

APPENDICES

Appendix A: Layout and diagram of field experiment

A1: Design of experiment follows Split – plot design

Replication I

L1				L2				L3				L4			
P1	P2	P3	P4	P2	P3	P4	P1	P3	P4	P1	P2	P4	P1	P2	P3

Replication II

L3				L4				L1				L2			
P3	P4	P1	P2	P4	P1	P2	P3	P1	P2	P3	P4	P2	P3	P4	P1

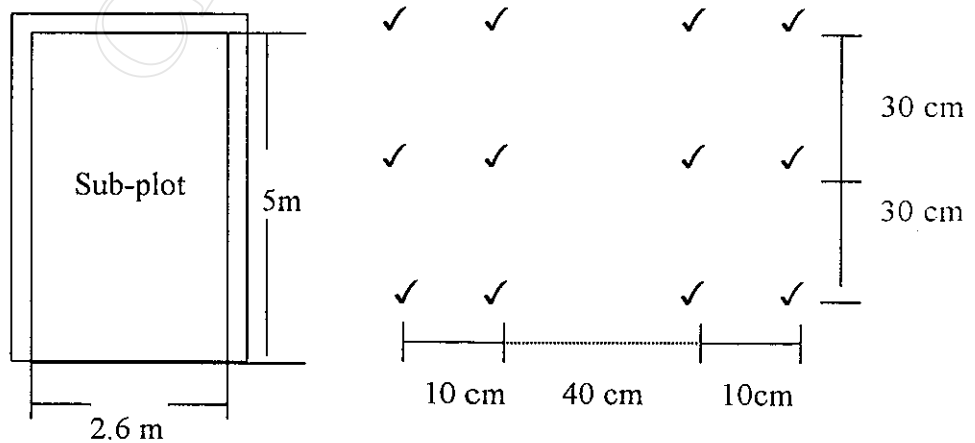
Replication III

L2				L3				L4				L1			
P2	P3	P4	P1	P3	P4	P1	P2	P4	P1	P2	P3	P1	P2	P3	P4

Note:

L1 – 0 kg lime ha ⁻¹	P1 – 0 kg P ₂ O ₅ ha ⁻¹
L2 – 500 kg lime ha ⁻¹	P2 – 60 kg P ₂ O ₅ ha ⁻¹
L3 – 700 kg lime ha ⁻¹	P3 – 90 kg P ₂ O ₅ ha ⁻¹
L4 – 900 kg lime ha ⁻¹	P4 – 120 kg P ₂ O ₅ ha ⁻¹

A2: Diagram of plot size and plant density of field experiment



Spacing of peanut plant

A3: Air temperature and relative humidity at Thua Thien Hue province in 1999

Months	Jan	Feb	March	April	May	June	July
Indicators							
Air temp (°C)	19.7	21.5	24.1	25.8	26.6	28.6	29.2
Humidity (%)	91	90	89	84	78	79	76

Source: Meteorological station of Thua Thien Hue province

A4: Rainfall, evaporation and sunshine at Thua Thien Hue province in 1999

Months	Jan	Feb	March	April	May	June	July
Indicators							
Rainfall (mm)	282	143	173	128	131	78	62
Evaporation (mm)	25.1	34.3	52.2	54.8	54.3	97.9	124.5
Sunshine (h)	141	118	160	188	250	237	234

Source: Meteorological station of Thua Thien Hue province

A5: Air temperature and rainfall of Thua Thien Hue province from 1989 to 1998

Months	Jan	Feb	March	April	May	June
Indicators						
Air temp (°C)	20.5	21.0	23.7	26.3	28.7	29.4
Rainfall (mm)	90	57	43	60	123	93
Month	July	Aug	Sept	Oct	Nov	Dec
Air temp (°C)	29.2	29.0	26.6	25.4	23.5	21.2
Rainfall (mm)	78	107	499	444	860	322

Source: Meteorological station of Thua Thien Hue province

A6: Sowing area and yield of peanut in hilly zone and Thua Thien Hue province

Years	1995	1996	1997	1998	1999
Indicators					
Sown area (ha)					
Thua Thien Hue prov.	2310	2415	3342	3729	3781
Hilly zone	1617	1736	2322	2669	2660
Yield (ton/ha)					
Thua Thien Hue prov.	0.90	1.24	1.33	1.38	1.51
Hilly zone	0.85	1.07	1.14	1.24	1.31

Source: Hue Statistical Book in 1999

A7: Sowing area (1000 ha) and pod yield (ton/ha) of peanut by agroecological regions and country of Vietnam in 1997 and 1998

Indicators	Year		Year	
	1997		1998	
Agroecological regions	Sowing area 1000 ha	Pod yield Ton/ha	Sowing area 1000 ha	Pod yield Ton/ha
Country	251.3	1.40	269.4	1.43
North – Mountainous	22.1	1.00	23.5	1.03
Red – River Delta	35.2	1.57	35.9	1.51
North Central Coast	62.9	1.23	71.1	1.31
South Central Coast	24.9	1.25	28.9	1.30
Central Highlands	198.8	1.08	18.6	1.02
North East South	66.3	1.79	68.8	1.82
Mekong River Delta	14.9	1.86	16.3	1.96

Source: Vietnam Statistical Yearbook in 1999

Appendix B: Data of field experiment

B1: Effect of phosphorous fertilizer and lime on dry matter yield at R₂ and R₄ stages (kg ha⁻¹)

Treat.	R ₂ (40DAS)				R ₄ (60DAS)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	756	766	766	763	2315	2330	2320	2322
P ₂ L ₁	900	937	839	892	2501	2483	2488	2491
P ₃ L ₁	1028	1017	1013	1019	2594	2605	2618	2606
P ₄ L ₁	1113	1115	1123	1117	2769	2764	2811	2781
P ₁ L ₂	785	776	771	777	2599	2547	2537	2548
P ₂ L ₂	1030	1049	1043	1041	2884	2872	2780	2845
P ₃ L ₂	1217	1239	1220	1225	3090	3185	2995	3090
P ₄ L ₂	1310	1370	1390	1357	3284	3383	3131	3266
P ₁ L ₃	841	842	845	843	2625	2694	2723	2681
P ₂ L ₃	1100	1251	1156	1169	2899	3004	2916	2940
P ₃ L ₃	1400	1420	1410	1410	3231	3213	3260	3235
P ₄ L ₃	1557	1545	1560	1554	3540	3460	3335	3427
P ₁ L ₄	890	884	884	886	2734	2829	2857	2810
P ₂ L ₄	1490	1466	1459	1472	3056	3298	3018	3124
P ₃ L ₄	1650	1640	1680	1657	3436	3456	3466	3453
P ₄ L ₄	1790	1787	1799	1792	3850	3710	3635	3732

B2: Effect of phosphorous fertilizer and lime on dry matter yield at R₆ and R₈ stages (kg ha⁻¹)

Treat.	R ₆ (80DAS)				R ₈ (Harvest)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	3462	3430	3440	3444	4435	4356	4405	4399
P ₂ L ₁	3880	4094	4041	4005	4799	4708	4838	4782
P ₃ L ₁	4450	4440	4455	4448	5363	5442	4972	5379
P ₄ L ₁	4620	4610	4630	4620	5521	5606	5426	5518
P ₁ L ₂	3912	3915	3930	3919	4859	4902	4832	4864
P ₂ L ₂	4380	4184	4347	4304	5490	5515	5461	5490
P ₃ L ₂	5262	5250	5286	5266	5739	5905	5787	5770
P ₄ L ₂	5448	5354	5460	5421	6008	6009	5849	5955
P ₁ L ₃	4112	4265	4280	4219	5332	5360	5288	5327
P ₂ L ₃	4630	4610	4603	4614	5699	5700	5540	5646
P ₃ L ₃	5940	5960	5980	5960	6384	6400	6300	6361
P ₄ L ₃	6145	6570	6140	6285	6516	6625	6397	6513
P ₁ L ₄	4380	4301	4308	4330	5387	5400	5316	5332
P ₂ L ₄	5015	4960	4942	4972	6206	6331	6201	6246
P ₃ L ₄	6280	6300	6252	6277	6560	6648	6464	6556
P ₄ L ₄	6540	6540	6550	6543	6749	6880	6738	6789

B3: Effect of phosphorous fertilizer and lime on number of nodule at R₂ and R₄ stages

Treat.	R ₂ (40DAS)				R ₄ (60DAS)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	9.0	8.5	9.6	9.0	16.5	16.2	15.7	16.1
P ₂ L ₁	10.9	12.2	11.5	11.5	20.2	20.4	21.0	20.5
P ₃ L ₁	13.9	15.1	12.8	13.9	20.8	21.0	21.8	21.2
P ₄ L ₁	15.6	16.7	17.8	16.7	25.0	24.6	24.7	24.8
P ₁ L ₂	11.6	11.1	11.7	11.5	18.7	18.5	17.9	18.4
P ₂ L ₂	15.6	15.6	15.9	15.7	21.6	21.1	22.3	21.7
P ₃ L ₂	16.0	16.6	17.5	16.7	25.0	27.1	26.8	26.3
P ₄ L ₂	16.4	19.5	18.2	18.0	28.9	28.5	28.5	28.6
P ₁ L ₃	14.5	14.7	16.0	15.1	22.7	22.3	23.8	22.9
P ₂ L ₃	19.0	18.5	21.8	19.8	24.1	23.5	24.9	24.2
P ₃ L ₃	23.7	20.7	20.7	21.7	30.5	29.4	30.1	30.0
P ₄ L ₃	21.5	22.7	23.9	22.7	33.6	34.0	33.9	33.8
P ₁ L ₄	17.6	17.8	17.9	17.8	25.7	24.5	23.0	24.4
P ₂ L ₄	22.4	21.4	23.0	22.3	27.8	27.1	26.5	27.1
P ₃ L ₄	26.5	25.3	24.0	25.3	30.0	31.1	30.9	30.7
P ₄ L ₄	24.0	25.5	25.5	25.0	35.7	36.2	36.1	36.0

B4: Effect of phosphorous fertilizer and lime on number of nodule at R₆ and R₈ stages

Treat.	R ₆ (80DAS)				R ₈ (Harvest)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	24.1	24.9	24.8	24.6	20.2	19.5	19.9	19.9
P ₂ L ₁	29.6	28.7	28.5	28.9	21.6	21.9	20.8	21.4
P ₃ L ₁	32.5	33.0	32.0	32.5	25.3	25.8	26.0	25.7
P ₄ L ₁	34.8	35.0	33.9	34.6	29.2	29.0	28.4	28.9
P ₁ L ₂	28.9	29.1	28.6	28.9	22.8	22.1	23.0	22.6
P ₂ L ₂	36.3	36.0	36.5	36.3	27.6	25.1	26.9	26.5
P ₃ L ₂	37.4	38.8	38.5	38.2	28.7	28.5	28.4	28.5
P ₄ L ₂	40.3	40.1	40.3	40.2	32.0	30.6	30.7	31.1
P ₁ L ₃	32.5	33.2	32.6	32.8	23.8	23.4	23.5	23.6
P ₂ L ₃	38.8	38.7	38.9	38.8	27.8	27.4	26.8	27.3
P ₃ L ₃	42.2	42.8	43.5	42.8	32.7	32.9	33.2	32.9
P ₄ L ₃	46.2	46.4	45.6	46.1	38.8	38.8	38.1	38.6
P ₁ L ₄	35.8	35.4	35.5	35.6	26.8	26.4	27.1	26.8
P ₂ L ₄	38.4	38.7	39.3	38.8	31.2	32.6	32.0	32.9
P ₃ L ₄	43.2	43.9	43.7	43.6	34.6	34.4	34.8	34.6
P ₄ L ₄	47.6	47.8	47.9	47.8	40.8	42.9	41.0	41.6

B5: Effect of phosphorous fertilizer and lime on nodule dry weight at R₂ and R₄ stages

Treat.	R ₂ (40DAS)				R ₄ (60DAS)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	12.4	12.5	12.2	12.4	34.2	35.0	33.0	34.1
P ₂ L ₁	15.1	15.5	15.4	15.3	35.6	35.7	35.1	35.5
P ₃ L ₁	17.0	17.4	17.5	17.3	37.0	36.9	36.0	36.6
P ₄ L ₁	19.0	19.2	20.6	19.6	38.4	38.5	38.8	38.6
P ₁ L ₂	14.0	15.0	14.4	14.5	35.1	35.3	35.6	35.3
P ₂ L ₂	19.2	18.0	17.8	18.3	38.2	37.8	38.1	38.0
P ₃ L ₂	18.2	18.4	19.4	18.7	39.8	40.0	39.4	39.7
P ₄ L ₂	21.5	21.6	20.3	21.1	41.8	41.2	40.5	41.2
P ₁ L ₃	16.3	14.3	16.8	15.8	36.8	36.9	36.4	36.7
P ₂ L ₃	18.3	18.8	22.5	19.9	39.4	39.2	39.8	39.5
P ₃ L ₃	23.4	21.0	21.8	22.1	41.2	41.4	41.8	41.5
P ₄ L ₃	21.1	23.0	23.3	22.5	41.8	42.4	42.8	42.3
P ₁ L ₄	17.7	17.8	17.8	17.8	37.8	38.0	38.9	38.2
P ₂ L ₄	20.2	19.4	22.4	20.7	38.4	37.0	39.1	38.2
P ₃ L ₄	24.9	23.1	22.5	23.5	45.1	45.3	45.8	45.4
P ₄ L ₄	23.0	24.4	25.1	24.2	47.9	47.5	47.7	47.7

B6: Effect of phosphorous fertilizer and lime on nodule dry weight at R₆ and R₈ stages

Treat.	R ₆ (80DAS)				R ₈ (Harvest)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	38.3	39.4	38.5	38.7	23.8	24.4	24.5	24.2
P ₂ L ₁	43.4	45.5	46.1	45.0	26.8	25.9	27.0	26.6
P ₃ L ₁	47.5	46.7	47.8	47.3	28.6	28.0	29.0	28.5
P ₄ L ₁	48.8	46.0	49.5	48.1	29.5	31.8	31.7	31.0
P ₁ L ₂	41.8	41.4	40.9	41.4	27.0	26.2	26.8	26.7
P ₂ L ₂	50.5	49.5	50.2	50.1	29.5	31.3	30.8	30.5
P ₃ L ₂	50.7	50.8	50.3	50.6	32.4	33.2	32.3	32.6
P ₄ L ₂	51.2	51.1	52.0	51.4	34.1	34.5	35.4	34.7
P ₁ L ₃	46.4	45.2	47.1	46.2	28.2	28.9	29.9	29.0
P ₂ L ₃	51.2	52.1	52.3	51.9	32.1	33.2	32.4	32.6
P ₃ L ₃	52.1	52.2	52.4	52.2	36.1	35.8	35.3	35.7
P ₄ L ₃	57.1	57.8	58.8	57.9	37.2	38.6	39.0	38.3
P ₁ L ₄	49.3	48.9	50.4	49.5	30.0	31.4	30.9	30.8
P ₂ L ₄	52.4	53.0	52.7	52.7	34.0	35.1	35.8	35.0
P ₃ L ₄	56.2	55.3	57.1	56.2	38.0	38.1	38.4	38.2
P ₄ L ₄	58.3	58.1	57.9	58.1	40.0	42.2	43.5	41.9

B7: Effect of phosphorous fertilizer and lime on leaf areas at R₂ and R₄ stages

Treat.	R ₂ (40DAS)				R ₄ (60DAS)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	0.20	0.18	0.17	0.18	0.38	0.43	0.53	0.46
P ₂ L ₁	0.23	0.22	0.22	0.22	0.42	0.49	0.53	0.48
P ₃ L ₁	0.34	0.34	0.33	0.34	0.55	0.61	0.70	0.62
P ₄ L ₁	0.36	0.39	0.38	0.38	0.57	0.65	0.75	0.66
P ₁ L ₂	0.27	0.28	0.27	0.27	0.42	0.52	0.62	0.52
P ₂ L ₂	0.36	0.37	0.34	0.36	0.51	0.59	0.70	0.60
P ₃ L ₂	0.39	0.41	0.39	0.40	0.57	0.63	0.74	0.65
P ₄ L ₂	0.42	0.43	0.43	0.43	0.59	0.68	0.80	0.69
P ₁ L ₃	0.31	0.31	0.31	0.31	0.43	0.59	0.63	0.55
P ₂ L ₃	0.37	0.38	0.37	0.37	0.52	0.68	0.69	0.63
P ₃ L ₃	0.45	0.43	0.42	0.43	0.59	0.75	0.80	0.71
P ₄ L ₃	0.51	0.51	0.50	0.51	0.61	0.79	0.84	0.75
P ₁ L ₄	0.33	0.32	0.31	0.32	0.52	0.57	0.60	0.57
P ₂ L ₄	0.42	0.40	0.40	0.41	0.63	0.68	0.70	0.67
P ₃ L ₄	0.59	0.59	0.57	0.58	0.68	0.75	0.80	0.75
P ₄ L ₄	0.60	0.62	0.59	0.60	0.73	0.82	0.89	0.81

B8: Effect of phosphorous fertilizer and lime on leaf areas at R₆ and R₈ stages

Treat.	R ₆ (80DAS)				R ₈ (Harvest)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	0.76	0.76	0.75	0.76	0.58	0.58	0.57	0.58
P ₂ L ₁	0.81	0.82	0.81	0.81	0.58	0.61	0.60	0.60
P ₃ L ₁	0.91	0.89	0.88	0.89	0.73	0.81	0.70	0.71
P ₄ L ₁	0.94	0.92	0.91	0.92	0.76	0.74	0.73	0.74
P ₁ L ₂	0.79	0.78	0.81	0.79	0.63	0.62	0.63	0.63
P ₂ L ₂	0.88	0.89	0.88	0.88	0.70	0.71	0.70	0.70
P ₃ L ₂	0.95	0.95	0.96	0.95	0.77	0.78	0.78	0.78
P ₄ L ₂	1.17	1.17	1.15	1.16	0.86	0.87	0.86	0.86
P ₁ L ₃	0.83	0.82	0.81	0.82	0.70	0.69	0.68	0.69
P ₂ L ₃	0.94	0.95	0.93	0.94	0.77	0.81	0.79	0.79
P ₃ L ₃	1.15	1.15	1.05	1.12	0.94	0.93	0.98	0.95
P ₄ L ₃	1.34	1.34	1.31	1.33	1.18	1.15	1.16	1.16
P ₁ L ₄	0.85	0.85	0.86	0.85	0.71	0.72	0.74	0.72
P ₂ L ₄	0.94	0.95	0.95	0.95	0.85	0.84	0.87	0.85
P ₃ L ₄	1.19	1.20	1.19	1.19	1.00	1.02	1.02	1.02
P ₄ L ₄	1.35	1.34	1.35	1.35	1.20	1.21	1.21	1.21

B9: Effect of phosphorous fertilizer and lime on no.of unfilled pod and filled pod per plant

Treat.	No. unfilled pods per plant				No. filled pods per plant			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	4.4	5.0	4.6	4.7	5.8	5.2	5.6	5.5
P ₂ L ₁	3.8	4.4	3.9	4.0	11.0	11.2	11.7	11.3
P ₃ L ₁	3.1	3.4	3.2	3.2	13.5	13.6	13.7	13.6
P ₄ L ₁	2.8	3.1	2.9	2.9	13.6	14.1	14.3	14.0
P ₁ L ₂	4.0	3.5	3.8	3.8	8.6	9.1	9.5	9.1
P ₂ L ₂	3.6	3.5	3.6	3.6	13.2	12.5	12.4	12.7
P ₃ L ₂	2.5	2.6	2.7	2.6	15.3	15.4	15.3	15.3
P ₄ L ₂	2.6	2.4	2.5	2.5	15.6	17.5	17.3	16.8
P ₁ L ₃	3.2	3.0	3.1	3.1	10.6	11.4	11.2	11.1
P ₂ L ₃	2.8	2.7	2.8	2.8	13.2	14.3	14.3	13.9
P ₃ L ₃	1.9	2.4	2.6	2.3	17.2	17.7	18.2	17.7
P ₄ L ₃	2.1	2.1	2.0	2.1	18.5	18.5	18.9	18.6
P ₁ L ₄	3.0	2.9	3.1	3.0	12.0	13.4	13.2	12.9
P ₂ L ₄	2.2	2.6	3.1	2.6	16.4	17.0	17.3	16.9
P ₃ L ₄	2.5	2.4	2.3	2.4	18.1	17.7	18.9	18.2
P ₄ L ₄	2.7	2.4	2.0	2.4	19.9	18.2	19.9	19.3

B10: Effect of phosphorous fertilizer and lime on seed weight and pod weight (g)

Treat.	Seed weight (g)				Pod weight (g)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	36.80	36.64	36.69	36.71	80.20	80.40	81.00	80.53
P ₂ L ₁	37.64	37.25	37.10	37.33	83.80	84.10	84.30	84.07
P ₃ L ₁	37.85	37.94	37.57	37.79	85.50	85.70	85.80	85.67
P ₄ L ₁	38.80	38.60	38.25	38.55	87.40	87.40	88.00	87.60
P ₁ L ₂	36.90	37.06	36.77	36.91	81.10	80.80	81.20	81.03
P ₂ L ₂	37.90	37.68	37.91	37.83	86.40	86.30	86.20	86.30
P ₃ L ₂	38.50	38.60	38.40	38.50	87.50	87.60	87.30	87.47
P ₄ L ₂	39.39	39.53	40.06	39.66	88.20	87.90	88.60	88.23
P ₁ L ₃	36.89	37.18	36.93	37.00	81.80	81.80	81.70	81.77
P ₂ L ₃	38.90	38.45	38.54	38.63	87.70	87.60	87.50	87.60
P ₃ L ₃	40.17	39.45	39.88	39.83	89.20	89.40	89.30	89.30
P ₄ L ₃	40.90	40.13	40.48	40.50	90.20	90.10	89.70	90.00
P ₁ L ₄	37.45	37.22	36.83	37.20	82.10	82.50	82.10	82.23
P ₂ L ₄	39.80	39.41	38.79	39.33	88.20	88.30	88.10	88.20
P ₃ L ₄	40.95	41.55	40.40	40.97	90.00	89.70	89.80	89.83
P ₄ L ₄	41.38	41.18	41.04	41.20	92.50	90.60	90.40	90.83

B11: Effect of phosphorous fertilizer and lime no. of pod and pod yield

Treat.	Pod yield (kg/ha)				No. of pods per plant			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	1080	1114	1063	1086	10.2	10.2	10.2	10.2
P ₂ L ₁	1437	1457	1380	1243	14.8	15.6	15.6	15.3
P ₃ L ₁	1643	1628	1494	1570	16.6	17.0	16.9	16.8
P ₄ L ₁	1662	1840	1619	1692	16.4	17.2	17.2	16.9
P ₁ L ₂	1200	1150	1175	1175	12.6	12.6	13.3	12.8
P ₂ L ₂	1548	1425	1437	1470	16.8	16.0	16.0	16.3
P ₃ L ₂	1875	1825	1900	1867	17.8	18.0	18.0	17.9
P ₄ L ₂	1925	1953	1950	1943	18.2	19.9	19.8	19.3
P ₁ L ₃	1344	1373	1373	1363	13.8	14.4	14.3	14.2
P ₂ L ₃	1767	1665	1700	1711	16.0	17.0	17.1	16.7
P ₃ L ₃	2138	2150	2174	2154	19.1	20.1	20.8	20.0
P ₄ L ₃	2175	2125	2197	2166	20.6	20.6	20.9	20.7
P ₁ L ₄	1325	1414	1360	1366	15.0	16.3	16.3	15.9
P ₂ L ₄	1816	1775	1754	1782	18.6	19.6	20.4	19.5
P ₃ L ₄	2195	2120	2181	2155	20.6	20.1	21.2	20.6
P ₄ L ₄	2210	2158	2200	2189	22.6	20.6	21.9	21.7

B12: Effect of phosphorous fertilizer and lime on revenue and gross margin

Treat.	Revenue (1000 VND)				Gross margin (1000 VND)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	5940	6127	5847	5971	2393	2580	2300	2424
P ₂ L ₁	7903	8013	7589	7835	3792	3902	3478	3724
P ₃ L ₁	8838	8755	8018	8537	4475	4392	3655	4174
P ₄ L ₁	8979	9958	8762	9226	4364	5343	4147	4611
P ₁ L ₂	6600	6325	6463	6463	2841	2566	2704	2704
P ₂ L ₂	8514	7838	7904	8085	4191	3515	3581	3762
P ₃ L ₂	10313	10038	10450	10267	5726	5451	5863	5680
P ₄ L ₂	10588	10742	10725	10685	5761	5915	5898	5858
P ₁ L ₃	6391	7550	7550	7497	2552	3711	3711	3658
P ₂ L ₃	9719	9158	9350	9409	5304	4743	4935	4994
P ₃ L ₃	11759	11825	11957	11847	7042	7108	7240	7130
P ₄ L ₃	11963	11688	12084	11912	7044	6769	7165	6992
P ₁ L ₄	7288	7777	7480	7515	3369	3858	3561	3596
P ₂ L ₄	9988	9763	9647	9799	5493	5268	5152	5304
P ₃ L ₄	12016	11604	11939	11853	7257	6845	7180	7094
P ₄ L ₄	12155	11869	12100	12041	7156	6870	7101	7042

B13: Effect of phosphorous fertilizer and lime on soil characteristics

Treat.	Available P (mg/100 g soil)				P ₂ O ₅ (%)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	5.16	5.14	5.09	5.13	0.015	0.025	0.020	0.020
P ₂ L ₁	5.71	5.64	5.6	5.65	0.036	0.030	0.025	0.030
P ₃ L ₁	5.97	6.04	5.78	5.93	0.041	0.029	0.032	0.034
P ₄ L ₁	6.1	5.96	5.91	5.99	0.038	0.031	0.035	0.035
P ₁ L ₂	5.3	5.25	5.11	5.22	0.035	0.030	0.028	0.031
P ₂ L ₂	6.71	6.53	6.41	6.55	0.037	0.034	0.034	0.035
P ₃ L ₂	7.82	7.77	7.78	7.79	0.039	0.037	0.035	0.037
P ₄ L ₂	8.33	8.34	8.29	8.32	0.040	0.040	0.040	0.040
P ₁ L ₃	5.91	5.8	5.54	5.75	0.034	0.030	0.028	0.031
P ₂ L ₃	7.86	7.9	7.64	7.8	0.043	0.039	0.036	0.039
P ₃ L ₃	8.6	8.52	8.53	8.55	0.045	0.041	0.036	0.041
P ₄ L ₃	9.2	9.3	10	9.5	0.047	0.048	0.038	0.044
P ₁ L ₄	6.59	6.61	6.51	6.57	0.035	0.033	0.032	0.033
P ₂ L ₄	8.54	8.4	8.5	8.48	0.043	0.040	0.041	0.041
P ₃ L ₄	9.14	9.01	9.0	9.05	0.045	0.044	0.042	0.044
P ₄ L ₄	10.12	10.04	10.02	10.06	0.050	0.049	0.042	0.046

B14: Effect of phosphorous fertilizer and lime on soil characteristics

Treat.	N(%)				K ₂ O(%)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	0.045	0.041	0.040	0.042	0.17	0.19	0.18	0.18
P ₂ L ₁	0.050	0.044	0.050	0.048	0.21	0.27	0.24	0.24
P ₃ L ₁	0.051	0.048	0.047	0.049	0.23	0.22	0.30	0.25
P ₄ L ₁	0.050	0.053	0.048	0.050	0.23	0.25	0.24	0.24
P ₁ L ₂	0.044	0.043	0.039	0.042	0.19	0.24	0.17	0.20
P ₂ L ₂	0.055	0.049	0.052	0.052	0.28	0.21	0.23	0.24
P ₃ L ₂	0.058	0.051	0.052	0.054	0.30	0.29	0.19	0.26
P ₄ L ₂	0.057	0.052	0.054	0.054	0.27	0.30	0.21	0.26
P ₁ L ₃	0.047	0.044	0.044	0.045	0.23	0.21	0.20	0.21
P ₂ L ₃	0.058	0.054	0.046	0.053	0.25	0.25	0.24	0.25
P ₃ L ₃	0.055	0.057	0.051	0.054	0.30	0.28	0.25	0.28
P ₄ L ₃	0.062	0.051	0.057	0.057	0.32	0.28	0.28	0.29
P ₁ L ₄	0.047	0.053	0.044	0.048	0.23	0.25	0.22	0.23
P ₂ L ₄	0.060	0.061	0.054	0.058	0.27	0.26	0.23	0.25
P ₃ L ₄	0.056	0.058	0.056	0.057	0.31	0.28	0.32	0.30
P ₄ L ₄	0.061	0.060	0.057	0.059	0.33	0.29	0.37	0.33

B15: Effect of phosphorous fertilizer and lime on soil characteristics

Treat.	pH _{KCl}				OM(%)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	4.2	4.1	4.2	4.2	0.93	0.94	0.98	0.95
P ₂ L ₁	4.5	4.5	4.6	4.5	1.08	1.10	0.94	1.04
P ₃ L ₁	4.7	4.8	4.7	4.7	1.15	1.11	1.13	1.13
P ₄ L ₁	4.9	4.9	4.8	4.9	1.18	1.09	1.18	1.15
P ₁ L ₂	4.4	4.4	4.5	4.4	1.10	1.04	0.98	1.04
P ₂ L ₂	4.8	4.8	5.0	4.9	1.42	1.38	1.25	1.35
P ₃ L ₂	5.1	5.1	5.1	5.1	1.49	1.42	1.45	1.45
P ₄ L ₂	5.3	5.3	5.4	5.3	1.51	1.55	1.64	1.57
P ₁ L ₃	4.8	4.8	4.7	4.8	1.08	1.03	1.00	1.04
P ₂ L ₃	5.2	5.3	5.1	5.2	1.57	1.50	1.53	1.53
P ₃ L ₃	5.5	5.5	5.4	5.5	1.63	1.61	1.56	1.60
P ₄ L ₃	5.7	5.6	5.6	5.6	1.73	1.68	1.57	1.66
P ₁ L ₄	5.1	4.7	4.8	4.9	1.11	1.04	1.01	1.05
P ₂ L ₄	5.2	5.2	5.3	5.2	1.63	1.55	1.55	1.58
P ₃ L ₄	5.6	5.7	5.6	5.6	1.81	1.74	1.70	1.75
P ₄ L ₄	5.9	5.8	5.9	5.9	1.92	1.78	1.76	1.82

B16: Effect of phosphorous fertilizer and lime on N and K concentration in plant

Treat.	N (%)				K(%)			
	Rep1	Rep2	Rep3	Mean	Rep1	Rep2	Rep3	Mean
P ₁ L ₁	2.76	2.8	2.79	2.78	1.18	1.17	1.28	1.21
P ₂ L ₁	2.95	2.97	2.95	2.96	1.36	1.28	1.37	1.34
P ₃ L ₁	3.06	3.15	3.19	3.13	1.39	1.46	1.43	1.43
P ₄ L ₁	3.29	3.35	3.25	3.30	1.42	1.44	1.47	1.44
P ₁ L ₂	2.75	2.94	2.87	2.85	1.13	1.34	1.22	1.23
P ₂ L ₂	3.03	3.27	3.24	3.18	1.38	1.42	1.31	1.37
P ₃ L ₂	3.39	3.39	3.38	3.39	1.55	1.43	1.47	1.48
P ₄ L ₂	3.54	3.56	3.56	3.55	1.54	1.46	1.40	1.47
P ₁ L ₃	2.99	2.94	2.93	2.95	1.37	1.25	1.21	1.28
P ₂ L ₃	3.21	3.17	3.24	3.21	1.41	1.49	1.53	1.48
P ₃ L ₃	3.49	3.17	3.24	3.21	1.41	1.57	1.53	1.50
P ₄ L ₃	3.57	3.5	3.58	3.55	1.51	1.56	1.49	1.52
P ₁ L ₄	3.10	2.96	2.88	2.98	1.41	1.29	1.44	1.38
P ₂ L ₄	3.37	3.41	3.33	3.37	1.41	1.51	1.49	1.47
P ₃ L ₄	3.53	3.51	3.56	3.53	1.42	1.52	1.62	1.52
P ₄ L ₄	3.56	3.78	3.64	3.63	1.54	1.51	1.61	1.55

B17: Effect of phosphorous fertilizer and lime on P concentration in plant

Treat.	P (%)			Mean
	Rep1	Rep2	Rep3	
P ₁ L ₁	0.24	0.26	0.27	0.26
P ₂ L ₁	0.29	0.27	0.28	0.28
P ₃ L ₁	0.30	0.29	0.29	0.29
P ₄ L ₁	0.31	0.28	0.31	0.30
P ₁ L ₂	0.27	0.25	0.28	0.27
P ₂ L ₂	0.30	0.31	0.32	0.31
P ₃ L ₂	0.34	0.33	0.34	0.34
P ₄ L ₂	0.34	0.35	0.35	0.35
P ₁ L ₃	0.28	0.29	0.28	0.28
P ₂ L ₃	0.32	0.35	0.33	0.33
P ₃ L ₃	0.37	0.35	0.36	0.36
P ₄ L ₃	0.37	0.37	0.36	0.37
P ₁ L ₄	0.34	0.31	0.32	0.32
P ₂ L ₄	0.35	0.37	0.37	0.36
P ₃ L ₄	0.39	0.42	0.39	0.40
P ₄ L ₄	0.41	0.42	0.40	0.41

Appendix C: Analysis of varianceC1: Analysis of variance for dry matter yield at R₂ stage

Source	DF	SS	MS	F	P
RE (A)	2	1927.63	963.813	0.99	0.4259
L(B)	3	2763494	921165	943.57	0.0000
A*B	6	5857.54	976.257		
P(C)	3	165673	552191	829.18	0.0000
A*C	6	3995.71	665.951		
B*C	9	323308	35923.1	59.39	0.000
A*B*C	18	10887.1	604.840		
Total	47	4766043			

C2: Analysis of variance for dry matter yield at R₄ stage

Source	DF	SS	MS	F	P
RE (A)	2	28381.5	14190.8	3.12	0.1177
L(B)	3	3406474	1135491	249.82	0.0000
A*B	6	27271.3	4545.22		
P(C)	3	3399297	1133099	148.95	0.0000
A*C	6	45643.6	7607.27		
B*C	9	209448	23272.0	5.92	0.0007
A*B*C	18	70760.9	3931.16		
Total	47	7187276			

C3: Analysis of variance for dry matter yield at R₆ stage

Source	DF	SS	MS	F	P
RE (A)	2	3366.54	1683.27	0.69	0.5385
L(B)	3	2.454E+07	8178358	3340.05	0.0005
A*B	6	14691.5	2448.58		
P(C)	3	1.398E+07	4629053	432.57	0.0001
A*C	6	64208.1	10701.4		
B*C	9	1893099	210344	31.21	0.0011
A*B*C	18	121325	6740.29		
Total	47	4.052E+07			

C4: Analysis of variance for dry matter yield at R₈ stage

Source	DF	SS	MS	F	P
RE (A)	2	76240.6	38120.3	15.06	0.0046
L(B)	3	1.038E+07	3460804	1367.33	0.0000
A*B	6	15186.4	2531.06		
P(C)	3	1.090E+07	3632785	720.95	0.0000
A*C	6	30233.2	5038.87		
B*C	9	303583	33731.4	19.59	0.0000
A*B*C	18	30993.8	1721.88		
Total	47	2.174E+07			

C5: Analysis of variance for dry weight of nodule at R₂ stage

Source	DF	SS	MS	F	P
RE (A)	2	3.83375	1.91687	2.17	0.1957
L(B)	3	195.831	65.2769	73.81	0.0000
A*B	6	5.30625	0.88437		
P(C)	3	304.767	101.589	86.77	0.0000
A*C	6	7.02458	1.17076		
B*C	9	9.38521	1.04280	0.97	0.4914
A*B*C	18	19.2554	1.06975		
Total	47	545.403			

C6: Analysis of variance for dry weight of nodule at R₄ stage

Source	DF	SS	MS	F	P
RE (A)	2	0.01542	0.00771	0.01	0.9873
L(B)	3	242.204	80.7347	133.65	0.0015
A*B	6	3.62458	0.60410		
P(C)	3	297.487	99.1625	525.94	0.0000
A*C	6	1.13125	0.18854		
B*C	9	65.1408	7.23787	34.88	0.0006
A*B*C	18	3.73542	0.20752		
Total	47	613.339			

C7: Analysis of variance for dry weight of nodule at R₆ stage

Source	DF	SS	MS	F	P
RE (A)	2	4.23500	2.11750	6.40	0.0326
L(B)	3	512.319	170.773	515.76	0.0000
A*B	6	1.98667	0.33111		
P(C)	3	683.089	227.696	571.22	0.0000
A*C	6	2.39167	0.39861		
B*C	9	22.9502	2.55002	3.74	0.0083
A*B*C	18	12.2867	0.68259		
Total	47	1239.26			

C8: Analysis of variance for dry weight of nodule at R₈ stage

Source	DF	SS	MS	F	P
RE (A)	2	7.95125	3.97562	13.89	0.0056
L(B)	3	520.534	173.511	606.30	0.0000
A*B	6	1.71708	0.28618		
P(C)	3	506.501	168.834	185.69	0.0000
A*C	6	5.45542	0.90924		
B*C	9	19.2308	2.13676	6.01	0.0006
A*B*C	18	6.40292	0.35572		
Total	47	1067.79			

C9: Analysis of variance for number of nodules at R₂ stage

Source	DF	SS	MS	F	P
RE (A)	2	2.93042	1.46521	1.86	0.2352
L(B)	3	685.996	228.665	290.29	0.0000
A*B	6	4.72625	0.78771		
P(C)	3	366.697	122.232	51.79	0.0001
A*C	6	14.1596	2.35993		
B*C	9	14.9502	1.66113	2.22	0.0717
A*B*C	18	13.4704	0.74836		
Total	47	1102.93			

C10: Analysis of variance for number of nodules at R₄ stage

Source	DF	SS	MS	F	P
RE (A)	2	0.18042	0.09021	0.19	0.8297
L(B)	3	519.884	173.295	370.08	0.0000
A*B	6	2.80958	0.46826		
P(C)	3	747.269	249.090	435.14	0.0000
A*C	6	3.43458	0.57243		
B*C	9	32.1925	3.57694	9.35	0.0000
A*B*C	18	6.88875	0.38271		
Total	47	1312.66			

C11: Analysis of variance for number of nodules at R₆ stage

Source	DF	SS	MS	F	P
RE (A)	2	0.48375	0.24188	1.48	0.3000
L(B)	3	737.727	245.909	1506.21	0.0020
A*B	6	0.97958	0.16326		
P(C)	3	1030.45	343.484	1227.03	0.0005
A*C	6	1.67958	0.27993		
B*C	9	29.2483	3.24981	20.96	0.0094
A*B*C	18	2.79042	0.15502		
Total	47	1803.36			

C12: Analysis of variance for number of nodules at R₈ stage

Source	DF	SS	MS	F	P
RE (A)	2	0.37792	0.18896	0.28	0.7664
L(B)	3	421.751	140.584	206.97	0.0000
A*B	6	4.07542	0.67924		
P(C)	3	726.409	242.136	625.65	0.0000
A*C	6	2.32208	0.38701		
B*C	9	40.8925	4.54361	17.00	0.0000
A*B*C	18	4.81125	0.26729		
Total	47	1200.64			

C13: Analysis of variance for leaf areas at R_2 stage

Source	DF	SS	MS	F	P
RE (A)	2	9.875E-04	4.938E-04	2.97	0.1266
L(B)	3	0.18229	0.06076	366.11	0.0000
A*B	6	9.958E-04	1.660E-04		
P(C)	3	0.27568	0.09189	639.2	0.0000
A*C	6	8.625E-04	1.438E-04		
B*C	9	0.01316	0.00146	13.47	0.0000
A*B*C	18	0.00195	1.086E-04		
Total	47	0.47593			

C14: Analysis of variance for leaf areas at R_4 stage

Source	DF	SS	MS	F	P
RE (A)	2	3.167E-04	1.583E-04	0.61	0.5756
L(B)	3	0.10841	0.03614	138.39	0.0000
A*B	6	0.00157	2.611E-04		
P(C)	3	0.28717	0.09572	820.50	0.0000
A*C	6	7.000E-04	1.167E-04		
B*C	9	0.00534	5.935E-04	4.30	0.0041
A*B*C	18	0.00248	1.380E-04		
Total	47	0.40599			

C15: Analysis of variance for leaf areas at R_6 stage

Source	DF	SS	MS	F	P
RE (A)	2	3.792E-04	1.896E-04	0.06	0.9579
L(B)	3	0.38359	0.12786	43.70	0.0002
A*B	6	0.01755	0.00293		
P(C)	3	0.01061	0.33687	382.26	0.0000
A*C	6	0.00529	8.812E-04		
B*C	9	0.17864	0.01985	14.26	0.0000
A*B*C	18	0.02505	0.00139		
Total	47	1.62110			

C16: Analysis of variance for leaf areas at R₈ stage

Source	DF	SS	MS	F	P
RE (A)	2	4.625E-04	2.312E-04	0.22	0.8091
L(B)	3	0.36437	0.12146	115.29	0.0000
A*B	6	0.00632	0.00105		
P(C)	3	0.75437	0.25146	238.69	0.0000
A*C	6	0.00632	0.00105		
B*C	9	0.16537	0.01837	40.52	0.0000
A*B*C	18	0.00816	4.535E-04		
Total	47	1.30538			

C17: Analysis of variance for number of unfilled pods per plant

Source	DF	SS	MS	F	P
RE (A)	2	0.05167	0.02583	0.32	0.7396
L(B)	3	10.5642	3.52139	43.27	0.0002
A*B	6	0.48833	0.08139		
P(C)	3	10.5892	3.52972	73.45	0.0000
A*C	6	0.28833	0.04806		
B*C	9	1.47917	0.16435	3.62	0.0098
A*B*C	18	0.81833	0.04546		
Total	47	24.2792			

C18: Analysis of variance for seed weight

Source	DF	SS	MS	F	P
RE (A)	2	0.65558	0.32779	1.96	0.2211
L(B)	3	34.9311	11.6437	69.68	0.0000
A*B	6	1.00265	0.16711		
P(C)	3	68.7569	22.9190	367.81	0.0000
A*C	6	0.37387	0.06231		
B*C	9	9.45245	1.05027	21.31	0.0000
A*B*C	18	0.88723	0.04929		
Total	47	116.060			

C19: Analysis of variance for yield

Source	DF	SS	MS	F	P
RE (A)	2	4394.67	2197.33	0.38	0.6962
L(B)	3	1699135	566378	99.21	0.0000
A*B	6	34254.0	5709.00		
P(C)	3	4496530	1498843	611.30	0.0000
A*C	6	14711.3	2451.89		
B*C	9	150225	16691.6	10.99	0.0000
A*B*C	18	27338.0	1518.78		
Total	47	6426588			

C20: Analysis of variance for number of pods per plant

Source	DF	SS	MS	F	P
RE (A)	2	3.25792	1.62896	9.03	0.0155
L(B)	3	137.832	45.9439	245.75	0.0000
A*B	6	1.08208	0.18035		
P(C)	3	291.532	97.1772	2512.30	0.0000
A*C	6	0.23208	0.03868		
B*C	9	9.75667	1.08407	2.85	0.0281
A*B*C	18	6.85458	0.38081		
Total	47	450.547			

C21: Analysis of variance for pod weight

Source	DF	SS	MS	F	P
RE (A)	2	0.02167	0.01083	0.06	0.9382
L(B)	3	90.4842	30.1614	179.47	0.0000
A*B	6	1.00833	0.16806		
P(C)	3	482.678	160.893	3387.21	0.0000
A*C	6	0.28500	0.04750		
B*C	9	9.15083	1.01676	20.53	0.0000
A*B*C	18	0.89167	0.04954		
Total	47	584.519			

C22: Analysis of variance for number of filled pods

Source	DF	SS	MS	F	P
RE (A)	2	2.64875	1.32437	8.35	0.0184
L(B)	3	219.627	73.2092	461.77	0.0000
A*B	6	0.95125	0.15854		
P(C)	3	409.351	136.450	2287.41	0.0000
A*C	6	0.35792	0.05965		
B*C	9	13.1542	1.46157	4.58	0.0029
A*B*C	18	5.74208	0.31900		
Total	47	651.832			

C23: Analysis of variance for gross margin

Source	DF	SS	MS	F	P
RE (A)	2	139706	69852.9	0.42	0.6729
L(B)	3	3.134E+07	1.045E+07	63.33	0.0001
A*B	6	989647	164941		
P(C)	3	8.144E+07	2.175E+07	394.91	0.0000
A*C	6	412423	68737.2		
B*C	9	4202903	466989	9.80	0.0000
A*B*C	18	857893	47660.7		
Total	47	1.194E+08			

C24: Analysis of variance for revenue

Source	DF	SS	MS	F	P
RE (A)	2	139706	69852.9	0.42	0.6729
L(B)	3	5.244E+07	1.748E+07	105.97	0.0000
A*B	6	989647	164941		
P(C)	3	1.404E+07	4.682E+07	681.09	0.0000
A*C	6	412423	68737.2		
B*C	9	4202903	466989	9.80	0.0000
A*B*C	18	857893	47660.7		
Total	47	1.194E+08			

C25: Analysis of variance for soil available phosphorous

Source	DF	SS	MS	F	P
RE (A)	2	0.05771	0.02886	3.51	0.0979
L(B)	3	11.6108	3.87027	470.67	0.0000
A*B	6	0.04934	0.00822		
P(C)	3	21.8893	7.29643	313.63	0.0000
A*C	6	0.13959	0.02326		
B*C	9	2.49382	0.27709	12.03	0.0000
A*B*C	18	0.41456	0.02303		
Total	47	36.6551			

C26: Analysis of variance for soil potassium

Source	DF	SS	MS	F	P
RE (A)	2	0.00219	0.00109	0.54	0.6077
L(B)	3	0.01868	0.00623	3.08	0.1117
A*B	6	0.01211	0.00202		
P(C)	3	0.04824	0.01608	62.42	0.0001
A*C	6	0.00155	2.576E-04		
B*C	9	0.00514	5.713E-04	0.68	0.7209
A*B*C	18	0.01522	8.456E-04		
Total	47	0.10313			

C27: Analysis of variance for soil nitrogen

Source	DF	SS	MS	F	P
RE (A)	2	1.329E-04	6.644E-05	5.62	0.0422
L(B)	3	4.334E-04	1.445E-04	12.22	0.0058
A*B	6	7.096E-05	1.183E-05		
P(C)	3	0.00107	3.561E-04	101.96	0.0000
A*C	6	2.096E-05	3.493E-06		
B*C	9	3.675E-05	4.083E-06	0.49	0.8622
A*B*C	18	1.499E-04	8.326E-06		
Total	47	0.00191			

C28: Analysis of variance for soil phosphorous

Source	DF	SS	MS	F	P
RE (A)	2	1.759E-04	8.794E-05	16.51	0.0036
L(B)	3	8.652E-04	2.884E-04	54.15	0.0001
A*B	6	3.196E-05	5.326E-06		
P(C)	3	0.00131	4.382E-04	78.59	0.0000
A*C	6	3.346E-05	5.576E-06		
B*C	9	5.869E-05	6.521E-06	0.61	0.7705
A*B*C	18	1.914E-04	1.063E-05		
Total	47	0.00267			

C29: Analysis of variance for pH_{KCL}

Source	DF	SS	MS	F	P
RE (A)	2	0.00939	0.00469	0.32	0.7389
L(B)	3	4.95195	1.65065	111.96	0.0000
A*B	6	0.08846	0.01474		
P(C)	3	5.01712	1.67237	190.36	0.0000
A*C	6	0.05255	0.00876		
B*C	9	0.13650	0.01517	3.45	0.0122
A*B*C	18	0.07917	0.00440		
Total	47	10.3351			

C30: Analysis of variance for organic matter

Source	DF	SS	MS	F	P
RE (A)	2	0.04061	0.02031	12.08	0.0079
L(B)	3	1.57416	0.52472	312.10	0.0000
A*B	6	0.01009	0.00168		
P(C)	3	2.00137	0.66712	550.52	0.0000
A*C	6	0.00727	0.00121		
B*C	9	0.34890	0.03877	13.46	0.0000
A*B*C	18	0.05183	0.00288		
Total	47	4.03423			

C31: Analysis of variance for plant nitrogen concentration

Source	DF	SS	MS	F	P
RE (A)	2	0.00112	5.583E-04	0.05	0.9499
L(B)	3	0.69111	0.23037	21.38	0.0013
A*B	6	0.06465	0.01078		
P(C)	3	6.56422	2.18807	593.15	0.0000
A*C	6	0.02213	0.00369		
B*C	9	0.08259	0.00918	2.02	0.0979
A*B*C	18	0.08183	0.00455		
Total	47	7.50765			

C32: Analysis of variance for plant phosphorous concentration

Source	DF	SS	MS	F	P
RE (A)	2	3.750E-05	1.875E-05	0.11	0.8950
L(B)	3	0.05312	0.01771	106.69	0.0000
A*B	6	9.958E-04	1.660E-04		
P(C)	3	0.03912	0.01304	157.81	0.0000
A*C	6	4.958E-04	8.264E-05		
B*C	9	0.00252	2.799E-04	1.71	0.1578
A*B*C	18	0.00294	1.632E-04		
Total	47	0.09923			

C33: Analysis of variance for plant potassium concentration

Source	DF	SS	MS	F	P
RE (A)	2	0.00615	0.00308	0.54	0.6095
L(B)	3	0.11557	0.03852	6.74	0.0239
A*B	6	0.03430	0.00572		
P(C)	3	0.48985	0.16328	105.77	0.0000
A*C	6	0.00926	0.00154		
B*C	9	0.01855	0.00206	0.40	0.9202
A*B*C	18	0.09329	0.00518		
Total	47	0.76697			

Appendix D: Survey questionnaires

Name of interviewer:

Date of interview:

Village:

District:

Province:

I. General information

Q.1. Name of respondent: ()

Sex: M () F ()

Age: ()

Q.2. Education level:

a. () Elementary

b. () Secondary

c. () High school

d. () Others

Q.3. How many household members do you have?

Male:..... Female:.....

Q.4. How many of them are working on the farm?

Q.5. Occupation:

a. () Farming only

b. () Farming and business

c. () Farming and service

d. () Others

II. Production profile

Q.6. Farm size:

Q.6.1. What is the size of arable area for food crops production?m²Q.6.2. What is the size of your peanut area? m²

Q.7. Please indicate the type of cropping systems, cultivated area and crops yield of household.

No.	Type of cropping systems	Area (m ²)	Yield (kg/ha)
1	Peanut		
2	Rice		

Q.8. Could you please describe your cropping patterns and crop calendar in this agricultural year?

Q.9. How many is the average yield of peanut from 1997 –1998 in your system obtained?

Q.10. When did you start growing peanut?

Q.11. Which peanut varieties do you use?

Q.12. What is the reason made you grow peanut?

() high income

() easy to grow

() suitable with area

() others

Q.13. What is the type of soil of your peanut?

Q.14. What is the amount (kg) of fertilizer that you apply for peanut and other crops?

- Manure
- Urea
- Phosphorous
- Potassium
- Lime
- Others

Q.15. Which fertilizer application methods do you apply for peanut?

- Broadcast
- Banded

Q.16. How many times do you apply fertilizer for peanut?

Q.17. Which practice management do you apply for peanut?

- Tillage
- No tillage
- Using pesticides

Q.18. Which plant density of peanut do you apply?

Q.19. Labor cost:

- Soil preparation
- Sowing
- Weeding
- Irrigation
- Harvesting
- Fertilizer application

III. Farmer's opinion about the role of peanut in farming systems

Q.20. What do you think about peanut considering as green manure and mulching? (please enumerate evidence for your answer)

- Very important
- Important
- No important

Q.21. What do you think about the following roles of peanut to soil fertility?

- Increase
- Decrease
- No change

Q.22. Do you think there are effects of peanut on soil erosions. If any, the erosion is

- Increase
- Decrease

Q.23. What do you think about the role of peanut with the pest situation to subsequent crops?

- Increase
- Decrease

- Similar

IV. Farmer's opinion about economic valuation of peanut

Q.24. What is your opinion about input requirement of peanut in comparison to non-legume crops in your family?

- Lower
- Higher
- The same

Q.25. What do you think about economic efficiency (benefit) of peanut as compared with other crops? Higher? Lower? The same?

Q.26. What do you think about labor use in your family when peanut is grown?

- Efficient
- Inefficient
- No change

V. Farmer's opinion about the role of lime and phosphorous in peanut yield improvement

Q.27. What do you think about the role of lime and phosphorous in improving peanut yield?

- Increase
- Decrease
- No change

VI. Farmer' opinion about constraints in their peanut production

Q.28. According to you what are the constraints on your peanut production with respect to the following physical conditions? What is the most serious? Please mark in the bracket

- Soil condition: Acidity ()
- Variety: not relevant ()
- Lack of manure ()
- Climatic conditions: Low or high temperature ()
- Infertility ()
- Lack of good seed ()
- Imbalance nutrient ()
- Drought ()
- Other ()

Q.29. What do you think about the socio – economic constraints to your peanut production? What is the most serious? Please mark in the bracket

- Lack of capital
- Lack of know – how in production
- Market accessibility
- Low prices
- Poor processing facilities
- Government policies incentives
- Others

CURRICULUM VITAE

Name: Hoang Thi Thai Hoa

Date of birth: January 30, 1973

Place of birth: Bacgiang province, Vietnam

Educational background:

1990 – 1995 B.S. Agriculture (Agronomy)

1998 – 2000 M.S. Agriculture (Agricultural Systems)

Chiang Mai University

Chiang Mai, Thailand

Work experiences:

1995 – 1997 Assist. lecturer and researcher

Faculty of Agronomy

Hue University of Agriculture and Forestry, Vietnam

1996 – 1997 Secretary of Center for Rural Development

Hue University of Agriculture and Forestry, Vietnam

1997 – 1998 Lecturer

Faculty of Agronomy

Hue University of Agriculture and Forestry, Vietnam

Scholarship for: Department of Technology and Economic Cooperation,
M.S. study Thailand (DTEC)

Address: Faculty of Agronomy
Hue University of Agriculture and Forestry
24 Phung Hung street, Hue city, Vietnam

Tel: - Home: (001)(84.54) 538897

 - Office: (001) (84.54) 525544

Fax: (001) (84.54) 530000

Email: knhdhnlh@dng.vnn.vn

hhoa24@hotmail.com

hvcl98@yahoo.com