



APPENDICES

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Appendix 1. The Average Production Cost, Yield and Return to Soybean of G₁₁ and G₁₂

per rai

Items	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	23		5	
Total farm area (rai)	5		5	
Planted area (rai)	5		3.38	
Labor : (md)	16.78		19.33	
Family labor	5.87		9.76	
Exchanged labor	8.84		8.42	
Hired labor	2.07	175.87	1.15	74.75
Material : (baht)				
Herbicides		35.87		
Insecticides		18.56		62.50
Fertilizers	14.37	114.96	13.75	110.00
Seeds	13.50	175.50	15.18	197.29
Machinery power : (baht)		170.00		170.00
Land preparation cost				
Total variable cost (baht)	177.00	690.76	144.37	614.54
Yield (kg/rai)				
Price (baht/kg)		9.07		9.07
Gross income (baht)		1605.39		1309.44
Soybean net income (baht)		914.39		694.90
Total net income (baht/HH)		4573.35		2348.76

Appendix 2. The Average Production Cost, Yield and Return to Soybean of G₂₁ and G₂₂

per rai

Items	G ₂₁		G ₂₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	19		6	
Total farm area (rai)	5		7	
Planted area (rai)	5		3.40	
Labor : (md)	11.91		18.66	
Family labor	4.68		8.78	
Exchanged labor	5.41		7.00	
Hired labor	1.82	109.20	2.87	143.50
Material : (baht)				
Herbicides		31.14		36.33
Insecticides		16.07		46.00
Fertilizers	30.68	230.10	32.00	152.52
Seeds	15.61	202.93	20.00	260.00
Machinery power : (baht)		140.00		
Land preparation cost				
Total variable cost (baht)	180.03	729.44	198.49	638.35
Yield (kg/rai)				
Price (baht/kg)		9.07		9.07
Gross income (baht)		1632.86		1800.32
Soybean net income (baht)		903.42		1161.97
Total net income (baht/HH)		4517.10		3950.70

Appendix 3. The Average Production Costs, Yields and Returns to Soybean - Tobacco of G₁₁ and G₁₂

Items	per rai			
	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	7		1	
Total farm area (rai)	5		10	
Planted area (rai)	5		4	
Soybean area: (rai)	2.75		2	
Labor: (md)	10.91		19.00	
Family labor	5.90		14.00	
Exchanged labor	2.64			
Hired labor	2.37	82.95	5.00	147.50
Materials: (baht)				
Herbicides		89.58		
Insecticides		45.41		
Fertilizers	22.00	132.81	40.00	200.00
Seeds	12.50	156.00	10.00	130.00
Machinery power: (baht)				
Land preparation cost		1,7.00		
Total variable cost (baht)		683.05		477.50
Yield (kg/rai)	132.49		130.00	
Price (baht/kg)		9.07		9.07
Gross income (baht)		1201.73		1179.04
Soybean net income (baht)		517.98		701.54
Tobacco area: (rai)	2.25		2.00	
Labor: (md)	31.18		30.00	
Family labor	16.47		15.00	
Exchanged labor	4.45		5.00	
Hired labor	10.26	615.00	10.00	566.09
Materials: (baht)				
Herbicides				
Insecticides		78.87		150.00
Fertilizers			50.00	376.00
Seeds	60.00	425.47		
Machinery power: (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1369.34		1342.09
Yield (kg/rai)	1419.00		1763.10	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3689.40		4584.06
Tobacco net income (baht)		2320.06		3241.97
Total net income (baht/HH)		6644.58		7887.02

Appendix 4. The Average Production Costs, Yields and Returns to Soybean - Tobacco of G₂₁ and G₂₂

per rai

Items	G ₂₁		G ₂₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	2		2	
Total farm area (rai)	5		7.5	
Planted area (rai)	5		4.5	
Soybean area: (rai)	3.50		2.5	
Labor: (md)	11.04		22.33	
Family labor	3.77		8.33	
Exchanged labor	2.81		2.50	
Hired labor	4.47	245.85	11.50	320.61
Materials: (baht)				
Herbicides		32.50		-
Insecticides		10.00		-
Fertilizers	22.00	327.23	26.67	173.36
Seeds	12.50	162.50	15.00	195.00
Machinery power: (baht)				
Land preparation cost		125.00		150.00
Total variable cost (baht)		903.08		838.96
Yield (kg/rai)	116.66		118.00	
Price (baht/kg)		9.07		9.07
Gross income (baht)		1511.61		1070.26
Soybean net income (baht)		608.55		231.30
Tobacco area: (rai)	1.50		2.00	
Labor: (md)	28.77		23.12	
Family labor	12.81		8.62	
Exchanged labor	9.46		9.00	
Hired labor	6.50	524.00	5.50	444.82
Materials: (baht)				
Herbicides				-
Insecticides		150.00		164.99
Fertilizers	60.00	540.59	62.49	594.86
Seeds				-
Machinery power: (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1464.59		1454.67
Yield (kg/rai)	1500.00		1822.09	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3900.00		4737.43
Tobacco net income (baht)		2435.41		3282.76
Total net income (baht/HH)		5783.04		7143.77

Appendix 5 The Average Production Costs, Yields and Returns
to Soybean - Mango of G₁₁ and G₁₂

Items	per rai			
	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	9		---nil---	
Total farm area (rai)	6.7		---nil---	
Planted area (rai)	6.7		---nil---	
Soybean area: (rai)	6.30			
Labor: (md)	19.30			
Family labor	7.38			
Exchanged labor	5.25			
Hired labor	6.67	266.80		
Materials: (baht)				
Herbicides		30.33		
Insecticides		27.45		
Fertilizers	31.11	202.81		
Seeds	17.00	221.00		
Machinery power: (baht)				
Land preparation cost		120.00		
Total variable cost (baht)		868.43		
Yield (kg/rai)	160.83			
Price (baht/kg)		9.07		
Gross income (baht)		1458.73		
Soybean net income		590.30		
Mango area: (rai)	5.10			
Labor: (md)	2.97			
Family labor	2.97			
Exchanged labor				
Hired labor				
Materials: (baht)				
Herbicides				
Insecticides				
Fertilizers	15.40	110.88		
Seeds				
Machinery power: (baht)				
Land preparation cost				
Total variable cost (baht)		110.88		
Yield (kg/rai)	11.11			
Price (baht/kg)		3.00		
Gross income (baht)		33.33		
Mango net income (baht)		-77.55		
Total net income (baht/HH)		3323.39		

Appendix 6 The Average Production Costs, Yields and Returns
to Soybean - Mango of G₂₁ and G₂₂

Items	G ₂₁		G ₂₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	5		1	
Total farm area (rai)	5		5	
Planted area (rai)	5		2	
Soybean area: (rai)	4.00		1	
Labor: (md)	15.37			
Family labor	7.88		12.10	
Exchanged labor	4.53		9.25	
Hired labor	2.97	148.50	2.85	180.00
Materials: (baht)				
Herbicides		31.40		
Insecticides		53.40		
Fertilizers	28.00	172.70	50.00	366.00
Seeds	16.20	210.60	18.00	234.00
Machinery power: (baht)				
Land preparation cost		120.00		120.00
Total variable cost (baht)		736.60		900.00
Yield (kg/rai)	166.00		270.00	
Price (baht/kg)		9.07		9.07
Gross income (baht)		1505.59		2448.90
Soybean net income		768.99		1548.90
Mango area: (rai)	3.40		1	
Labor: (md)	6.32			
Family labor	6.32		2.50	
Exchanged labor				
Hired labor			2.50	
Materials: (baht)				
Herbicides				
Insecticides		7.33		
Fertilizers	5.33	38.40		
Seeds				
Machinery power: (baht)				
Land preparation cost				
Total variable cost (baht)		45.73		
Yield (kg/rai)				
Price (baht/kg)				
Gross income (baht)				
Mango net income (baht)		-45.73		
Total net income (baht/HH)		2920.48		1548.90

Appendix 7. The Average Production Cost, Yield and Return to Tobacco of G₁₁ and G₁₂

per rai

Items	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	16		35	
Total farm area (rai)	5		6.15	
Planted area (rai)	5		2.40	
Labor : (md)	30.66		35.98	
Family labor	12.18		25.87	
Exchanged labor	9.04		3.07	
Hired labor	9.44	694.44	7.04	329.51
Material : (baht)				
Herbicides				
Insecticides		91.72		214.88
Fertilizers	37.44	355.68	55.04	376.61
Seeds				
Machinery power : (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1391.84		1171.00
Yield (kg/rai)	1395.97		1428.27	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3535.95		3713.50
Tobacco net income (baht)		2144.09		2542.50
Total net income (baht/HH)		10720.45		6102.00

Appendix 8. The Average Production Cost, Yield and Return to Tobacco of G₂₁ and G₂₂

per rai

Items	G ₂₁		G ₂₂	
	Quantity	Baht	Quantity	Baht
No. of household (HH)	3		5	
Total farm area (rai)	5		5	
Planted area (rai)	5		2.10	
Labor : (md)	31.10		36.19	
Family labor	22.87		25.53	
Exchanged labor	3.85		1.21	
Hired labor	4.38	376.50	9.45	650.58
Material : (baht)				
Herbicides				
Insecticides		140.17		88.10
Fertilizers	40.00	360.00	51.67	465.03
Seeds				
Machinery power : (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1126.67		1453.71
Yield (kg/rai)	1503.88		1982.12	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3910.09		5153.52
Tobacco net income (baht)		2783.42		3699.81
Total net income (baht/HH)		13917.10		7769.60

Appendix 9. The Average Production Costs, Yields and Returns to Tobacco - Mango of G₁₁ and G₁₂

Items	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	12		10	
Total farm area (rai)	5		6.25	
Planted area (rai)	5		4.68	
Tobacco area: (rai)	2.60		2.30	
Labor: (md)	33.88		25.42	
Family labor	20.35		15.38	
Exchanged labor	2.95		2.13	
Hired labor	10.58	535.00	7.91	401.20
Materials: (baht)				
Herbicides				
Insecticides		249.40		211.09
Fertilizers	68.00	476.00	40.62	324.96
Seeds				
Machinery power: (baht)				
Land preparation cost		200.00		230.00
Total variable cost (baht)		1460.40		1167.25
Yield (kg/rai)	1516.93		1564.11	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3944.03		4066.69
Tobacco net income (baht)		2483.63		2899.44
Mango area: (rai)	4.10		2.38	
Labor: (md)	5.21		7.61	
Family labor	4.01		7.61	
Exchanged labor	1.20			
Hired labor	0.20	10.00		
Materials: (baht)				
Herbicides				
Insecticides		3.86		33.71
Fertilizers	3.66	11.45	8.17	24.72
Seeds				
Machinery power: (baht)				
Land preparation cost		4.16		32.50
Total variable cost (baht)		29.47		90.93
Yield (kg/rai)	6.67			
Price (baht/kg)		3.00		
Gross income (baht)		20.00		
Mango net income (baht)		-9.47		-90.93
Total net income (baht/HH)		6418.61		6452.30

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Appendix 10. The Average Production Costs, Yields and Returns
to Tobacco - Mango of G₂₁ and G₂₂

Items	per rai			
	G ₂₁		G ₂₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	2		1	
Total farm area (rai)	5		5	
Planted area (rai)	5		2	
Tobacco area: (rai)	2.50		1	
Labor: (md)	28.44		27.10	
Family labor	14.75		14.88	
Exchanged labor	7.55		5.82	
Hired labor	6.14	370.00	6.40	386.34
Materials: (baht)				
Herbicides				
Insecticides		102.25		154.38
Fertilizers	59.70	477.75	70.94	567.52
Seeds				
Machinery power: (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1200.00		1358.84
Yield (kg/rai)	1249.98		1500.00	
Price (baht/kg)		2.60		2.60
Gross income (baht)		3249.95		3900.00
Tobacco net income (baht)		2049.95		2541.16
Mango area: (rai)	4.00		1.00	
Labor: (md)	5.81		7.00	
Family labor	5.81		7.00	
Exchanged labor				
Hired labor				
Materials: (baht)				
Herbicides				
Insecticides				
Fertilizers				
Seeds				
Machinery power: (baht)				
Land preparation cost				
Total variable cost (baht)				
Yield (kg/rai)				
Price (baht/kg)				
Gross income (baht)				
Mango net income (baht)				
Total net income (baht/HH)		5124.87		2541.16

Appendix 11. The Average Production Costs, Yields and Returns to Tobacco· Tomato · Mango of G₁₁ and G₁₂

Items	G ₁₁		G ₁₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	4		3	
Total farm area (rai)	5		5	
Planted area (rai)	5		4.09	
Tobacco area: (rai)	1.67		2.17	
Labor: (md)	43.54		29.82	
Family labor	25.46		20.23	
Exchanged labor	15.75		8.47	
Hired labor	2.33	205.00	1.12	
Materials: (baht)				100.00
Herbicides		-	-	170.00
Insecticides		381.50		
Fertilizers	91.66	824.00	87.50	700.00
Seeds				
Machinery power: (baht)				
Land preparation cost		270.00	270.00	
Total variable cost (baht)		1680.50		1240.00
Yield (kg/rai)	1778.74		1779.45	
Price (baht/kg)		2.60		2.60
Gross income (baht)		4624.70		4626.57
Tobacco net income (baht)		2944.23		3386.57
Tomato area: (rai)	1		0.75	
Labor: (md)	36.04		35.29	
Family labor	30.00		34.41	
Exchanged labor	-		0.88	
Hired labor	6.04	480.00	-	
Materials: (baht)				
Herbicides		-	-	
Insecticides		295.30		413.91
Fertilizers	100.00	723.87	67.00	393.42
Seeds				
Machinery power: (baht)				
Land preparation cost		200.00		200.00
Total variable cost (baht)		1699.17		1007.33
Yield (kg/rai)	2124.23		1499.75	
Price (baht/kg)		2.00		2.00
Gross income (baht)		4248.46		2999.50
Tomato net income (baht)		2549.29		1992.17
Mango area: (rai)	3.33		1.17	
Labor (md)	7.42		5.25	
Family labor	7.42		5.25	
Exchange labor	-		-	
Hired labor	-		-	
Materials: (baht)				
Herbicides		-	-	
Insecticides		81.88		90.55
Fertilizers	5.56	38.89	6.55	32.77
Seeds				
Machinery power: (baht)				
Land preparation cost				
Total variable cost (baht)		120.77		123.32
Yield (kg/rai)				
Price (baht/kg)		-		-
Gross income (baht)		-		-
Mango net income (baht)		-120.77		-123.32
Total net income (baht/HH)		7063.99		8698.70

Appendix 12. The Average Production Costs, Yields and Returns to Tobacco - Tomato - Mango of G₂₁ and G₂₂

Items	per rai			
	G ₂₁		G ₂₂	
	Quantity	baht	Quantity	baht
No. of household (HH)	2		4	
Total farm area (rai)	5		5	
Planted area (rai)	5		4.25	
Tobacco area: (rai)	2.75		1.75	
Labor: (md)	28.54		34.46	
Family labor	15.23		17.99	
Exchanged labor	5.51		10.66	
Hired labor	7.80	468.00	5.81	
Materials: (baht)				406.00
Herbicides		30.00		43.75
Insecticides		207.00		234.78
Fertilizers	74.45	521.42	93.74	801.75
Seeds				
Machinery power: (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1476.42		1736.28
Yield (kg/rai)	1563.10		1866.56	
Price (baht/kg)		2.60		2.60
Gross income (baht)		4064.06		4853.06
Tobacco net income (baht)		2587.64		3116.78
Tomato area: (rai)	1.50		1.00	
Labor: (md)	30.54		38.44	
Family labor	18.83		19.22	
Exchanged labor	6.42		14.72	
Hired labor	5.29	320.00	4.50	250.00
Materials: (baht)				
Herbicides				18.75
Insecticides		191.83		374.34
Fertilizers	91.50	559.00	81.24	365.04
Seeds				
Machinery power: (baht)				
Land preparation cost		250.00		250.00
Total variable cost (baht)		1320.83		1258.13
Yield (kg/rai)	2000.00		1999.80	
Price (baht/kg)		2.00		2.00
Gross income (baht)		4000.00		3999.60
Tomato net income (baht)		2679.17		2741.48
Mango area: (rai)	2		1.50	
Labor (md)	6.62		3.57	
Family labor	6.62		3.57	
Exchange labor	-		-	
Hired labor	-		-	
Materials: (baht)				
Herbicides				47.00
Insecticides		60.00		
Fertilizers				
Seeds				
Machinery power: (baht)				
Land preparation cost				
Total variable cost (baht)		60.00		47.00
Yield (kg/rai)				
Price (baht/kg)				
Gross income (baht)				
Mango net income (baht)		-60.00		-47.00
Total net income (baht/HH)		11014.76		8125.35

Appendix 13. Statistics of the Variables in the Land Intensity Model.

Variables	Mean	Standard deviation
Land intensity (Y)	0.7309	0.2727
Total land (TLAND)	6.8234	2.5331
Insufficient cap. (INB)	0.1808	0.3859
Insufficient lab (INLAB)	0.0960	0.2955
Land problem (CONSTR)	0.1017	0.3031
Cropping syst. (CSYS)	0.4519	0.4991

Appendix 14. Statistics of the Variables in Soybean Production Function.

Variables	Mean	Standard deviation
Output (LNY)	5.1082	0.22430
Total cult. land (LNLT)	2.6994	0.30598
Fertilizer (LNFERT)	2.9788	0.86245
Other cash input (LNCASH)	5.9543	0.25493
G_{12}	0.7500E-01	0.26505
G_{21}	0.32500	0.47133
G_{22}	0.11250	0.31797
Soybean - Mango syst. (M_1)	0.18750	0.39277
Soybean - Tobacco syst. (M_2)	0.15000	0.35932

Appendix 15. Statistics of the Variables in Tobacco Production Function.

Variables	Mean	Standard deviation
Output (LNY)	7.30560	0.21497
Total cult. land (LNLT)	3.46710	0.21804
Fertilizer (LNFERT)	3.93700	0.46180
Other cash input (LNCASH)	6.03580	0.23561
G_{12}	0.44954	0.49975
G_{21}	0.82569E-01	0.27650
G_{22}	0.11009	0.31445
Tobacco - Tomato - Mango (M_1)	0.11927	0.32560
Tobacco - Mango (M_2)	0.22936	0.42236
Soybean - Tobacco (M_3)	0.11009	0.31445

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