

## APPENDIX

**Appendix 1** Standard range of soil bulk density (Modified Kanchanaprasert, 1986)

No	Levels	Range (Mg m <sup>-3</sup> )
1	very low VL	< 1.0
2	low L	1.0 - 1.2
3	moderately low ML	1.2 - 1.4
4	medium M	1.4 - 1.6
5	moderately high MH	1.6 - 1.8
6	high H	1.8 - 2.0
7	very high VH	> 2.0

**Appendix 2** Standard range of soil reaction (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Soil reaction	pH Range
1	ultra acid	< 3.5
2	extremely acid	3.5 - 4.4
3	very strongly acid	4.5 - 5.0
4	strongly acid	5.1 - 5.5
5	moderately acid	5.6 - 6.0
6	slightly acid	6.1 - 6.5
7	neutral	6.6 - 7.3
8	slightly alkaline	7.4 - 7.8
9	moderately alkaline	7.9 - 8.4
10	strongly alkaline	8.5 - 9.0
11	very strongly alkaline	> 9.0

**Appendix 3** Standard range of soil organic matter contents (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range	
			g.kg <sup>-1</sup>	%
1	very low	VL	< 5	< 0.5
2	low	L	5 - 10	0.5 - 1.0
3	moderately low	ML	10 - 15	1.0 - 1.5
4	medium	M	15 - 25	1.5 - 2.5
5	moderately high	MH	25 - 35	2.5 - 3.5
6	high	H	35 - 45	3.5 - 4.5
7	very high	VH	> 45	> 4.5

**Appendix 4** Standard range of soil carbon contents (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range	
			g.kg <sup>-1</sup>	%
1	very low	VL	< 2.90	< 0.29
2	low	L	2.90 - 5.80	0.29 - 0.58
3	moderately low	ML	5.80 - 8.70	0.58 - 0.87
4	medium	M	8.70 - 14.50	0.87 - 1.45
5	moderately high	MH	14.50 - 20.30	1.45 - 2.03
6	high	H	20.30 - 26.10	2.03 - 2.61
7	very high	VH	> 26.10	> 2.61

**Note:** soil organic matter = % organic carbon x 1.724 (carbon = 58% of soil organic matter)

**Appendix 5** Standard range of total nitrogen contents (Land Use Planning Division, 1993)

No	Levels		Range	
			g.kg <sup>-1</sup>	%
1	very low	VL	< 1.0	< 0.1
2	low	L	1.0 - 2.0	0.1 - 0.2
3	medium	M	2.0 - 5.0	0.2 - 0.5
4	high	H	5.0 - 7.5	0.5 - 0.75
5	very high	VH	> 7.5	> 0.75

**Appendix 6** Standard range of available phosphorus concentrations (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range	
			mg.kg <sup>-1</sup>	%
1	very low	VL	< 3	< 3
2	low	L	3 - 6	3 - 6
3	moderately low	ML	6 - 10	6 - 10
4	medium	M	10 - 15	10 - 15
5	moderately high	MH	15 - 25	15 - 25
6	high	H	25 - 45	25 - 45
7	very high	VH	> 45	> 45

**Appendix 7** Standard range of extractable potassium concentrations (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range		
			cmol.kg <sup>-1</sup>	mg.kg <sup>-1</sup>	ppm
1	very low	VL	< 0.2	< 30	< 30
2	low	L	0.2 - 0.3	30 - 60	30 - 60
3	medium	M	0.3 - 0.6	60 - 90	60 - 90
4	high	H	0.6 - 1.2	90 - 120	90 - 120
5	very high	VH	> 1.2	> 120	> 120

**Appendix 8** Standard range of extractable calcium concentrations (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range		
			cmol.kg <sup>-1</sup>	mg.kg <sup>-1</sup>	ppm
1	very low	VL	< 2.0	< 400	< 400
2	low	L	2 - 5	400 - 1,000	400 - 1,000
3	medium	M	5 - 10	1,000 - 2,000	1,000 - 2,000
4	high	H	10 - 20	2,000 - 4,000	2,000 - 4,000
5	very high	VH	> 20	> 4,000	> 4,000

**Appendix 9** Standard range of extractable magnesium concentrations (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range		
			cmol.kg <sup>-1</sup>	mg.kg <sup>-1</sup>	ppm
1	very low	VL	< 0.3	< 36.45	< 36.45
2	low	L	0.3 - 1.0	36.45 - 121.5	36.45 - 121.5
3	medium	M	1.0 - 3.0	121.5 - 364.5	121.5 - 364.5
4	high	H	3.0 - 8.0	364.5 - 972	364.5 - 972
5	very high	VH	> 8.0	> 972	> 972

**Appendix 10** Standard range of extractable sodium concentrations (Land Classification and FAO Project Staff, 1973; Soil Survey Division Staff, 1993)

No	Levels		Range		
			cmol.kg <sup>-1</sup>	mg.kg <sup>-1</sup>	ppm
1	very low	VL	< 0.1	< 23	< 23
2	low	L	0.1 - 0.3	23 - 69	23 - 69
3	medium	M	0.3 - 0.7	60 - 161	60 - 161
4	high	H	0.7 - 2.0	161 - 460	161 - 460
5	very high	VH	> 2.0	> 460	> 460

**Appendix 11** Standard range of soil chemical properties assessment (Land Classification and FAO Project Staff, 1973)

No	Levels		Range				
			CEC (cmol.kg <sup>-1</sup> )	OM (g.kg <sup>-1</sup> )	BS (%)	P (mg.kg <sup>-1</sup> )	K (mg.kg <sup>-1</sup> )
1	very low	VL	< 3	< 5	-	< 3	< 30
2	low	L	3 - 5	5 - 10	35	3 - 6	30 - 60
3	moderately low	ML	5 - 10	10 - 15	-	6 - 10	-
4	medium	M	10 - 15	15 - 25	35 - 75	10 - 15	60 - 90
5	moderately high	MH	15 - 20	25 - 35	-	15 - 25	-
6	high	H	20 - 30	35 - 45	> 75	25 - 45	90 - 120
7	very high	VH	> 30	> 45		> 45	> 120

**Appendix 12** Standard range of fertility assessment using soil chemical properties (Soil Survey Division, 1980)

No	Levels	CEC ( $\text{cmol.kg}^{-1}$ )	OM ( $\text{g.kg}^{-1}$ )	BS (%)	P ( $\text{mg.kg}^{-1}$ )	K ( $\text{mg.kg}^{-1}$ )
1	low (score)	< 10 (1)	< 15 (1)	< 35 (1)	< 10 (1)	< 60 (1)
2	medium (score)	10 - 20 (2)	15 - 35 (2)	35 - 75 (2)	10 - 25 (2)	60 - 90 (2)
3	high (score)	> 20 (3)	> 35 (3)	> 75 (3)	> 25 (3)	> 90 (3)

**Note** total score  $\leq 7$  = low fertile, total score 8-12 = moderately fertile,  
total score  $\geq 13$  = high fertile

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