2.30	217.5	218.2	220.3	176.3

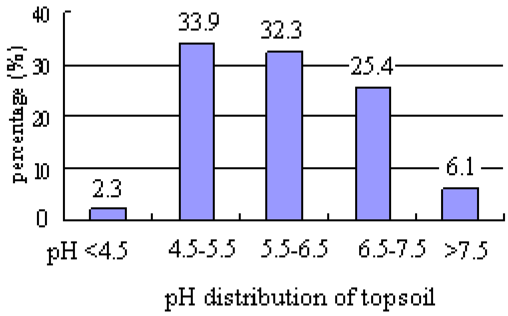
*n=8 in lacustrine unit, n=21 in transition unit, n=3 in mountain unit, n=32 for all top/subsoil samples.

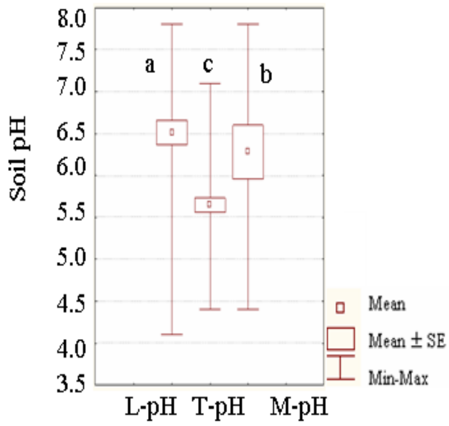
Annex 4.6 b: Ratio of total TE contents in topsoil to subsoil (RTS)

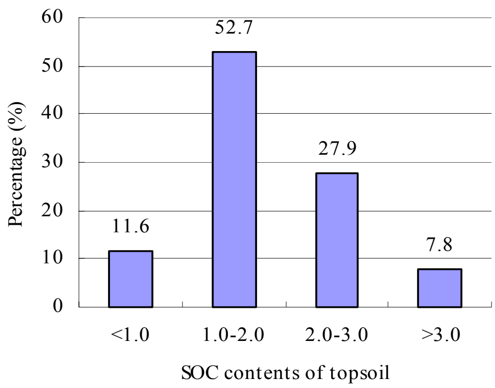
Unit	Ratio	Pb	Cd	Cu	Zn
Lacustrine	Median	1.19	1.05	1.04	1.52
	Mean	1.48	1.18	1.11	1.45
	Min	0.94	0.77	0.89	0.98
	Max	3.73	1.70	1.62	1.81
Transition	Median	1.0	1	0.99	1.09
	Mean	1.51	1.36	0.97	1.39
	Min	0.74	0.70	0.73	0.76
	Max	11.51	8.44	1.28	8.13
Mountain	Median	0.98	1	1.12	1.12
	Mean	1.16	1.24	1.20	1.16
	Min	0.96	0.89	0.84	1.10
	Max	1.55	1.82	1.65	1.25
All	Median	1.06	1	0.99	1.11
	Mean	1.47	1.30	1.03	1.38
	Min	0.74	0.70	0.73	0.76
	Max	11.51	8.44	1.65	8.13

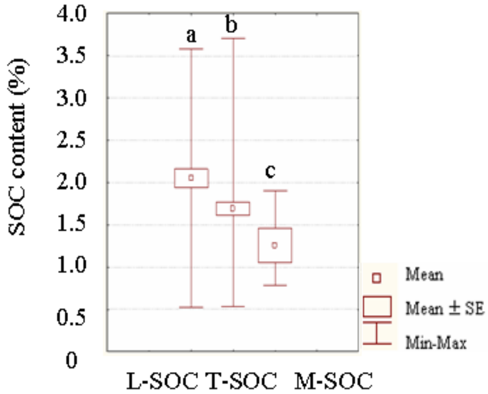
*n=8 in lacustrine unit, n=21 in transition unit, n=3 in mountain unit, n=32 for all top/subsoil samples.

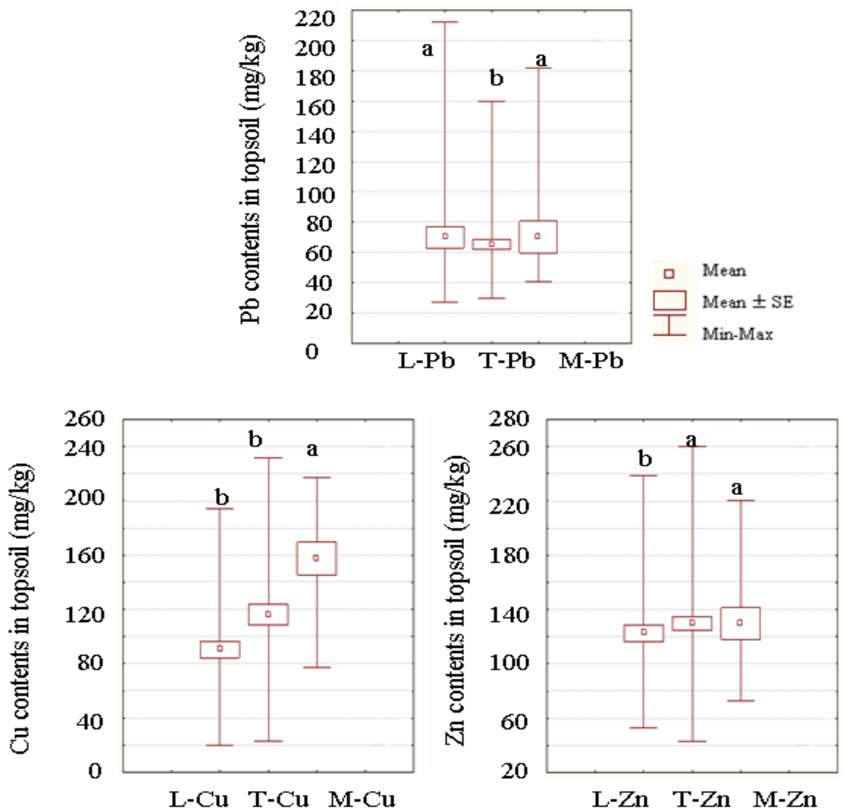
ANNEX 4.7: ANALYSIS RESULTS BASED ON DATA OF GAU+YAU











Pb, Cu and Zn contents of topsoil in the 3 units (based on data analysis at GAU+YAU)

ANNEX 5.1: GENERAL ANALYSIS DATA OF SOILS RESPONDING TO VEGETABLE SAMPLES

Unit	No.	Soil samples (mg/kg)								Vegetable samples (mg/kg DM)			
		T-Pb	T-Cd	T-Cu	T-Zn	Pi-Pb	Pi-Cd	Pi-Cu	Pi-Zn	Pb	Cd	Cu	Zn
lacustrine unit	1	53.9	0.847	19.7	109.8	1.09	2.78	0.56	1.07	53.9	0.847	19.7	109.8
	2	74	0.819	44.7	123.4	1.18	2.74	1.15	1.16	74	0.819	44.7	123.4
	3	86.3	0.992	67.5	194.8	1.24	2.99	1.5	1.63	86.3	0.992	67.5	194.8
	4	116.5	0.712	187.5	220.7	1.38	2.59	2.29	1.8	116.5	0.712	187.5	220.7
	5	178	0.146	130.9	172	1.67	0.73	2.1	1.48	178	0.146	130.9	172
	6	197.4	0.438	172.6	192.5	1.76	2.2	2.24	1.62	197.4	0.438	172.6	192.5
	7	47.1	0.569	26.9	95.6	1.06	2.38	0.77	0.96	47.1	0.569	26.9	95.6
	8	81.5	0.76	49.9	119.2	1.22	2.66	1.23	1.23	81.5	0.76	49.9	119.2
	9	143.7	0.114	92.3	170.8	1.51	0.57	1.89	1.47	143.7	0.114	92.3	170.8
	10	99.5	0.884	87.5	172.8	1.3	2.83	1.81	1.49	99.5	0.884	87.5	172.8
	11	160.5	0.211	62.7	134.8	1.58	1.87	1.43	1.23	160.5	0.211	62.7	134.8
	12	60.6	1.101	43.7	156.3	1.12	3.14	1.13	1.38	60.6	1.101	43.7	156.3
	13	86.4	0.891	53	142.9	1.24	2.84	1.28	1.29	86.4	0.891	53	142.9
	14	60.4	1.005	29.5	88.7	1.12	3.01	0.84	0.89	60.4	1.005	29.5	88.7
	15	51.3	0.557	168.5	215.7	1.08	2.37	2.23	1.77	51.3	0.557	168.5	215.7
	30	59.7	0	151.7	113.4	1	0	0.59	0.53	5.7	0.236	6.2	47.1
	33	62.8	0.27	145.2	131.9	1.13	1.7	2.7	1.21	6.6	0.309	4.5	51.8
	34	48.6	0.24	142.1	148.6	1.06	1.4	2.65	1.32	6.5	0.453	5.3	74.0
	35	44.7	0.1	122.3	112.4	1.05	0.5	2.34	1.08	5.4	0.244	4.7	44.2
	36	43.1	0.12	95.9	107	1.04	0.2	1.94	1.05	5.8	0.324	5.8	50.5
	37	35.4	0.27	89.3	129.5	1	1.7	1.84	1.2	6.1	0.706	7.7	52.1
	38	45.2	0.12	80.2	109.7	1.05	0.2	1.7	1.07	4.8	0.581	5.1	39.8
	39	49.9	0.94	110.3	238.5	1.07	2.91	2.16	1.92	6.1	0.342	5.1	40.5
	42	37.6	0	92.3	105.5	1	0	1.88	1.04	6.1	0.888	5.2	43.9
	43	39.6	0	90.4	113.5	1.02	0	1.85	1.09	4.8	1.337	6.8	157.5
	44	48.6	0.04	105.4	97	1.06	0.2	2.02	0.97	6.4	0.496	5.6	36.9
transition unit	47	44.9	1.723	159.7	167.1	1.05	4.03	2.19	1.45	44.9	1.723	159.7	167.1
	48	43.9	2.095	149.8	171.5	1.04	4.56	2.17	1.48	43.9	2.095	149.8	171.5
	49	49.3	1.008	36.7	97.7	1.07	3.01	1.03	0.98	49.3	1.008	36.7	97.7
	50	85.5	0.874	54.7	134.3	1.23	2.82	1.3	1.23	85.5	0.874	54.7	134.3
	51	81.9	0.617	50.2	150.3	1.22	2.45	1.23	1.34	81.9	0.617	50.2	150.3
	52	51.2	0.626	148.5	260.1	1.08	2.47	2.16	2.04	51.2	0.626	148.5	260.1
	53	110.7	0.362	110.4	162.8	1.35	2.09	2.03	1.42	110.7	0.362	110.4	162.8
	54	123.3	0.376	87.2	156.6	1.41	2.11	1.8	1.38	123.3	0.376	87.2	156.6
	55	86.6	0.837	37.4	105.6	1.24	2.77	1.04	1.04	86.6	0.837	37.4	105.6
	56	48.3	0.101	42.6	104.6	1.06	0.51	1.12	1.03	48.3	0.101	42.6	104.6
	57	128.1	0.4	79	182.2	1.43	2.14	1.68	1.55	128.1	0.4	79	182.2
	58	144.4	0.393	60.1	124.4	1.51	2.13	1.39	1.16	144.4	0.393	60.1	124.4

	59	75.9	0.843	50.7	125.6	1.19	2.78	1.24	1.17	75.9	0.843	50.7	125.6
	60	79.1	1.63	221.3	207	1.21	3.9	2.4	1.71	79.1	1.63	221.3	207
	61	59.8	0.972	47.9	139.5	1.12	2.96	1.2	1.26	59.8	0.972	47.9	139.5
	62	62.8	1.035	24.5	128.8	1.13	3.05	0.7	1.19	62.8	1.035	24.5	128.8
	63	86.4	1.047	36.6	159.6	1.24	3.07	1.02	1.4	86.4	1.047	36.6	159.6
	64	158.2	0.259	40.8	130.7	1.57	1.94	1.09	1.2	158.2	0.259	40.8	130.7
	65	159.7	0.124	38.8	156.1	1.58	0.62	1.06	1.37	159.7	0.124	38.8	156.1
	66	158.6	0.373	45.8	132.6	1.57	2.1	1.17	1.22	158.6	0.373	45.8	132.6
	67	72.4	1.016	22.8	109.3	1.17	3.02	0.65	1.06	72.4	1.016	22.8	109.3
	68	71.3	0.959	30.4	107.3	1.17	2.94	0.87	1.05	71.3	0.959	30.4	107.3
	69	49.2	0.543	170.2	193.6	1.07	2.35	2.23	1.62	49.2	0.543	170.2	193.6
	70	76.6	0.794	200.4	242.1	1.19	2.71	2.33	1.95	76.6	0.794	200.4	242.1
	71	53	0.43	89.4	156.8	1.08	2.19	1.84	1.38	53	0.43	89.4	156.8
	72	77.8	0.731	106.1	242.7	1.2	2.62	2.02	1.95	77.8	0.731	106.1	242.7
	73	71.9	0.42	52.9	144.2	1.17	2.17	1.28	1.29	71.9	0.42	52.9	144.2
	91	46.2	0.01	191.7	152.8	1.05	0.05	3.41	1.35	4.5	0.656	5.3	83.3
	92	45	0.02	204.2	153.4	1.05	0.1	3.6	1.36	4.8	0.574	9.3	48.2
	93	40.5	0.15	179.6	151.4	1.03	0.75	3.23	1.34	6.1	0.487	5.8	43.5
	94	45.5	0.16	179.3	134.4	1.05	0.8	3.22	1.23	6.0	0.509	5.6	35.7
	95	46.1	0	213.5	185.9	1.05	0	3.75	1.57	5.0	0.231	5.5	34.9
	96	44.7	0.14	210.6	158.2	1.05	0.7	3.7	1.39	5.9	0.486	5.5	37.8
	97	43.7	0.16	231.7	163	1.04	0.8	4.03	1.42	5.7	0.471	6.2	41.4
	98	43.2	0	211.6	147	1.04	0	3.72	1.31	5.3	0.244	5.9	34.9
	99	44.9	0.08	210	159.5	1.05	0.4	3.7	1.4	5.6	0.298	4.7	35.2
	112	60.7	0.11	192	161.4	1.12	0.55	3.42	1.41	5.2	0.464	6.4	41.6

Pi: signal index of contamination.

ANNEX 5.2: GENERAL ANALYSIS DATA OF CHINESE CABBAGE AND ITS RESPONDING SOILS

Unit	No.	Soil samples																						Chinese cabbage samples							
		pH	SOC (%)	T- Pb (mg/kg)	T- Cd (mg/kg)	T-Cu (mg/kg)	T-Zn (mg/kg)	Available Pb (mg/kg)	Available Cd (mg/kg)	Available Cu (mg/kg)	Available Zn (mg/kg)	A-Pb	B-Pb	C-Pb	A-Cd	B-Cd	C-Cd	A-Cu	B-Cu	C-Cu	A--Zn	B-Zn	C-Zn	Total Pb (mg/kgDM)	Total Cd (mg/kgDM)	Total Cu (mg/kgDM)	Total Zn (mg/kgDM)	Total Pb (mg/kgFM)	Total Cd (mg/kgFM)	Total Cu (mg/kgFM)	Total Zn (mg/kgFM)
Lacustrine unit	30	5.80	2.91	59.7	0.00	151.7	113.4	12	0.16	19	6.8	0.65	6.47	8.78	0.073	0.108	0.034	1.18	2.9	16.27	0.58	11.07	14.67	6.1	0.706	7.7	52.1	0.305	0.035	0.38	2.61
	33	7.30	2.59	62.8	0.27	145.2	131.9	16	0.23	20	7	1.24	9.55	8.91	0.072	0.156	0.095	1.04	2.55	13.83	0.52	11	13.44	4.8	0.581	5.1	39.8	0.24	0.029	0.25	1.99
	34	6.20	3.03	48.6	0.24	142.1	148.6	12	0.23	17	14	0.86	6.25	5.1	0.07	0.164	0.067	0.98	1.94	14.52	1.27	16.69	19.61	6.1	0.342	5.1	40.5	0.31	0.017	0.26	2.03
	35	7.10	1.46	44.7	0.10	122.3	112.4	6.2	0.11	13	7.9	1.44	5.16	4.32	0.07	0.163	0.078	1.3	2.67	15.73	1.18	13.87	13.13	5.7	0.236	6.2	47.1	0.28	0.012	0.31	2.35
	36	7.10	1.68	43.1	0.12	95.9	107.0	7.2	0.16	11	11	1.55	4.77	5.73	0.073	0.134	0.098	1.38	1.83	12.61	1.3	15.61	12.89	6.6	0.309	4.5	51.8	0.33	0.015	0.23	2.59
	37	6.90	1.87	35.4	0.27	89.3	129.5	6.3	0.29	13	30	2.12	4.19	3.21	0.072	0.182	0.07	1.01	2.33	9.37	0.35	23.61	17.27	6.5	0.453	5.3	74.0	0.32	0.023	0.26	3.70
	38	6.70	2.87	45.2	0.12	80.2	109.7	10	0.19	14	23	0.65	8.36	5.07	0.075	0.106	0.029	1.07	1.83	16.29	2.78	23.47	12.64	6.1	0.888	5.2	43.9	0.31	0.044	0.26	2.19
	39	5.20	2.30	49.9	0.94	110.3	238.5	7.5	0.56	18	43	0.65	12.05	5.52	0.073	0.154	0.046	1.15	4.43	26.44	11.97	44.02	38.88	4.8	1.337	6.8	157.5	0.24	0.067	0.34	7.88
	42	7.20	1.56	37.6	0.00	92.3	105.5	6.3	0.11	8.1	7.8	2.56	3.6	1.63	0.088	0.209	0.023	1.51	1.15	6.17	1.05	8.48	10.69	5.4	0.244	4.7	44.2	0.27	0.012	0.23	2.21
	43	6.90	1.66	39.6	0.00	90.4	113.5	6.5	0.13	8.3	11	2.31	4.92	1.69	0.092	0.216	0.033	1.33	0.75	6.17	1.29	11.38	10.51	5.8	0.324	5.8	50.5	0.29	0.016	0.29	2.52
	44	6.00	3.43	48.6	0.04	105.4	97.0	12	0.16	16	6.3	1.05	3.5	8.39	0.07	0.129	0.028	1.13	1.79	15.26	0.99	9.17	9.9	6.4	0.496	5.6	36.9	0.32	0.025	0.28	1.85
Transition unit	91	5.30	2.37	46.2	0.01	191.7	152.8	6.6	0.13	18	8.1	0.65	9.96	6.74	0.07	0.099	0.014	1.42	6.15	21.47	1.09	15.37	18.9	4.5	0.656	5.3	83.3	0.22	0.033	0.26	4.16
	92	4.80	2.65	45.0	0.02	204.2	153.4	5.1	0.15	18	7.2	0.65	6.14	6.13	0.07	0.112	0.031	1.29	6.33	24.66	1.4	15.88	23.11	4.8	0.574	9.3	48.2	0.24	0.028	0.46	2.41
	93	5.75	2.64	40.5	0.15	179.6	151.0	5.7	0.23	19	11	0.87	5.79	5.01	0.07	0.122	0.036	1.28	5.47	21.65	1.1	18.31	20.7	6.1	0.487	5.8	43.5	0.31	0.024	0.29	2.17
	94	5.60	2.59	45.5	0.16	179.3	134.4	6	0.21	21	14	0.86	6.59	5.37	0.071	0.092	0.024	1.23	6.37	23.97	2.4	20.1	24.12	6.0	0.509	5.6	35.7	0.29	0.025	0.28	1.79
	95	5.60	2.44	46.1	0.00	213.5	185.9	5.8	0.1	21	6.9	1.67	7.67	6.68	0.034	0.081	0.009	1.36	7.49	26.45	1.03	14.56	24.18	5.0	0.231	5.5	34.9	0.25	0.012	0.27	1.75
	96	5.70	2.33	44.7	0.14	210.6	158.2	5.4	0.19	20	6.8	1.32	7.36	5.34	0.054	0.104	0.024	1.36	8.01	28.53	1.44	14.61	21.55	5.9	0.486	5.5	37.8	0.29	0.024	0.27	1.89
	97	5.20	2.23	43.7	0.16	231.7	163.0	4.5	0.17	20	7.7	2.87	6.1	5.82	0.004	0.122	0.068	1.4	9.45	28.63	1.55	15.04	28.82	5.7	0.471	6.2	41.4	0.28	0.023	0.31	2.07
	98	5.50	3.07	43.2	0.00	211.6	147.0	4.1	0.11	23	8.8	0.65	4.94	6.38	0.045	0.095	0.04	1.37	6.42	0.4	1.5	14.01	27.2	5.3	0.244	5.9	34.9	0.27	0.012	0.29	1.74
	99	4.20	2.36	44.9	0.08	210.0	159.5	4.8	0.17	19	9.4	2.57	4.19	4.56	0.022	0.107	0.027	1.48	6.65	27.37	2.77	16.73	23.44	5.6	0.298	4.7	35.2	0.28	0.015	0.23	1.76
	112	5.60	1.77	60.7	0.11	192.0	161.4	5.2	0.18	18	8.5	1.79	9.67	11.33	0.029	0.155	0.081	1.03	9.51	30.61	1.26	13.31	32.09	5.2	0.464	6.4	41.6	0.26	0.023	0.32	2.08

ANNEX 5.3: RESULTS OF THE TRACE ELEMENT CONTENTS OF VEGETABLE SAMPLES

Annex 5.3 a: TE contents in soil and soil characteristics

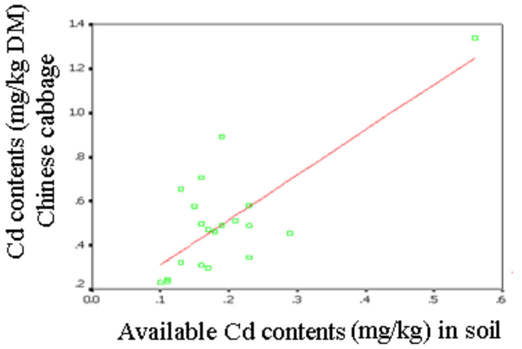
	No.	Village	Water (%)	pH	OM (%)	Clay content (mm)		CEC	Pb	Cd	Cu	Zn
						< 0.01	< 0.002	(cmol/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Lacustrine unit	1	Dounanlianpenwei	3.2	5.5	4.35	46	22	20.8	53.9	0.847	19.7	109.8
	2	Dounanlianpenwei	3.6	6.3	6.17	49	26	25.9	74.0	0.819	44.7	123.4
	3	Shangkele	4.1	5.9	5.97	48	29	27.0	86.3	0.992	67.5	194.8
	4	Wulong	3.4	6.4	3.28	31	20	29.6	116.5	0.712	187.5	220.7
	5	Dayu	4.3	6.6	4.06	43	11	35.6	178.0	0.146	130.9	172.0
	6	Dayu	4.3	7.3	3.73	42	9	39.7	197.4	0.438	172.6	192.5
	7	Dounanlianpenwei	2.7	5.3	4.12	41	23	13.7	47.1	0.569	26.9	95.6
	8	Dounanlianpenwei	3.2	5.9	4.41	48	20	20.6	81.5	0.760	49.9	119.2
	9	Shangkele	4.1	5.5	6.09	59	33	30.4	143.7	0.114	92.3	170.8
	10	Shangkele	3.9	4.8	5.22	57	33	17.3	99.5	0.884	87.5	172.8
	11	Wulong	3.6	4.7	4.23	53	16	17.3	160.5	0.211	62.7	134.8
	12	Wulong	3.5	4.8	3.68	40	19	20.0	60.6	1.101	43.7	156.3
	13	Shangkele	3.1	5.4	3.99	40	20	20.9	86.4	0.891	53.0	142.9
	14	Dounanlianpenwei	4.3	7.2	4.65	53	28	29.9	60.4	1.005	29.5	88.7
	15	Yuejiao	6.3	6.9	3.31	44	4	39	51.3	0.557	168.5	215.7
Transition unit	47	Bailongtan	4.3	6.8	3.08	52	21	25.6	44.9	1.723	159.7	167.1
	48	Langjiaying	5.0	5.3	3.48	55	31	24.2	43.9	2.095	149.8	171.5
	49	Xiazhuang	3.7	4.8	4.04	58	33	14.8	49.3	1.008	36.7	97.7
	50	Qibuchang	3.8	6.7	4.75	53	28	24.4	85.5	0.874	54.7	134.3
	51	Qibuchang	2.6	4.9	4.84	34	12	13.9	81.9	0.617	50.2	150.3
	52	Qiang Wei Ying	6.1	5.8	3.02	62	36	25.8	51.2	0.626	148.5	260.1
	53	Maizi	4.0	5.0	5.94	38	29	25.0	110.7	0.362	110.4	162.8
	54	Maizi	4.4	6.2	4.70	41	20	32.0	123.3	0.376	87.2	156.6
	55	Qibuchang	4.4	4.8	6.26	54	30	18.2	86.6	0.837	37.4	105.6
	56	Qibuchang	3.9	5.8	4.81	58	27	25.0	48.3	0.101	42.6	104.6
	57	Qibuchang	3.4	5.6	4.04	32	20	19.7	128.1	0.400	79.0	182.2
	58	Qibuchang	3.1	6.2	2.69	35	12	18.0	144.4	0.393	60.1	124.4
	59	Qibuchang	3.6	6.7	2.78	52	26	18.7	75.9	0.843	50.7	125.6
	60	Langjiaying	4.7	5.5	3.99	49	34	25.9	79.1	1.630	221.3	207.0
	61	Xiazhuang	3.3	5.1	3.22	45	20	14.5	59.8	0.972	47.9	139.5
	62	Qibuchang	4.1	4.8	5.51	61	37	20.2	62.8	1.035	24.5	128.8
	63	Qibuchang	4.0	4.9	5.45	60	38	20.8	86.4	1.047	36.6	159.6
	64	Baimalu	3.6	4.7	2.39	66	40	12.7	158.2	0.259	40.8	130.7
	65	Baimalu	3.4	4.6	2.47	58	41	11.0	159.7	0.124	38.8	156.1
	66	Baimalu	3.4	4.8	2.35	58	41	12.3	158.6	0.373	45.8	132.6
	67	Xiazhuang	3.2	5.9	2.96	35	15	20.1	72.4	1.016	22.8	109.3
	68	Xiazhuang	10.3	4.4	3.81	46	21	13.8	71.3	0.959	30.4	107.3
	69	Zhongzhuang	5.9	5.5	2.72	57	32	24.5	49.2	0.543	170.2	193.6
	70	Qiang Wei Ying	6.1	6.6	2.05	47	24	30.2	76.6	0.794	200.4	242.1
	71	Zhongzhuang	4.0	4.6	3.16	50	27	15.1	53.0	0.430	89.4	156.8
	72	Zhongzhuang	4.2	4.6	2.90	55	32	16.8	77.8	0.731	106.1	242.7
	73	Xiazhuang	3.1	4.7	2.39	37	16	9.7	71.9	0.420	52.9	144.2

Annex 5.3b: TE contents (mg/kg DM) in the eaten and non-consumed parts of vegetables

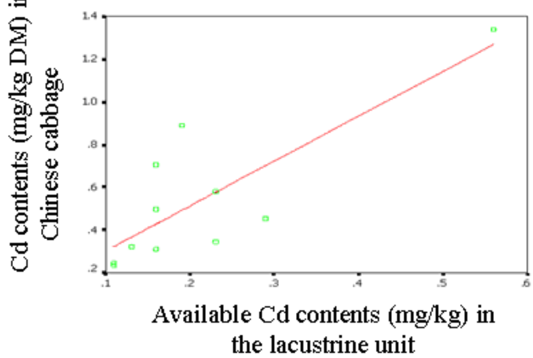
Vegetables	NO.	Eaten part (mg/kg DM)				Non-consumed part (mg/kg DM)			
		Pb	Cd	Cu	Zn	Pb	Cd	Cu	Zn
Cauliflower	47	32.7	0.008	131.2	20.4	21.8	1.437	180.7	85.7
	48	29.6	0.001	233.6	164.8	23.1	0.130	144.3	110.0
	49	41.2	0.008	214.8	92.0	19.3	1.491	338.3	56.3
	50	29.7	0.239	180.8	50.4	29.1	0.900	124.3	103.0
	51	12.6	0.184	142.8	106.8	9.9	0.120	147.0	99.7
	52	12.6	0.422	93.7	70.5	20.9	3.279	85.1	111.9
Celery	53	7.3	0.265	70.0	103.4	0.1	1.247	49.4	43.1
	54	4.6	0.538	44.8	150.0	4.1	4.273	43.6	157.0
	1	2.8	0.278	34.8	64.8	3.3	3.913	52.8	119.0
	55	3.8	0.062	65.6	91.6	3.9	0.340	46.7	158.3
	2	4.0	0.243	68.8	114.8	3.7	2.620	46.9	154.2
	3	4.5	0.061	68.8	111.4	4.6	1.733	47.7	148.6
Chinese Cabbage	4	7.8	0.976	49.6	283.2	6.6	0.582	28.8	241.4
	5	7.7	0.104	48.0	140.8	7.1	6.074	34.0	89.6
	6	7.5	2.636	43.8	146.6	7.2	3.808	35.0	72.4
	56	19.1	1.320	85.4	55.8	20.1	2.092	74.8	35.6
	7	9.0	0.010	103.8	81.6	6.1	3.620	128.0	58.2
	8	7.5	0.996	70.2	78.2	5.8	2.290	139.8	69.6
Lettuce	57	7.7	1.140	75.0	333.8	1.2	0.445	21.5	73.7
	9	6.4	0.240	53.8	195.8	6.3	0.085	31.8	69.0
	58	12.6	0.070	38.3	36.3	1.3	0.099	29.8	7.8
	59	14.6	0.330	185.8	69.0	14.7	0.408	156.6	47.2
	10	12.4	4.023	229.0	85.5	13.6	0.003	96.4	37.2
	60	2.4	0.107	231.5	34.3	5.1	1.274	75.8	65.4
Pea	11	1.2	0.224	29.6	75.2	1.2	0.099	31.4	31.0
	61	1.3	0.001	135.0	96.4	2.6	0.646	128.2	32.4
	62	11.3	0.001	85.2	160.1	9.4	0.090	80.3	97.7
	12	0.5	0.002	78.8	46.4	7.0	1.095	112.2	77.2
	63	10.1	0.002	86.2	161.6	9.4	0.093	80.4	97.8
	13	6.4	0.002	105.6	39.2	8.0	0.474	89.8	27.0
Radish	64	8.0	0.017	39.4	93.2	8.1	4.233	32.0	118.2
	65	7.0	0.612	32.0	131.6	7.4	3.633	32.0	72.2
	66	7.1	0.497	51.3	137.0	7.9	4.693	33.2	85.2
	67	0.8	0.004	186.0	91.6	0.3	2.820	61.8	54.0
	14	12.5	0.002	112.2	52.0	10.6	4.233	136.6	106.2
	68	11.9	0.474	94.1	66.4	13.7	3.460	119.2	32.1
Tomato	69	9.2	0.208	17.2	65.6	25.6	0.793	34.7	85.5
	70	5.7	0.013	15.2	18.2	30.4	4.473	26.5	75.6
	71	8.4	0.053	15.1	29.0	35.2	1.660	31.3	69.7
	72	5.2	0.168	15.7	30.0	28.3	3.093	35.1	68.6
	73	6.5	0.205	15.2	144.4	24.5	6.207	30.1	79.7
	15	5.0	0.295	19.2	116.7	17.8	3.180	16.4	77.3

ANNEX 5.4: RELATIONSHIPS BETWEEN TRACE ELEMENT CONTENTS IN CHINESE CABBAGE AND TRACE ELEMENT FRACTION CONTENTS IN SOIL

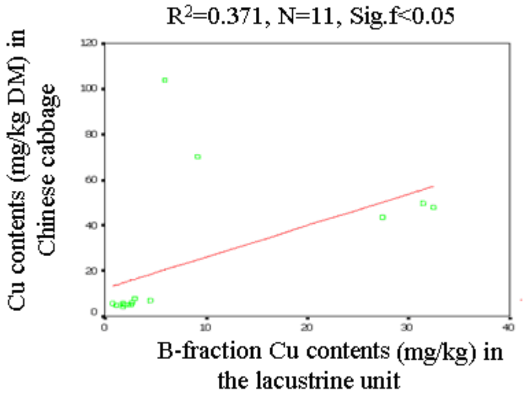
R^2=0.594, N=21, Sig.f<0.05



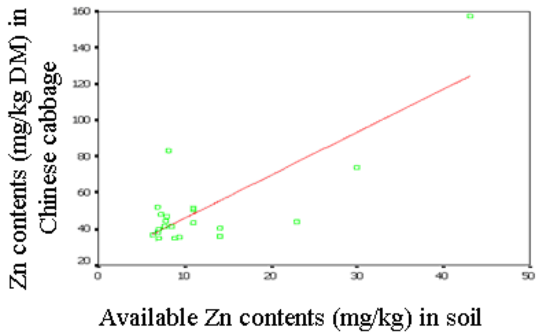
R^2=0.650, N=10, P<0.05



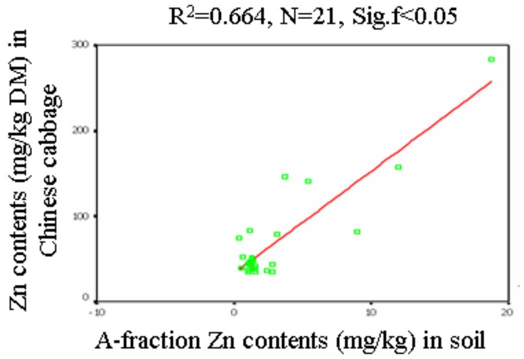
R^2=0.371, N=11, Sig.f<0.05



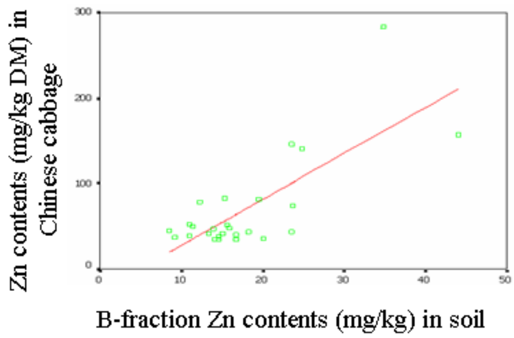
R^2=0.633, N=21, P<0.05



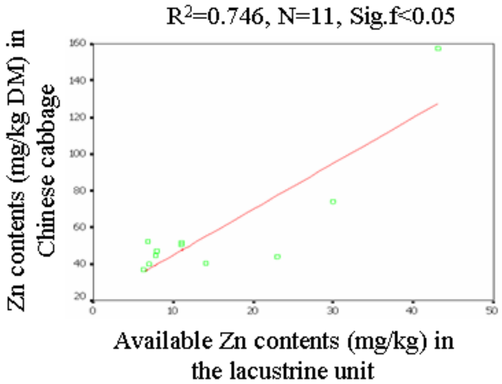
R^2=0.664, N=21, Sig.f<0.05



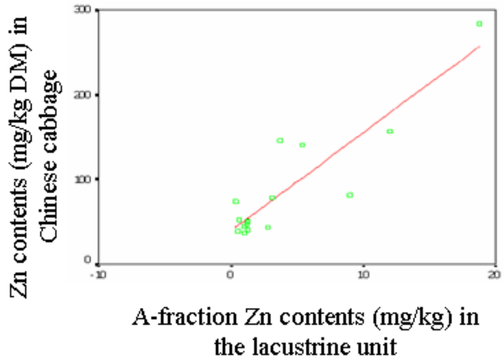
R^2=0.659, N=21, P<0.05

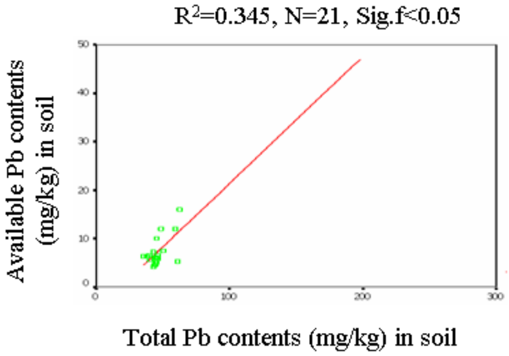


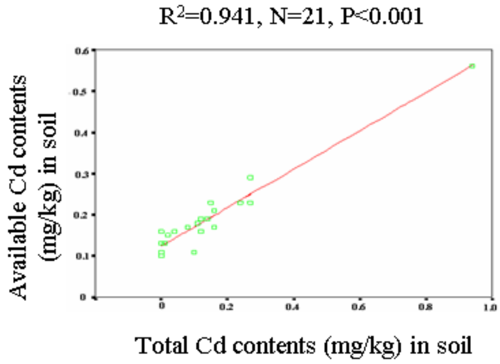
R^2=0.746, N=11, Sig.f<0.05

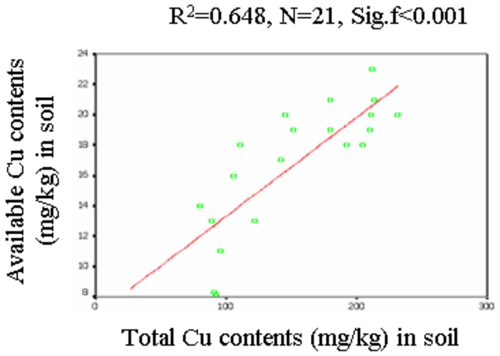


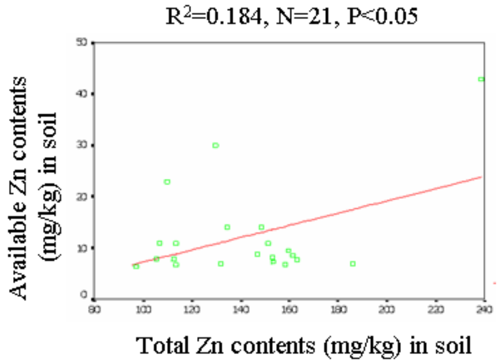
R^2=0.846, N=21, P<0.001



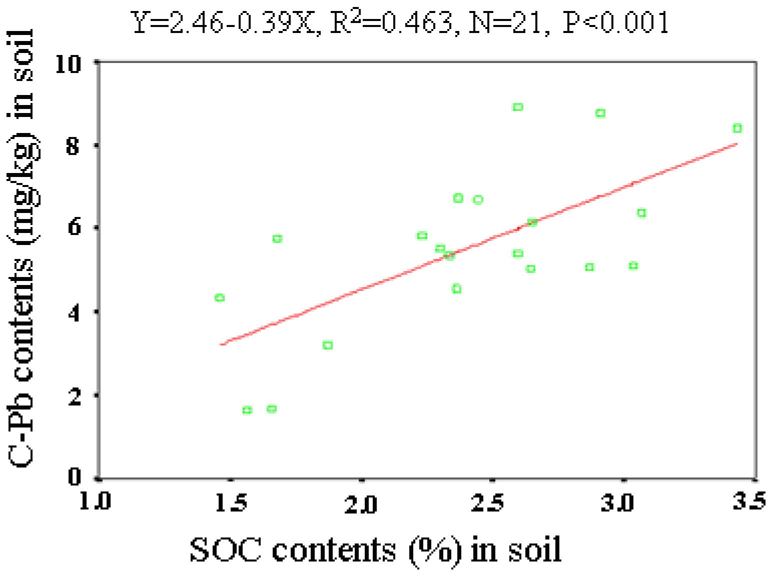








ANNEX 5.5. RELATIONSHIP BETWEEN C-Pb AND SOIL ORGANIC CARBON

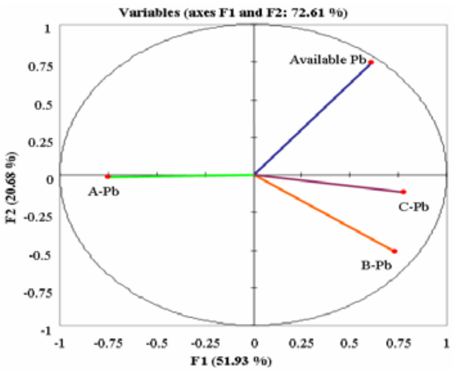


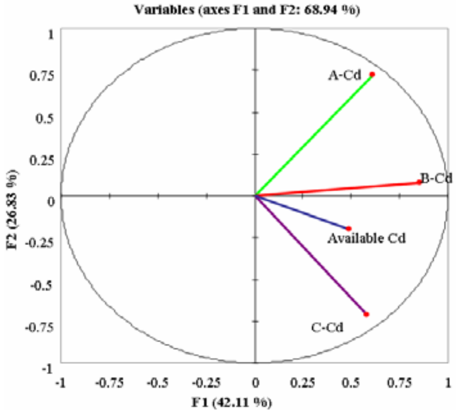
ANNEX 5.6: PCA OF TRACE ELEMENT FRACTION CONTENTS IN SOIL

Correlation matrix (Pearson (n)):

Variables	Available Pb (mg/kg)	A- Pb	B-Pb	C -Pb
Available Pb (mg/kg)	1***	-0.344*	0.183	0.342 *
A-Pb	-0.344 *	1***	-0.419**	-0.378*
B-Pb	0.183	-0.419**	1***	0.467**
C -Pb	0.342 *	-0.378 *	0.467 **	1***

n=21, P<0.05 *, P<0.01 **, P<0.001 ***.

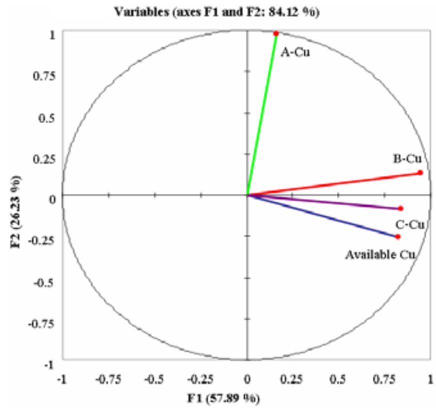




Correlation matrix (Pearson (n)):

Variables	Available Cd (mg/kg)	A -Cd	B-Cd	C -Cd
Available Cd (mg/kg)	1***	0.143	0.162	0.184
A -Cd	0.143	1***	0.451**	-0.065
B-Cd	0.162	0.451**	1***	0.402*
C -Cd	0.184	-0.065	0.402 *	1***

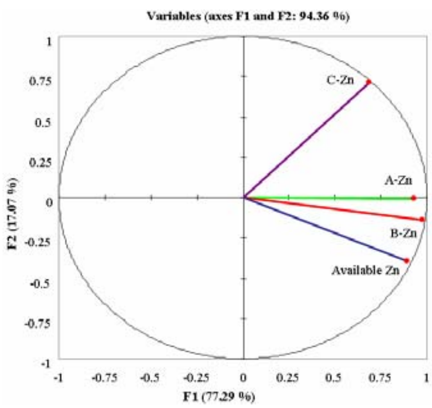
n=21, P<0.05 *, P<0.01 **, P<0.001 ***.



Correlation matrix (Pearson (n)):

Variables	Available Cu (mg/kg)	A-Cu	B-Cu	C -Cu
Available Cu (mg/kg)	1***	-0.064	0.719 ***	0.495**
A-Cu	-0.064	1***	0.260	0.027
B-Cu	0.719 ***	0.260	1***	0.728 ***
C -Cu	0.495**	0.027	0.728 ***	1***

n=21, P<0.05 *, P<0.01 **, P<0.001 ***.



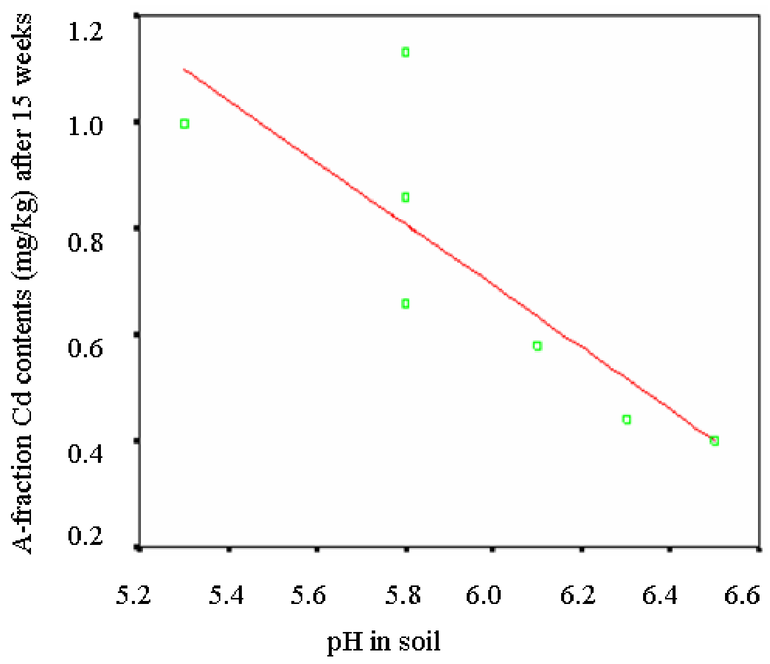
Correlation matrix (Pearson (n)):

Variables	Available Zn (mg/kg)	A-Zn	B-Zn	C -Zn
Available Zn (mg/kg)	1***	0.765***	0.926***	0.361*
A-Zn	0.765***	1***	0.875***	0.596***
B-Zn	0.926***	0.875***	1***	0.581***
C -Zn	0.361*	0.596**	0.581***	1***

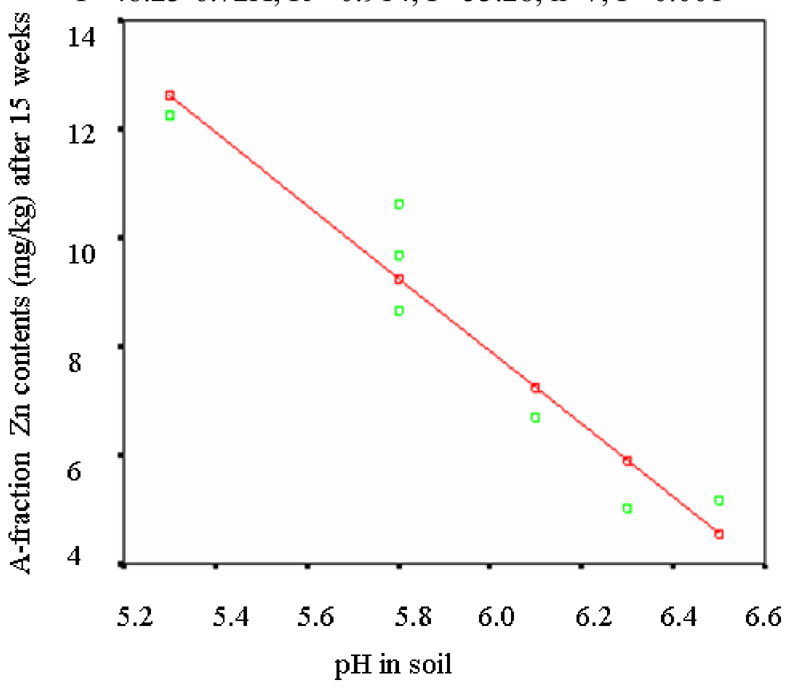
n=21, P<0.05 *, P<0.01 **, P<0.001 ***.

ANNEX 6.1: RELATIONSHIPS BETWEEN A-FRACTION CONTENTS OF CD AND ZN AND pH AFTER 15 WEEKS IN FPOT

$Y=4.19-0.58X$, $R^2=0.684$, $F=10.80$, $n=7$, $P<0.05$



$Y=48.23-6.72X$, $R^2=0.914$, $F=53.28$, $n=7$, $P<0.001$



ANNEX 6.2: TRACE ELEMENT CONTENTS (mg/kg DM) IN CHINESE CABBAGE IN 3 POT EXPERIMENTS

Pot experiments	Treatments		Pb	Cd	Cu	Zn
MPOT	Control (CK)		6.9	2. 28	18.4	78. 1
	Lime	T1	6.8	2.09	13.2	70.9
		T2	5.6	1.79	16.5	62.9
		T3	6.1	1.48	16.1	50.6
		T4	5.8	1.18	13.1	36.9
	Lime + lower pig manure (P1)	T1P1	7.4	1.41	11.0	51.8
		T2P1	6.9	1.18	9.2	50.2
		T3P1	6.3	1.15	5.8	49.6
		T4P1	6.0	0.88	7.6	46.9
	Lime + higher pig manure (P2)	T1P2	7.4	0.99	12.1	52.7
		T2P2	7.4	0.95	8.4	52.2
		T3P2	6.6	0.9	7.1	50.1
		T4P2	6.3	0.9	4.4	50.1
TPOT	Control (CK)		1.6	0.25	5.7	36.0
	Lime	T2	0.9	0.15	4.7	35.2
		T4	0.7	0.13	3.7	35.2
	Pig manure	P1	0.5	0.27	2.9	36.3
		P2	1.2	0.25	5.9	34.4
	Lime + lower pig manure (P1)	T2P1	1.8	0.25	3.1	32.9
		T4P1	0.6	0.20	1.6	29.9
	Lime + higher pig manure (P2)	T2P2	1.1	0.13	6.1	37.6
		T4P2	1.1	0.06	5.4	36.2
LPOT	Control (CK)		1.6	0.12	4.2	36.0
	Lime	T2	1.6	0.10	4.2	36.5
		T4	1.3	0.07	3.9	22.3
	Pig manure	P1	1.6	0.28	4.7	28.2
		P2	2.7	0.32	4.3	22.5
	Lime + lower pig manure (P1)	T2P1	1.2	0.12	3.9	34.5
		T4P1	1.2	0.10	4.2	34.2
	Lime + higher pig manure (P2)	T2P2	1.8	0.15	4.2	27.9
		T4P2	1.7	0.13	3.7	25.0

ANNEX 6.3: A-FRACTION TRACE ELEMENT CONTENTS (mg/kg) IN 3 POT EXPERIMENTS

Pot experiments	Treatments		A-Pb	A-Cd	A-Cu	A-Zn
MPOT	Control (CK)		0.4	0. 04	15.1	1.2
	Lime	T1	0.37	0.04	10.2	1.1
		T2	0.33	0.03	13.8	1.1
		T3	0.33	0.03	12.8	1.0
		T4	0.31	0.03	9.8	0.9
	Lime + lower pig manure (P1)	T1P1	0.38	0.05	8.8	1.0
		T2P1	0.36	0.05	7.3	0.8
		T3P1	0.35	0.05	4.9	0.6
		T4P1	0.32	0.05	6.5	0.6
	Lime + higher pig manure (P2)	T1P2	0.38	0.04	9.1	1.0
		T2P2	0.38	0.05	7.3	0.8
		T3P2	0.37	0.05	5.8	0.8
		T4P2	0.37	0.05	1.6	0.8
TPOT	Control (CK)		Trace	Trace	1.0	6.1
	Lime	T2	Trace	Trace	0.9	5.6
		T4	Trace	Trace	2.2	5.6
	Pig manure	P1	Trace	Trace	0.9	5.9
		P2	Trace	Trace	0.9	3.4
	Lime + lower pig manure (P1)	T2P1	Trace	Trace	0.8	5.2
		T4P1	Trace	Trace	2.2	2.8
	Lime + higher pig manure (P2)	T2P2	Trace	Trace	4.9	5.3
		T4P2	Trace	Trace	2.5	4.1
LPOT	Control (CK)		Trace	Trace	2.5	41.1
	Lime	T2	Trace	Trace	1.6	49.3
		T4	Trace	Trace	1.0	36.5
	Pig manure	P1	Trace	Trace	1.6	13.5
		P2	Trace	Trace	0.4	12.4
	Lime + lower pig manure (P1)	T2P1	Trace	Trace	0.7	36.6
		T4P1	Trace	Trace	0.6	17.5
	Lime + higher pig manure (P2)	T2P2	Trace	Trace	0.2	22.6
		T4P2	Trace	Trace	0.6	20.4