# Appendix A

**Table A- 1**    Stock solution and all chemical reagents list

| Order | Chemical reagent name |
|---|---|
| **Stock solution** | Sodium hydrogen arsenate heptahydrate ($Na_2HAsO_4.7H_2O$) |
| **Chemical reagent list** | |
| 1 | Perchloric acid ($HClO_4$) |
| 2 | Sodium borohydride ($NaBH_4$) |
| 3 | Sodium hydroxide (NaOH) |
| 4 | Hydrochloric acid (HCl) |
| 5 | Potassium iodide (KI) |
| 6 | Ascorbic acid ($C_6H_8O_6$) |
| 7 | Nitric acid ($HNO_3$) |

**Table A- 2**    The parameters used for Perkin Elmer model 5000

| Parameter | Setting |
|---|---|
| Wavelength | 193.7 nm |
| Lamp type | EDL |
| Energy | 40-46 mA |
| Spectral bandpass | 0.7 nm (low slit) |
| Read time | 2.0 sec |
| Atomization temperature | 900 °C |
| Signal measurement | Peak-height absorbance |
| Carrier solution | 2M HCl, flow rate 0.1 ml/min |
| Reductant and reducing agent | 3% (w/v) $NaBH_4$ in 0.1% (w/v) NaOH flow rate 0.2 ml $min^{-1}$ |
| Carrier gas | Nitrogen (N) flow rate 0.25 ml $min^{-1}$ |
| Reaction coil | 5 m x 1.0 mm ID. |
| Sample injection volume | 2 ml |

**Table A- 3** The parameters used for Perkin Elmer FIAS 100 -AAanlyst 800

| Parameter | Setting |
| --- | --- |
| Wavelength | 193.7 nm |
| Lamp type | EDL |
| Energy | 23-25 mA |
| Slit width | 0.7 nm |
| Read time | 15 sec |
| Atomization temperature | 900 ºC |
| Signal measurement | Peak area |
| Carrier solution | 10 % (v/v) HCl, flow rate 10 ml /min |
| Reductant | 0.3 % (w/v) $NaBH_4$ in 0.05% (w/v) NaOH flow rate 7 ml $min^{-1}$ |
| Carrier gas | Argon (Ar), flow rate 40 ml/min |
| Reaction coil (length x I.D.) | 10 cm. X 1.0 mm I.D. |
| Sample injection volume | 500 μL |
| Reducing agent : | Containing solution of 3 % (w/v) KI mixed with 3% (w/v) Ascorbic acid |

**Table A- 4**     Name and GPS position of each sampling site

| Village No. | Number | House number | X | Y |
|---|---|---|---|---|
| Moo.1 | 1 | B470/2 | 595093 | 904638 |
| | 2 | B447/1 | 594838 | 904576 |
| | 3 | B475/1 | 595314 | 904539 |
| | 4 | B409 | 594663 | 904555 |
| | 5 | B465 | 595560 | 904503 |
| Moo.2 | 1 | B66 | 591911 | 904358 |
| | 2 | B10 | 593307 | 904905 |
| | 3 | B237 | 591875 | 904373 |
| | 4 | B380/4 | 592124 | 904382 |
| | 5 | B85/1 | 591825 | 904357 |
| Moo.8 | 1 | B93 | 587887 | 900127 |
| | 2 | B151 | 587682 | 900064 |
| | 3 | B151/1 | 587856 | 900149 |
| | 4 | B153/2 | 587209 | 899931 |
| | 5 | B156 | 589333 | 900462 |
| Moo.9 | 1 | B79/1 | 595648 | 906854 |
| | 2 | B205 | 595811 | 906999 |
| | 3 | B205/1 | 595744 | 906194 |
| | 4 | B201 | 596035 | 907046 |
| | 5 | B76/2 | 595842 | 906980 |
| Moo.11 | 1 | B398 | 593928 | 910723 |
| | 2 | B29 | 593449 | 911249 |
| | 3 | B78/4 | 592685 | 911910 |
| | 4 | B20 | 592014 | 912422 |
| | 5 | B16 | 592288 | 912170 |
| Moo.12 | 1 | B251/10 | 593824 | 903802 |
| | 2 | B197/1 | 593924 | 904414 |
| | 3 | B251/5 | 593314 | 903895 |
| | 4 | B209 | 592753 | 903385 |
| | 5 | B306/2 | 593751 | 904382 |
| Moo.13 | 1 | B340/1 | 594084 | 903620 |
| | 2 | B381 | 594142 | 903149 |
| | 3 | B383/1 | 594161 | 903335 |
| | 4 | B394/1 | 594472 | 903663 |
| | 5 | B397/4 | 594371 | 903468 |
| Moo.14 | 1 | B80 | 592581 | 901358 |
| | 2 | B204 | 592794 | 901349 |
| | 3 | B201 | 593487 | 901371 |
| | 4 | B162/1 | 593621 | 901362 |
| | 5 | B79/1 | 592428 | 900759 |

X( Easting) and Y( Northing) are GPS position in WGS84 zone 47N-UTM

## Appendix B

## The preparation of standard arsenic stock solution, solutions for calibration curve and chemical reagents

### Preparation of stock solution:

1000 mg $L^{-1}$ of arsenate; As(V) stock solution was prepared by dissolving 4.16 g of sodium hydrogen arsenate heptahydrate ($Na_2HAsO_4.7H_2O$) in DDW and the mixture was then made up to 1000 ml.

### Preparation of calibration for AAS Model 5000

The calibration curve was performed at 5, 10, 25, 25, 50 and 75 µg $L^{-1}$ by diluting stock arsenate standard with 1% $HNO_3$ (v/v)

### Preparation of calibration for FIAS 100-AAanlyst 800

The calibration curve was performed at 1, 2, 4 and 8 µg $L^{-1}$ by mixing 1 ml of stock arsenate standard (10, 20, 40 and 80 µg $L^{-1}$) with 1 ml of 6 M HCl and 1 ml of a solution containing 3% (w/v) KI and 3% (w/v) Ascorbic acid.  The solution was made up to 10 ml by using 10 %HCl, after 15 min.

### Chemical reagent preparations

### Perkin Elmer model 5000

Reducing agent: 3% Sodium borohydride solution ($NaBH_4$) was prepared by dissolving 3.0 g of $NaBH_4$ powder in 0.1% w/v sodium hydroxide (NaOH)/water in a 100 ml volumetric flask. This $NaBH_4$ solution was filtered through a 0.45 µm filter prior to use.

Carrier solution: 2M Hydrochloric acid (HCl) was prepared by diluting 165 ml of conc. HCl to 1000 ml by DDW.

### Perkin Elmer FIAS 100-AAanlyst 800

Reductant agent: 0.3% Sodium borohydride solution ($NaBH_4$) was prepared by dissolving 0.3 g of $NaBH_4$ powder in 0.05% w/v sodium hydroxide (NaOH)/water in a 100 ml volumetric flask.

**Carrier solution**: 10% (v/v) HCl was prepared by diluting 10 ml of conc. HCl to 100 ml by DDW.

**Reducing agent:** The mixing between 3% (w/v) of KI mixed with 3% (w/v) of Ascorbic acid was prepared by dissolving 3 g. of KI

# Appendix C

**Table C- 1**     Optimization of carrier gas (argon)

| Flow rate (ml min$^{-1}$) | Replicated 1 | Replicated 2 | Replicated 3 | Response (Mean ± SD) | %RSD |
|---|---|---|---|---|---|
| 40 | 1.678 | 1.637 | 1.609 | 1.641 ± 0.028 | 1.7 |
| 45 | 1.433 | 1.425 | 1.425 | 1.427 ± 0.004 | 0.3 |
| 50 | 1.282 | 1.288 | 1.282 | 1.284 ± 0.003 | 0.2 |
| 75 | 1.172 | 1.162 | 1.154 | 1.163 ± 0.007 | 0.6 |

Three replications were performed for each carrier flow rate

**Table C- 2**     The effect of NaBH$_4$ concentration on the peak area of arsine

| NaBH$_4$ conc. % (w/v) | Replicated 1 | Replicated 2 | Replicated 3 | Response (Mean ± SD) | %RSD |
|---|---|---|---|---|---|
| 0.1 | 1.08 | 1.07 | 1.09 | 1.077 ± 0.008 | 0.76 |
| 0.3 | 1.53 | 1.51 | 1.52 | 1.521 ± 0.010 | 0.63 |
| 0.5 | 1.54 | 1.57 | 1.55 | 1.551 ± 0.013 | 0.83 |
| 0.7 | 1.36 | 1.33 | 1.30 | 1.330 ± 0.022 | 1.72 |

Three replications were performed for each NaBH$_4$ concentration

**Table C- 3**     The effect of HCl concentration (%v/v) on the peak height and peak area of arsine

| HCl conc. (% v/v) | Peak area Mean ± SD | %RSD | Peak height Mean ± SD | %RSD |
|---|---|---|---|---|
| 1 | 1.438 ± 0.009 | 0.65 | 0.320 ± 0.003 | 0.8 |
| 5 | 1.463 ± 0.027 | 1.83 | 0.328 ± 0.002 | 0.6 |
| 10 | 1485 ± 0.003 | 0.20 | 0.331 ± 0.002 | 0.6 |
| 15 | 1.509 ± 0.001 | 0.05 | 0.330 ± 0.001 | 0.2 |
| 20 | 1.535 ± 0.001 | 0.07 | 0.328 ± 0.004 | 1.1 |

Three replications were performed for each HCl concentration

**Table C- 4**    The effect of KI/ Ascorbic acid reagent using as reducing agent on the
peak area of arsine

| KI + Ascorbic acid (%w/v) | Replicated 1 | Replicated 2 | Replicated 3 | Response (Mean ± SD) | %RSD |
|---|---|---|---|---|---|
| 1+1 | 1.47 | 1.47 | 1.47 | 1.469 ± 0.002 | 0.2 |
| 3+3 | 1.54 | 1.54 | 1.54 | 1.543 ± 0.001 | 0.1 |
| 5+5 | 1.55 | 1.54 | 1.55 | 1.547 ± 0.005 | 0.3 |
| 7+7 | 1.54 | 1.54 | 1.54 | 1.537 ± 0.001 | 0.0 |
| 9+9 | 1.52 | 1.53 | 1.53 | 1.528 ± 0.004 | 0.3 |

Three replications were performed for each reducing concentration

**Table C- 5**    The effect of reduction time on the peak area of arsine

| Time (minute) | Replicated 1 | Replicated 2 | Replicated 3 | Response (Mean ± SD) | %RSD |
|---|---|---|---|---|---|
| 0 | 0.59 | 0.59 | 0.59 | 0.592 ± 0.002 | 0.4 |
| 15 | 1.45 | 1.45 | 1.45 | 1.446 ± 0.002 | 0.1 |
| 30 | 1.59 | 1.55 | 1.53 | 1.557 ± 0.022 | 1.4 |
| 45 | 1.52 | 1.51 | 1.50 | 1.512 ± 0.009 | 0.6 |
| 60 | 1.55 | 1.54 | 1.54 | 1.544 ± 0.002 | 0.1 |
| 75 | 1.54 | 1.56 | 1.56 | 1.551 ± 0.007 | 0.5 |

Three replications were performed for each reduction time

**Table C- 6**    The effect of optimization temperature on the peak area of arsine

| Temperature (°C) | Replicated 1 | Replicated 2 | Replicated 3 | Response (Mean ± SD) | %RSD |
|---|---|---|---|---|---|
| 700 | 0.31 | 0.32 | 0.32 | 0.315 ± 0.006 | 1.9 |
| 750 | 1.32 | 1.34 | 1.33 | 1.328 ± 0.005 | 0.4 |
| 800 | 1.54 | 1.55 | 1.53 | 1.542 ± 0.008 | 0.5 |
| 850 | 1.56 | 1.55 | 1.56 | 1.556 ± 0.006 | 0.4 |
| 900 | 1.59 | 1.60 | 1.59 | 1.594 ± 0.006 | 0.3 |
| 950 | 1.51 | 1.53 | 1.52 | 1.520 ± 0.009 | 0.6 |

Three replications were performed for each temperature

**Table C- 7**    Comparison of the method used for extraction

| Repeated | Autoclave | Hot Plate |
|----------|-----------|-----------|
| Repeat1 | 1.17 | 1.33 |
| Repeat2 | 1.06 | 1.24 |
| Repeat3 | 1.08 | 1.21 |
| Average | 1.10 | 1.26 |
| Standard deviation (*s*) | 0.06 | 0.06 |
| %R.S.D. | 5.32 | 5.03 |

**Table C- 8**    The result of the standard addition in soil ($B_{79/1}$ $M_9$)

| As concentration ($\mu g\ L^{-1}$) | STD curve (Mean ± SD) | %RSD | STD addition (Mean ± SD) | %RSD |
|-----------------------------------|-----------------------|------|--------------------------|------|
| 0 | 0 | - | 0.311 ± 0.018 | 5.9 |
| 1 | 0.459 ± 0.012 | 2.61 | 0.630 ± 0.055 | 8.7 |
| 2 | 0.872 ± 0.29 | 3.31 | 0.979 ± 0.096 | 9.8 |
| 4 | 1.658 ± 0.053 | 3.19 | 1.849 ± 0.039 | 2.1 |
| 8 | 3.117 ± 0.078 | 2.52 | 3.391 ± 0.049 | 1.4 |

Three replications were performed for each concentration

**Table C- 9**    The result of the standard addition in *Curcuma Longa*. plant ($B_{79/1}$ $M_9$)

| As concentration ($\mu g\ L^{-1}$) | STD curve (Mean ± SD) | %RSD | STD addition (Mean ± SD) | %RSD |
|-----------------------------------|-----------------------|------|--------------------------|------|
| 0 | 0 | - | 0.518 ± 0.008 | 1.6 |
| 1 | 0.459 ± 0.012 | 2.61 | 0.884 ± 0.006 | 0.7 |
| 2 | 0.872 ± 0.029 | 3.31 | 1.217± 0.032 | 2.6 |
| 4 | 1.658 ± 0.053 | 3.19 | 2.022 ± 0.004 | 0.2 |
| 8 | 3.117 ± 0.078 | 2.52 | - | - |

Three replications were performed for each concentration

**Table C- 10**   The detection limit for arsenic measurement using hydride generation
of AAS Perkin Model 5000

| Order | Peak Height | Amount of As (5µg L$^{-1}$) | Standard deviation |
|-------|-------------|------------------------------|--------------------|
| 1 | 3.5 | 5.62 | |
| 2 | 3.5 | 5.62 | |
| 3 | 3.0 | 4.50 | |
| 4 | 3.0 | 4.50 | |
| 5 | 3.0 | 4.50 | 0.54 |
| 6 | 3.0 | 4.50 | |
| 7 | 3.0 | 4.50 | |
| 8 | 3.0 | 4.50 | |
| 9 | 3.0 | 4.50 | |
| 10 | 3.5 | 5.62 | |
| DL=3 x 0.54 / 0.4449 = 3.64 µg L$^{-1}$ | | | |

**Table C- 11**   The detection limit for arsenic measurement using hydride generation
of FIAS 100-AAnalyst 800

| Order | Peak Area | Amount of As in reagent blank (µg L$^{-1}$) | Standard deviation |
|-------|-----------|---------------------------------------------|--------------------|
| 1 | 0.03 | 0.08 | |
| 2 | 0.03 | 0.06 | |
| 3 | 0.02 | 0.05 | |
| 4 | 0.03 | 0.07 | |
| 5 | 0.02 | 0.04 | 0.01 |
| 6 | 0.02 | 0.06 | |
| 7 | 0.03 | 0.08 | |
| 8 | 0.03 | 0.07 | |
| 9 | 0.02 | 0.06 | |
| 10 | 0.03 | 0.07 | |
| DL=3 x 0.012 / 0.3801 = 0.09 µg L$^{-1}$ | | | |

**Table C- 12**  The % RSD calculation from soil sample ($M_{14}B_{204}$)

| Order | As concentration (mg kg$^{-1}$) | Average (mg kg$^{-1}$) | Stand Deviation | %RSD |
|---|---|---|---|---|
| 1 | 8.06 | | | |
| 2 | 8.45 | | | |
| 3 | 7.96 | | | |
| 4 | 8.01 | | | |
| 5 | 7.54 | 7.88 | 0.69 | 8.71 |
| 6 | 7.48 | | | |
| 7 | 7.87 | | | |
| 8 | 9.30 | | | |
| 9 | 7.60 | | | |
| 10 | 6.49 | | | |

RSD = Relative Standard Deviation

**Table C- 13**  The % RSD calculation from *Carica* sp. ($M_2B_{10}$)

| Order | As concentration (µg g$^{-1}$) | Average (µg g$^{-1}$) | Stand Deviation | %RSD |
|---|---|---|---|---|
| 1 | 0.34 | | | |
| 2 | 0.29 | | | |
| 3 | 0.28 | | | |
| 4 | 0.26 | | | |
| 5 | 0.28 | 0.29 | 0.02 | 8.36 |
| 6 | 0.26 | | | |
| 7 | 0.30 | | | |
| 8 | 0.30 | | | |
| 9 | 0.32 | | | |
| 10 | 0.27 | | | |

RSD = Relative Standard Deviation

**Table C- 14**    Percent recovery

| Soil sample | | | Plant sample | | |
|---|---|---|---|---|---|
| sample + spiked | Conc. (mg/kg) | Recovery (%) | Sample + spiked | Conc. (ug/g) | Recovery (%) |
| Real Sample | 5.06 | | Sample | 0.13 | |
| Sample + 5 µg l$^{-1}$ | 9.52 | 94.6 | Sample + 0.1 µg l$^{-1}$ | 0.25 | 111 |
| Sample + 10 µg l$^{-1}$ | 15.3 | 101 | Sample + 0.2 µg l$^{-1}$ | 0.35 | 106 |
| Sample + 20 µg l$^{-1}$ | 26.7 | 106 | Sample + 0.4 µg l$^{-1}$ | 0.58 | 110 |

3 replications of each concentration, % RSD < 7

**Table C- 15**    Linear dynamic range for AAnalyst 800 and Perkin Elmer Model 5000

| FIAS 100-AAnalyst 800 | |
|---|---|
| Concentration (ug/L) | Peak area |
| 0 | 0.00 |
| 1 | 0.24 |
| 2 | 0.69 |
| 4 | 1.42 |
| 6 | 2.05 |
| 8 | 2.79 |
| 10 | 3.42 |
| 12 | 4.04 |
| 14 | 4.58 |
| 16 | 5.06 |
| 18 | 5.56 |
| 20 | 6.06 |
| 30 | 7.68 |
| 40 | 9.04 |
| 50 | 9.50 |

**Table C- 16**    Arsenic concentration in soil samples at the Ronphibun Sub-district

| Village number | Sample number | House name | Replicate 1 | Replicate 2 | Mean | Average |
|---|---|---|---|---|---|---|
| **High Risk Village** | | | | | | |
| | 1 | B470/2 | 5.06 | 4.15 | 4.60 | |
| | 2 | B447/1 | 17.8 | 18.3 | 18.0 | |
| Moo. 1 | 3 | B475/1 | 25.1 | 26.9 | 26.0 | 12.7 ± 8.40 |
| | 4 | B409 | 11.3 | 11.0 | 11.2 | |
| | 5 | B465 | 3.79 | 3.83 | 3.81 | |
| | 1 | B66 | 114 | 129 | 121 | |
| | 2 | B10 | 70.3 | 62.5 | 66.4 | |
| Moo.2 | 3 | B237 | 68.0 | 63.1 | 65.6 | 107 ± 61.5 |
| | 4 | B380/4 | 59.3 | 60.7 | 60.0 | |
| | 5 | B85/1 | 230 | 242 | 221 | |
| | 1 | B251/10 | 34.9 | 37.1 | 36.0 | |
| | 2 | B197/1 | 44.4 | 47.1 | 45.8 | |
| Moo. 12 | 3 | B251/5 | 102 | 104 | 103 | 66.9 ± 27.0 |
| | 4 | B209 | 59.8 | 49.0 | 54.4 | |
| | 5 | B306/2 | 92.1 | 98.7 | 95.4 | |
| | 1 | B340/1 | 90.5 | 92.6 | 91.6 | |
| | 2 | B381 | 52.3 | 53.6 | 52.9 | |
| Moo.13 | 3 | B383/1 | 87.5 | 88.8 | 88.2 | 186 ± 161 |
| | 4 | B394/1 | 480 | 501 | 491 | |
| | 5 | B397/4 | 208 | 204 | 206 | |
| **Low Risk Village** | | | | | | |
| | 1 | B93 | 5.59 | 5.57 | 5.58 | |
| | 2 | B151 | 8.32 | 8.36 | 8.34 | |
| Moo.8 | 3 | B151/1 | 4.93 | 4.88 | 4.91 | 5.65 ± 1.40 |
| | 4 | B153/2 | 4.48 | 4.23 | 4.35 | |
| | 5 | B156 | 5.10 | 5.05 | 5.07 | |
| | 1 | B79/1 | 4.13 | 4.07 | 4.10 | |
| | 2 | B205 | 2.77 | 2.79 | 2.78 | |
| Moo.9 | 3 | B205/1 | 0.66 | 0.52 | 0.59 | 1.83 ± 1.39 |
| | 4 | B201 | 1.03 | 1.09 | 1.06 | |
| | 5 | B76/2 | 0.69 | 0.54 | 0.62 | |
| | 1 | B398 | 8.25 | 8.65 | 8.45 | |
| | 2 | B29 | 7.32 | 7.30 | 7.31 | |
| Moo.11 | 3 | B78/4 | 9.41 | 9.72 | 9.56 | 12.2 ± 7.27 |
| | 4 | B20 | 9.18 | 8.99 | 9.09 | |
| | 5 | B16 | 26.9 | 26.4 | 26.7 | |
| | 1 | B80 | 12.7 | 12.6 | 12.6 | |
| | 2 | B204 | 7.88 | 7.73 | 7.81 | |
| Moo.14 | 3 | B201 | 11.9 | 11.7 | 11.8 | 8.34 ± 3.37 |
| | 4 | B162/1 | 4.96 | 4.91 | 4.94 | |
| | 5 | B79/1 | 4.54 | 4.52 | 4.53 | |

**Table C- 17**   Arsenic concentration in edible plants

| Name[a] | Name[b] | Root | | Leaves | | | | | | Fruit | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Alp | Cur. | Oci sp. | Oci san. | Cym | Pol | Ipo | Cit | Musa. | Psi gua | Car | Cap | Arc |
| High risk Village | | | | | | | | | | | | | | |
| | $M_1B_{470/2}$ | 2.42 | | | | ND | 1.00 | | | | | ND | | ND |
| | $M_1B_{447/1}$ | | 1.67 | | | ND | | | | | | | | ND |
| M 1 | $M_1B_{475/1}$ | | 1.96 | 2.22 | | 0.63 | | | | | | | | |
| | $M_1B_{409}$ | | | 1.81 | 1.62 | 0.63 | | | | | | | | |
| | $M_1B_{465}$ | | | 2.24 | | | | | | | | | | ND |
| | $M_2B_{66}$ | 1.87 | | | 0.53 | | 0.97 | | | ND | 0.53 | 1.01 | ND | |
| | $M_2B_{10}$ | 0.51 | | | | | | | | | | 0.31 | | ND |
| M 2 | $M_2B_{237}$ | | 1.12 | | | | ND | | | | | | | |
| | $M_2B_{380/4}$ | | | | | | 0.4 | | | | | 0.2 | | ND |
| | $M_2B_{85/1}$ | 0.74 | | | | 0.49 | 0.89 | | | | | | | ND |
| | $M_{13}B_{340/1}$ | | | 5.58 | | 0.44 | 0.38 | | | | ND | | | |
| | $M_{13}B_{381}$ | 2.01 | | 7.36 | | 0.95 | 0.89 | | | | | | | |
| M 13 | $M_{13}B_{383/1}$ | | | | 0.87 | | | | | | 0.87 | | | ND |
| | $M_{13}B_{394/1}$ | 2.57 | | 0.72 | ND | | | | | | 0.53 | 0.4 | | |
| | $M_{13}B_{397/4}$ | ND | | 5.32 | 4.5 | | | | | ND | | | | ND |
| Low risk Village | | | | | | | | | | | | | | |
| | $M_9B_{79/1}$ | | | 6.00 | ND | | | | | | | 0.28 | | |
| | $M_9B_{205}$ | | | | 1.41 | ND | ND | | 1.02 | | | 0.26 | ND | |
| M 9 | $M_9B_{205/1}$ | | | | 1.07 | ND | | | | | | | | |
| | $M_9B_{201}$ | | | 1.84 | | | | 2.34 | | | ND | ND | | |
| | $M_9B_{76/2}$ | 0.41 | | | 0.86 | | | | | | | | | |

**Table C-17**     Arsenic concentration in edible plants (continue)

| Name^a | Name^b | Root | | Leaves | | | | | | Fruit | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Alp | Cur. | Oci sp. | Oci san. | Cym | Pol | Ipo | Cit | Musa. | Psi gua | Car | Cap | Arc |
| Low risk Village | | | | | | | | | | | | | | |
| | $M_8B_{93}$ | 0.42 | | | ND | | 0.43 | | | | | 0.39 | | |
| | $M_8B_{151}$ | 0.61 | | | | ND | ND | | | | | | ND | ND | |
| M8 | $M_8B_{151/1}$ | ND | | ND | ND | | | | | | | | | ND |
| | $M_8B_{153/2}$ | 0.2 | | | 0.63 | 0.53 | 0.62 | | | | | | | |
| | $M_8B_{156}$ | | 1.01 | | | | 1.01 | | | ND | | ND | | |
| | $M_{11}B_{398}$ | | | | | | 0.75 | | | ND | | | | |
| | $M_{11}B_{29}$ | ND | | | | | | | 0.22 | | | ND | | |
| M 11 | $M_{11}B_{78/4}$ | | | | | ND | | | | | | 0.21 | | |
| | $M_{11}B_{20}$ | | | | | ND | | | | ND | | ND | | ND |
| | $M_{11}B_{16}$ | ND | | | ND | | | | | | | | | |
| | $M_{14}B_{80}$ | | | | | | 0.41 | | 0.26 | | | | | |
| | $M_{14}B_{204}$ | ND | | | | | 0.52 | | | | | | | |
| M 14 | $M_{14}B_{201}$ | | | | | 0.22 | 0.19 | | | | | | | ND |
| | $M_{14}B_{162/1}$ | 0.36 | 1..56 | | 0.64 | | ND | | | | | | | |
| | $M_{14}B_{79/1}$ | | | | 0.54 | | ND | | 0.31 | ND | | | | |

Name^a     = Village Name
Name^b     = House Name
ND         = < 0.001 µg g$^{-1}$ for AAnalyst 800 and < 0.036 µg g$^{-1}$ for Perkin Elmer Model 5000
__ Analysed by Perkin Elmer AAS AAnalyst 800-FIAS 100 (Thailand),   other case were analysed by AAS Perkin Elmer Model 5000 (Denmark)

| | | | | | | |
|---|---|---|---|---|---|---|
| Alp | = *Alpinia* sp. | Ipo | = *Ipomoea sp.* | Car | = *Carica* sp. | Cur | = *Curcuma longa* |

Alp     = *Alpinia* sp.        Ipo     = *Ipomoea sp.*        Car  = *Carica* sp.        Cur     = *Curcuma longa*
Oci sp. = *Ocimum* sp.        Musa.  = *Musa* sp.        Arc  = *Arece* sp.        Cym     = *Cymbopogon* sp.
Pol     = *Polyscias* sp.        Psi gua  = *Psidium guajava*        Cit  = *Citrus sp.*        Oci san. = *Ocimum sanctum* Linn.

**Table C- 18**  The bioconcentration factor of edible plant sample

| Name[a] | Name[b] | Root | | Leaves | | | | | | Fruit | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Alp | Cur | Oci sp. | Oci s.an | Cym | Pol | Ipo | Cit | Musa | Psi gua | Car | Cap | Arc |
| **High risk Village** | | | | | | | | | | | | | | |
| | $M_1B_{470/2}$ | 0.53 | | | | ~0 | 0.22 | | | | | ~0 | | ~0 |
| | $M_1B_{447/1}$ | 0.09 | | | | ~0 | | | | | | | | ~0 |
| M 1 | $M_1B_{475/1}$ | | 0.08 | 0.09 | | 0.02 | | | | | | | | |
| | $M_1B_{409}$ | | | 0.16 | 0.15 | 0.06 | | | | | | | | |
| | $M_1B_{465}$ | | | 0.59 | | | | | | | | | | ~0 |
| | $M_2B_{66}$ | 0.02 | | | ~0 | | 0.01 | | | ~0 | ~0 | 0.01 | ~0 | |
| | $M_2B_{10}$ | 0.01 | | | | | | | | | | ~0 | | ~0 |
| M 2 | $M_2B_{237}$ | | 0.02 | | | | ~0 | | | | | | | |
| | $M_2B_{380/4}$ | | | | | | 0.01 | | | | | ~0 | | ~0 |
| | $M_2B_{85/1}$ | ~0 | | | | ~0 | ~0 | | | | | | | ~0 |
| | $M_{13}B_{340/1}$ | | | 0.06 | | ~0 | ~0 | | | | ~0 | | | |
| | $M_{13}B_{381}$ | 0.04 | | 0.14 | | 0.02 | 0.02 | | | | | | | |
| M 13 | $M_{13}B_{383/1}$ | | | | 0.01 | | | | | | 0.01 | | | ~0 |
| | $M_{13}B_{394/1}$ | 0.01 | | ~0 | ~0 | | | | | | ~0 | ~0 | | |
| | $M_{13}B_{397/4}$ | ~0 | | 0.03 | 0.02 | | | | | ~0 | | | | ~0 |
| **Low risk Village** | | | | | | | | | | | | | | |
| | $M_8B_{93}$ | 0.08 | | | ~0 | | 0.08 | | | | | ~0 | | |
| | $M_8B_{151}$ | 0.07 | | | | ~0 | ~0 | | | | | ~0 | ~0 | |
| M8 | $M_8B_{151/1}$ | ~0 | | | ~0 | ~0 | | | | | | | ~0 | |
| | $M_8B_{153/2}$ | 0.05 | | | 0.14 | 0.12 | 0.14 | | | | | | | |
| | $M_8B_{156}$ | | 0.20 | | | | 0.20 | | | ~0 | ~0 | | | |

**Table C-18**    The bioconcentration factor of edible plant sample (continued)

| Name[a] | Name[b] | Root | | Leaves | | | | | | Fruit | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Alp | Cur | Oci sp. | Oci s.an | Cym | Pol | Ipo | Cit | Musa | Psi gua | Car | Cap | Arc |
| | $M_9B_{79/1}$ | | | 1.46 | ~0 | | | | | | | 0.07 | | |
| | $M_9B_{205}$ | | | 0.51 | ~0 | ~0 | | ~0 | | | 0.09 | ~0 | | |
| M9 | $M_9B_{205/1}$ | | | | 1.81 | ~0 | | | | | | | | |
| | $M_9B_{201}$ | | | 1.74 | | | | 2.21 | | | ~0 | ~0 | | |
| | $M_9B_{76/2}$ | 0.66 | | | 1.39 | | | | | | | | | |
| | $M_{11}B_{398}$ | | | | | | 0.09 | | | ~0 | | | | |
| | $M_{11}B_{29}$ | ~0 | | | | | | | 0.03 | | | ~0 | | |
| M 11 | $M_{11}B_{78/4}$ | | | | | ~0 | | | | | | 0.02 | | |
| | $M_{11}B_{20}$ | | | | | | | | | ~0 | | ~0 | | ~0 |
| | $M_{11}B_{16}$ | ~0 | | | | ~0 | | | | | | | | |
| | $M_{14}B_{80}$ | | | | | | 0.03 | | 0.02 | | | | | |
| | $M_{14}B_{204}$ | ~0 | | | | | ~0 | | | | | | | |
| M 14 | $M_{14}B_{201}$ | | | | | 0.02 | 0.02 | | | | | | | ~0 |
| | $M_{14}B_{162/1}$ | 0.07 | 0.32 | | 0.13 | | ~0 | | | | | | | |
| | $M_{14}B_{79/1}$ | | | | 0.12 | | ~0 | | 0.07 | ~0 | | | | |

Name[a]   = Village Name
Name[b]   = House Name
~0       = <0.001 µg g$^{-1}$ for AAnalyst 800 and <0.036 µg g$^{-1}$ for Perkin Elmer Model 5000

| | | | | | | |
|---|---|---|---|---|---|---|
| Alp | = *Alpinia* sp. | Ipo | = *Ipomoea sp.* | Car | = *Carica* sp. |
| Cur. | = *Curcuma longa* . | Cit | = *Citrus sp.* | Cap | = *Capcicum* sp. |
| Oci sp. | = *Ocimum* sp. | Musa. | = *Musa* sp. | Arc | = *Arece* sp. |
| Cym | = *Cymbopogon* sp. | Oci san. | = *Ocimum sanctum* Linn. | Pol | = *Polyscias* sp |
| Psi gua | = *Psidium guajava* | | | | |

# Appendix D

**Table D- 1**      Total population in Ronphibun Sub-district, Nakhon Si Thammarat
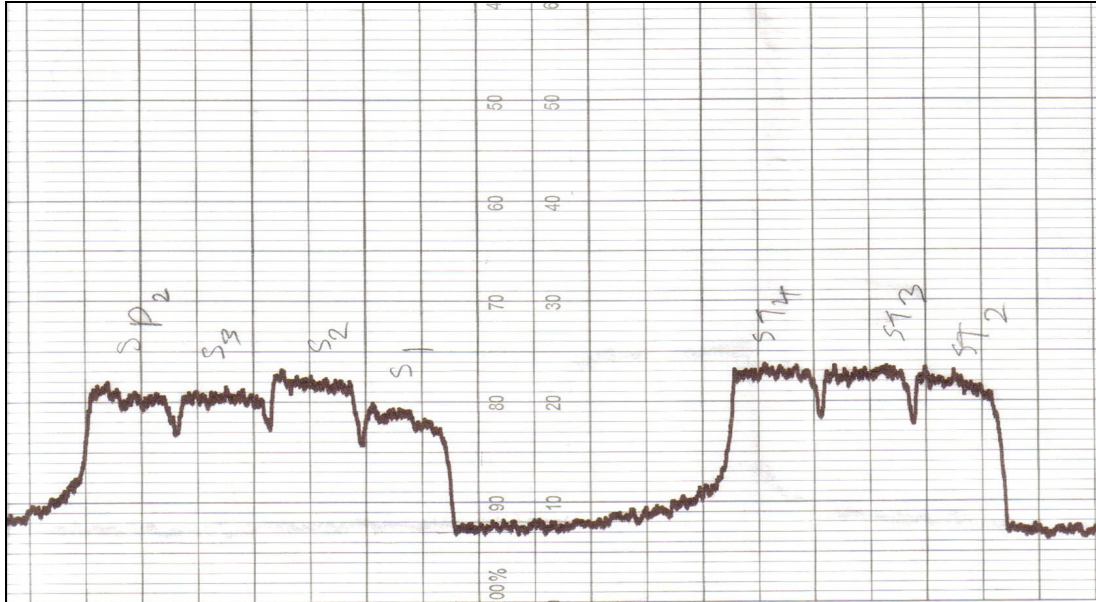
| Village / Moo | Men | Women | Total |
|---|---|---|---|
| 1 | 248 | 272 | 520 |
| 2 | 1,227 | 1,241 | 2468 |
| 8 | 870 | 932 | 1,802 |
| 9 | 666 | 701 | 1,367 |
| 11 | 434 | 423 | 857 |
| 12 | 186 | 215 | 401 |
| 13 | 306 | 360 | 666 |
| 14 | 380 | 362 | 742 |

Data obtained from Tambon Administrative organization of Ronphibun Sub-district, Ronphibun District, Nakhon Si Thammarat (July 2005)

## Appendix E
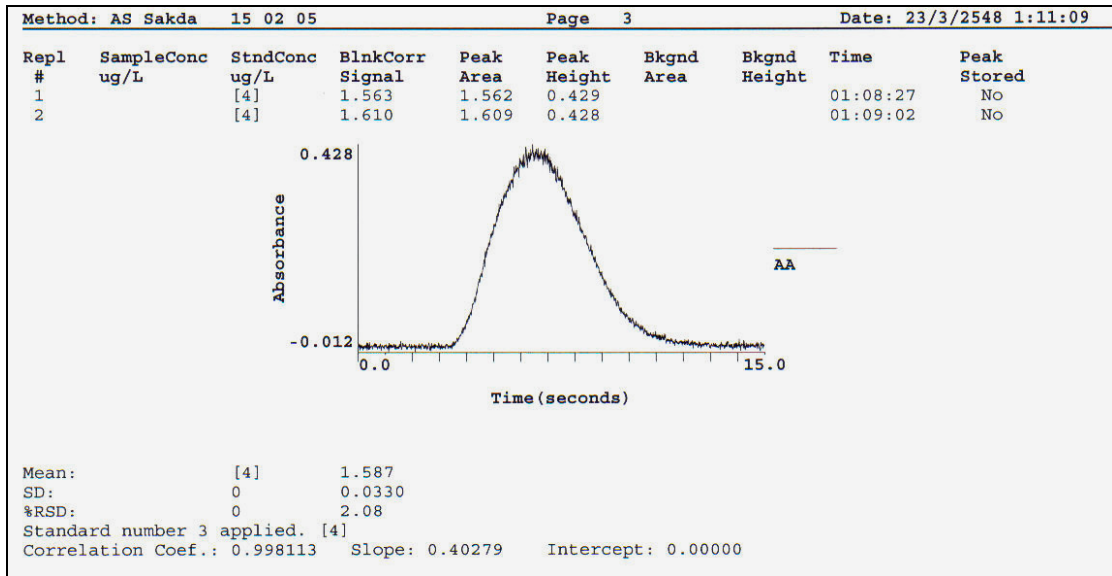


Peak area measurement for for Perkin Elmer modelFIAS 100- AAanlyst 800



Peak area measurement for for HG-Perkin Elmer model 5000