

CHAPTER IV

FARM PRODUCTION AND RETURN

This chapter describes existing cropping systems, input utilization for farm enterprises of 4 different groups of farmers who fully or partially cultivated their LRA land and who had or did not have land outside the LRA. Costs and returns for major cropping systems are also presented. The information found in this chapter will be inputs for the analysis of farm planning in the next chapter.

4.1 The Existing Cropping Systems

In 1989/1990, there were more than 30 different cropping systems in the Chom Thong LRA. Those patterns included single and diversified cropping systems, which could be divided into four major types, namely, monocropping, integration of two annual crops, integration of an annual crop with a perennial and integration of two annual crops with a perennial.

Monocropping accounted for 49% of the total observations. Integration of annual crops accounted for 14% and intercropping of one and two annual crops with a perennial accounted for 21 and 16% respectively (Table 4.1)

Table 4.1 The cropping systems of the farmer groups in the Chom Thong LRA 1989/1990.

Items	Both groups %	Group 1 households %	Group 2 households %
Monocropping systems	48.87	48.44	50.00
Tobacco**	20.69	27.08	8.16
Soybean**	18.28	14.58	25.51
Peanut	2.07	1.04	4.08
Mungbean	1.03	0.52	2.04
Rice	1.38	0.52	3.06
Tomato	1.38	0.52	3.06
Roselle	1.03	1.04	1.02
Mango	3.10	3.13	3.06
Two annual crops systems	14.13	13.02	16.32
Soybean - tobacco**	4.14	4.17	4.08
Soybean - rice	0.69	-	2.04
Soybean - roselle	1.72	2.08	1.02
Soybean - other	0.34	0.52	-
Tobacco - peanut	3.45	3.65	3.06
Tobacco - rice	0.34	0.52	2.04
Tobacco - tomato	1.75	1.56	2.04
Tobacco - other	0.69	-	1.02
Rice - peanut	0.69	0.52	1.02
Tomato - peanut	0.34	-	1.02
One annual crop integrated with a perennial crop systems	21.38	25.52	13.27
Soybean - mango**	5.17	4.69	6.12
Tobacco - mango**	8.62	11.46	3.06

Table 4.1 (Cont.)

Items	Both	Group 1	Group 2
	groups	households	households
	%	%	%
Mungbean - mango	1.03	1.04	1.02
Peanut - mango	2.07	2.60	1.02
Tomato - mango	2.76	3.65	1.02
Roselle - mango	1.72	2.08	1.02
Two annual crops integrated with a perennial crop systems	15.52	13.02	20.41
Soybean - tobacco - mango	2.07	1.56	3.06
Soybean - mungbean - mango	0.69	1.04	-
Soybean - rice - mango	0.69	0.52	1.02
Tobacco - peanut - mango	0.34	0.52	-
Tobacco - tomato - mango**	4.48	3.65	6.12
Tobacco - roselle - mango	0.34	0.52	-
Tobacco - tomato - other	0.69	0.52	1.02
Others	6.21	4.69	9.18
Total (%)	100.00	100.00	100.00
Total Households (HH)	290.00	192.00	98.00

Remark : ** The dominant cropping systems

As shown in Table 3.5, soybean and tobacco occupied about 60% of the cultivated area in the LRA. Table 4.1 presents percentages of the households engaged in monocropping systems of two groups of farmers. Soybean and tobacco were the dominant crops while other annual crops were relatively insignificant. Mango was the only perennial species suitable for the climatic condition there.

Soybean-tobacco and tobacco-peanut were a relatively common integration. The farmers also preferred soybean and tobacco intercropping with mango. Other annual species intercropped with mango were peanut, tomato, soybean and roselle.

Two annual crops with a perennial species took up about 16 percent. The relatively distinct combination of this category, tobacco-tomato-mango, accounted for only 4% of the total observations. The two annual species were planted in the rainy season since the farmers could not irrigate their crops in the dry season.

4.2 Production, Costs and Returns

Because of the large diversity of the cropping systems and the small number of farms found in each system, only six relatively important patterns including 177 farmers will be analysed for the rest of the study. Each of six patterns was practiced by at least 12 farm households. They are :

- 1) Tobacco
- 2) Soybean
- 3) Soybean - tobacco
- 4) Soybean - mango
- 5) Tobacco - mango
- 6) Tobacco - tomato - mango

This section aims to describe farmers' resource utilization and production technologies in terms of cultural management practices, varieties and etc. Finally, cost and return of each of

the six cropping systems will be presented. In order to have a better understanding, it is necessary to further classify these 177 farmers into two more sub groups based on the degree of land utilization. This makes up totalling four groups of farmers namely, G₁₁, G₁₂, G₂₁ and G₂₂ (Table 4.2).

- G₁₁ and G₁₂ are the codes for group 1 farmers who fully and partially utilized their LR farms, respectively.

- G₂₁ and G₂₂ are the codes for group 2 farmers, who fully and partially utilized their LR farms, respectively.

Table 4.2 Classification of farmers.

Group	no. of household	% of total
G ₁ : No outside land		
fully cult. land (G ₁₁)	71	40.11
partially cult. land (G ₁₂)	54	30.51
G ₂ : Having outside land		
fully cult. LRA land (G ₂₁)	33	18.64
partially cult. LRA land (G ₂₂)	19	10.74
Total	177	100.00

4.2.1 Soybean Production

Soybean production appeared in three dominant cropping systems, namely, soybean, soybean - tobacco and soybean - mango. The soybean season in Chom Thong LRA is from August/September to November/December. It matures in 95-99 days. Common varieties

planted in the area were SJ4, SJ5 and CM60. As for fertilizer application, 16-20-0 and 15-15-15 fertilizers were generally used. Tamaron, Lannate and Azodrin were used for pest control and Gramoxone for weed control.

Table 4.3 shows that 81.25% of the soybean growers were those who fully utilized their LR land. Soybean monocropping was the most popular for all farmer groups followed by soybean - mango.

Table 4.3 Number of growers of dominant soybean cropping systems.

Cropping systems	---Farmer groups---				Total (HH)	Total (%)
	G ₁₁	G ₁₂	G ₂₁	G ₂₂		
Soybean	23	5	19	6	53	66.25
Soybean-tobacco	7	1	2	2	12	15.00
Soybean-mango	9	-	5	1	15	18.75
Total	39	6	26	9	80	100.00

4.2.1.1 Input Utilization in Soybean Production

Resource utilization in the form of land, labor and capital for soybean production are summarized in Table 4.4. Soybean cultivated land varied from 1 to 6.3 rai/household. Labor and capital utilization (in terms of variable cost) varied from 10.91 to 22.33 mandays/rai and from 477.50 to 903.08 baht/rai, respectively. One rai of soybean production required, on the

average, 16.07 mandays/rai and 734.67 baht/rai of farm labor and cash cost respectively.

Table 4.4 Resources utilization of soybean production.

Cropping systems	Farmer groups	No. of HH.	Total farm area (rai)	Soybean planted area (rai)	Total labor (kg/rai)	Total variable cost (bath/rai)	Yield (kg/rai)
Soybean	G11	23	5	5	16.78	690.76	177
	G12	5	5	3.38	19.33	614.54	144.37
	G21	19	5	5	11.91	729.44	180.03
	G22	6	5	3.4	18.66	638.35	198.49
Soybean-tobacco	G11	7	5	2.75	10.91	683.75	132.49
	G12	1	10	2	19	477.5	130
	G21	2	5	3.5	11.04	903.08	166.66
	G22	2	7	2.5	22.33	838.96	118
Soybean-mango	G11	9	6.7	6.3	19.3	868.43	160.83
	G12	0	-	-	-	-	-
	G21	5	5	4	15.37	736.6	166
	G22	1	5	1	12.1	900	270
Total		80	63.7	38.83	176.73	8081.41	1843.87
Average			5.79	3.53	16.07	734.67	167.82

For soybean monocrop, the farmers (G₁₁ and G₂₁) used up 5 rai of their land but those who partially cultivated their LR land (G₁₂ and G₂₂) used only about 3.4 rai. Those who adopted a soybean-tobacco system devoted slightly more land for soybean than for

tobacco (Tables 4.3-4.4). For the soybean-mango system, land allocated for soybean ranged from 80% to 90% of the available land for those who fully cultivated LR land. Only one farmer who had land outside the LRA used only 20% of LR land for soybean or just 1 out of 5 rai (Table 4.4).

Regarding labor and capital invested on variable cost (material and hired labor), the general situation is rather clear that the G₁ farmers used more labor in soybean production than the G₂ farmers did on a per rai basis. However, one can generally say that G₂ farmers tended to hire more labor than the G₁ farmers except in the soybean-mango system. (Tables 4.5, 4.6 and 4.7)

In soybean monocropping which included about 70% of the farmers in the soybean cropping system, the labor and capital utilization patterns are interesting. Those who did not have land outside the LRA and partially used their land (G₁₂) utilized more family labor and less hired labor and capital than other groups. This evidence coincides with the hypothesis that they (G₁₂) had the least income to invest on variable cost and, therefore, they used more labor as a substitute for fertilizer, chemicals and seeds.

Table 4.5 The Average Production Cost, Yield and Return to Soybean in Soybean Monocropping System

Items	611		612		621		622	
	quantity baht		quantity baht		quantity baht		quantity baht	
No. of household (HH)	23		5		19		6	
Total farm area (rai)	5		5		5		7	
Planted area (rai)	5		3.38		5		3.4	
Labor: (md)	16.78		19.33		11.91		18.66	
Family labor	5.87		9.76		4.68		8.78	
Exchanged labor	8.84		8.42		5.41		7.00	
Hired labor	2.07	175.87	1.15	74.75	1.82	109.20	2.87	143.50
Materials: (baht)								
Herbicides	35.87		-		31.14		36.33	
Insecticides	18.56		62.50		16.07		46.00	
Fertilizers	14.37	114.96	13.75	110.00	30.68	230.10	32.00	152.52
Seeds	13.50	175.50	15.18	197.29	15.61	202.93	20.00	260.00
Machinery power: (baht)								
Land preparation cost	170.00		170.00		140.00		-	
Total variable cost (baht)	690.76		614.54		729.44		638.35	
Yield (kg/rai)	177.00		144.37		180.03		198.49	
Price (baht/kg)	9.07		9.07		9.07		9.07	
Gross income (baht)	1605.39		1309.44		1632.86		1800.32	
Soybean net income (baht)	914.67		694.90		903.42		1161.97	

Table 4.6 The Average Production Cost, Yield and Return to Soybean in Soybean-Tobacco Cropping Syst

Items	B11		B12		B21		B22	
	quantity	baht	quantity	baht	quantity	baht	quantity	baht
No. of household (HH)	7		1		2		2	
Total farm area (rai)	5		10		5		7.5	
Planted area (rai)	5		4		5		4.5	
Soybean area: (rai)	2.75		2.00		3.50		2.50	
Labor: (md)	10.91		19.00		11.04		22.33	
Family labor	5.90		14.00		3.77		8.33	
Exchanged labor	2.64		-		2.81		2.50	
Hired labor	2.37	82.95	5.00	147.50	4.47	245.85	11.50	320.61
Materials: (baht)								
Herbicides		89.58		-		32.50		-
Insecticides		45.41		-		10.00		-
Fertilizers	22.00	132.81	40.00	200.00	22.00	327.23	26.67	173.36
Seeds	12.50	156.00	10.00	130.00	12.50	162.50	15.00	195.00
Machinery power: (baht)								
Land preparation cost		177.00		-		125.00		150.00
Total variable cost (baht)		683.05		477.50		903.08		838.96
Yield (kg/rai)	132.49		130.00		116.66		118.00	
Price (baht/kg)		9.07		9.07		9.07		9.07
Gross income (baht)		1201.73		1179.04		1511.61		1070.26
Soybean net income (baht)		517.98		701.54		608.55		231.30

Table 4.7 The Average Production Cost, Yield and Return to Soybean in Soybean-Mango Cropping System

Items	611		612		621		622	
	quantity	baht	quantity	baht	quantity	baht	quantity	baht
No. of household (HH)	9		---nil---		5		1	
Total farm area (rai)	6.7		---nil---		5		5	
Planted area (rai)	6.7		---nil---		5		2	
Soybean area: (rai)	6.30				4.00		1.00	
Labor: (md)	19.30				15.37		12.10	
Family labor	7.38				7.88		9.25	
Exchanged labor	5.25				4.53		2.85	
Hired labor	6.67	266.80			2.97	148.50	-	-
Materials: (baht)								
Herbicides		30.33				31.40		-
Insecticides		27.45				53.40		180.00
Fertilizers	31.11	202.81			28.00	172.70	50.00	366.00
Seeds	17.00	221.00			16.20	210.60	18.00	234.00
Machinery power: (baht)								
Land preparation cost		120.00				120.00		120.00
Total variable cost (baht)		868.43				736.60		900.00
Yield (kg/rai)	160.83				166.00		270.00	
Price (baht/kg)		9.07				9.07		9.07
Gross income (baht)		1458.73				1505.59		2448.90
Soybean net income (baht)		590.30				768.99		1548.90

However, labor substitution for material input in this case may be rather poor as we can observe. The soybean yield of this group (G₁₂) was the lowest and that of G₂₂ was the highest in monocrop soybean and only average in soybean-tobacco system. The major factors that might have caused the yield difference of these 2 groups (G₁₂,G₂₂) are fertilizer and herbicides. The difference of fertilizer rate was significant. More interesting is the fact that a herbicide was on used (at the common rate) by all groups but the G₁₂ farmers who did not use it and their yield was apparently the lowest.

Net income or net margin is defined as gross income minuses total variable cost. Among the monocrop soybean, the G₂₂ farmers obtained the highest net income per rai (1161 baht) which was closed to the G₁₁ and the G₂₂ but rather different from that of the G₁₂ which was only about 700 baht per rai. Again comparing the G₁₂ (which obtained the lowest yield and net income) with the G₂₂ (which obtained the highest yield and net income), the variable costs of these 2 groups were almost the same and lower than the other two groups (G₁₁ and G₂₁)

Therefore, one can not really conclude that more investment on variable cost would raise yield and net income. However one should be more specific on the type of inputs. In this particular case, herbicide and fertilizer might be important factors.

In soybean-tobacco and soybean-mango systems, are source utilization comparison of farm groups does not show any distinct pattern. For example, labor used in soybean production is commonly hypothesized to be less in soybean-tobacco system than in general since farmers tended to devote their labor for tobacco. Table 4.8

shows that it was true only in the case of G₁₁ but not the others. A more obvious pattern shown in Table 4.8 is that G₂₁ used the least labor in soybean production.

Fertilizer application ranged from 14 to 50 kg/rai. Most farmers applied only a low rate (14-25 kg/rai) (Tables 4.5-4.7). Comparing all cropping systems, fertilizer applications in soybean-mango was the highest. On the average, those who had only LR land tended to apply more fertilizer when growing only soybean and less fertilizer in soybean-tobacco system as we expected. However, the situation reversed for the groups G₂₁ and G₂₂.

Table 4.8 Resource utilization in soybean production system of farmer groups.

Resource and No. of HH	Farmer groups			
	G ₁₁	G ₁₂	G ₂₁	G ₂₂
No. of HH	39	6	27	9
Labor (md/rai)				
Soybean	16.78	19.33	11.91	18.66
Soybean-tobacco	10.91	19.00	11.04	22.33
Soybean-mango	19.30	-	15.37	12.10
Fertilizer (kg/rai)				
Soybean	14.37	13.74	30.68	32.00
Soybean-tobacco	22.00	40.00	22.00	26.67
Soybean-mango	31.11	-	28.00	50.00

4.2.1.2 Cost and Returns to Soybean Production

The average yield of soybean ranged from about 120 to 270 kg/rai which was not far from expectation as compared to the average of wet season soybean in Chiang Mai (152 kg/rai) (Wiboonpongse and Sriboonchitta, 1990). The average price received by the farmers in the LRA in 1989/1990 was 9.07 baht/kg. This brought the gross income to an average of 1,070 to 2,448 baht/rai. The price at 9.07 baht was considerably high compared to the lower prices in the recent years (1990/1992 which were lower than 9 baht/kg).

Regarding the cost of production, the total variable costs in Tables 4.5-4.7, and 4.9 refer to cash cost of hired labor, material supply and machine service for land preparation. The minimum total variable (cash) cost per rai was slightly less than 500 baht/rai (G₁₂ of soybean-tobacco system) which corresponded to almost the lowest yield (130 kg/rai). The statistical tests given in Chapter VI show that fertilizer and cash expenses are important determinants of yield. The evidence in Table 4.9 also shows the positive relationship of the cash cost and yield.

Since labor and cash are important and limited resources, returns to these factors should be evaluated in such a way that one can compare their prices in a similar way farmers usually base their decision.

Table 4.9 Soybean yield, cost, and returns.

System/group	Yield (kg/rai)	Gross income	Total ⁽¹⁾ variable cost	Net income	Return to labor	Return to capital
		baht/rai	baht/rai	baht/rai	baht/day	per baht
Soybean						
G11	177	1605.39	690.76	914.63	64.99	2.78
G12	144.37	1309.44	614.54	694.9	39.8	2.28
G21	180.03	1632.86	729.44	903.42	85.02	2.46
G22	198.49	1800.32	638.35	1161.97	69.96	3.35
Average	174.97	1587.00	668.27	918.73	64.94	2.72
Soybean-tobacco						
G11	132.49	1201.73	683.05	517.98	55.08	1.86
G12	130	1179.04	477.5	701.54	44.68	3.13
G21	166.67	1458.1	903.08	555.02	36.31	1.24
G22	118	1070.26	835.96	231.3	24.72	1.45
Average	136.79	1227.28	724.90	501.46	40.20	1.92
Soybean-mango						
G11	160.83	1458.73	868.43	590.3	44.41	1.98
G12	-	-	-	-	-	-
G21	166	1505.59	736.6	768.77	59.7	2.31
G22	270	2448.9	900	1548.9	128	1.72
Average	198.94	1804.41	835.01	969.32	77.37	2.00

Source : calculated from Table 4.5 - 4.7

Note : (1) Total variable cost = cash paid for hired labor + material cost + machinery service cost for land preparation

(2) Return to labor = (gross income - material and machinery cost)/total manday

(3) Return to capital = return to 1 baht paid for material and machinery cost

Return to labor is defined as gross income minus cost of material and machine service. This margin, in fact, includes fixed costs (including land, farm equipment and managerial income of the farmer). However, to a farmer, fixed input does not affect this production decision. This is true in the short run. In Table 4.9, return to labor is calculated on a per day basis so that one can compare return to labor in crop production to labor wage. The minimum return was 24 baht and the maximum was 138 baht corresponding to the yields.

Return to capital or cash is defined as gross income minus cost paid for hired labor divided by cash paid for material and machine service. This return refers to return to one baht of cash investment on material and land preparation of hired machine, land use, fixed input and managerial income. The result shows that the farmers (in group G21 of soybean-tobacco system) could obtain at least 1.24 baht in return and the maximum was 3.35 baht (G22 of soybean system).

On the average, farmers who grew soybean alone outperformed farmers in the other soybean systems in terms of returns to labor and capital.

Net return per rai varied considerably. It ranged from 231 to 1,548 baht (G22 of soybean-tobacco and soybean-mango systems respectively). The highest variation was G22 of farmers in soybean-tobacco system (of which minimum was only 32 % of the maximum). The least variation occurred in soybean monocrop system (the minimum was 59% of maximum). Figures from Table 4.9 should suggest that net income per rai earned by the farmers in monocrop system seemed stable and preferable to the others. One possible explanation is

that farm income of these farmers relied mainly on this crop so they had to work more intensively.

4.2.2 Tobacco Production

Virginia and Burley were two main varieties found in the area. Its growing season in Chom Thong LRA is from the beginning of August to the end of September.

Tobacco production was labor intensive especially during planting and harvesting stages. Fertilizer such as 13-13-13 and 4-16-24 and pesticides like Furadan, Tameron, Altrachlor were common in the area.

The tobacco growers in Chom Thong LRA contributed their land and labor while the tobacco curers provided seedlings and credit in the form of fertilizers and insecticides. The tobacco curers did not charge for the seedling cost because they wanted to ensure that their growers would plant only the qualified varieties they required. Therefore, in the gross margin analysis of tobacco, seedling cost was not counted.

Tobacco appeared in 4 cropping systems, namely, monocrop tobacco, soybean-tobacco, tobacco-mango and tobacco-tomato-mango. 54% of the tobacco growers practiced monocropping and 35% intercropped tobacco in mango orchard (Table 4.10). 80% of the tobacco farmers did not have land outside the LRA (i.e. groups G₁₁ and G₁₂).

Table 4.10 Number of growers of dominant tobacco cropping systems.

Cropping systems	-----Farmer groups-----				Total (HH)	Total (%)
	G11	G12	G21	G22		
Tobacco	16	35	3	5	59	54.13
Soybean - tobacco	7	1	2	2	12	11.01
Tobacco - mango	12	10	2	1	25	22.93
Tobacco - tomato - mango	4	3	2	4	13	11.93
Total	39	49	9	12	109	100

4.2.2.1 Input Utilization in Tobacco Production

Land, labor and capital utilization for tobacco production can be observed from Table 4.11. Among those four dominant cropping systems, which included tobacco, 2.44 rai or nearly half of the farm land were used for tobacco.

Land utilization by tobacco monocropping farmers ranged from 2.10 to 5.00 rai. Those cultivated 5 rai were mainly the farmers having LR land and they fully utilized their land. But those who partially used their LR land cultivated only 50% of their land which was less than monocrop soybean (Table 4.4). This is understandable since tobacco requires more labor (23-43 mandays/rai).

Among those who fully used of LR land and planted more than one crop, they usually devoted more land to other crops than to tobacco as one can observe from the ratio of tobacco land to the total farm area, e.g. 2.25 to 5 rai (G11 of soybean-tobacco) and

1.50 to 5 rai (G₂₁ of the same system). This is true except for mango which is intercropped with annual crops. The maximum area of tobacco (5 rai) is a considerably large size for tobacco since this crop used to be grown under a quota system controlled by curing houses.

Table 4.11 Resources utilization of tobacco production.

Cropping systems	farmer groups	No. of HH	Total farm area (rai)	Tobacco planted area (rai)	Total labor md/rai	Total variable cost baht/rai	Yield (kg/rai)
Tobacco	G11	16	5	5	30.66	1391.84	1359.97
	G12	35	6.15	2.4	35.98	1171	1428.27
	G21	3	5	5	31.1	1126.67	1503.88
	G22	5	5	2.1	36.19	1453.71	1982.12
Soybean-tobacco	G11	7	5	2.25	31.18	1369.34	1419
	G12	1	10	2	30	1342.09	1763.1
	G21	2	5	1.5	28.77	1464.59	1500
	G22	2	7.5	2	23.12	1454.67	1822.09
Tobacco-mango	G11	12	5	2.6	33.88	1460.4	1516.93
	G12	10	6.25	2.3	25.42	1167.25	1564.11
	G21	2	5	2.5	28.44	1200	1249.98
	G22	1	5	1	27.1	1358.84	1500
Tobacco-tomato-mango	G11	4	5	1.67	43.54	1680.5	1778.74
	G12	3	5	2.17	29.82	1240	1779.45
	G21	2	5	2.75	28.54	1476.42	1563.1
	G22	4	5	1.75	34.46	1736.28	1866.56
Total		109	89.9	38.99	498.2	22093.6	25597.3
Average			5.62	2.44	31.14	1380.85	1599.83

Labor employed in tobacco production varied from 23 to 43 mandays/rai. Table 4.11 shows that those who practiced tobacco-tomato-mango system seemed to use more labor and invest more on variable cost than the farmers in the other systems.

The farmers in the soybean-tobacco system employed the least labor for tobacco (i.e. below the average of 31.14 mandays/rai) but more on cash items. Those who relied solely on tobacco were expected to devote most of their resources to the crop. Table 4.11 shows that 69% of farmers used labor above the overall average and the rest used labor slightly below the average.

4.2.2.2 Costs and Returns to Tobacco Production

The average yield of tobacco ranged from 1200 to about 2000 kg/rai. The group G22 (of monocropping) obtained the highest yield and thus the highest net income (3699 baht). However, the maximum return on labor belongs to G22 of tobacco-soybean system (161.23 baht/day). The averages of net income per rai of tobacco were rather high especially compared to soybean. Net income ranged from 2000 to 3699 baht. Return on labor was approximately 72-161 baht/day and return on one baht of capital invested was 2.10-5.61. Details are shown in Table 4.12 and Appendix 11.

Table 4.12 Tobacco yield, costs, and returns.

System/group	Yield kg/rai	Gross income baht/rai	Total variable cost baht/rai	Net income baht/rai	Return to labor baht/day	Return to capital per baht
Tobacco						
G11	1395.97	3535.95	1391.84	2144.09	92.58	4.07
G12	1428.27	3713.5	1171	2542.5	79.82	4.02
G21	1503.88	3910.09	1126.67	2783.42	91.96	4.71
G22	1982.12	5153.52	1453.71	3699.81	120.21	5.61
Average	1577.56	4078.27	1285.81	2792.46	96.14	4.60
Tobacco-soybean						
G11	1419	3689.4	1369.34	2320.06	94.13	4.08
G12	1763.1	4584.06	1342.09	3241.97	126.94	5.18
G21	1500	3900	1464.59	2435.41	102.86	3.59
G22	1822.09	4737.43	1454.67	3282.76	161.23	4.25
Average	1626.05	4227.72	1407.67	2820.05	121.29	4.28
Tobacco-mango						
G11	1516.93	3944.03	1460.4	2483.63	89.1	3.68
G12	1564.11	4066.69	1167.25	2899.44	129.84	4.78
G21	1249.98	3249.95	1200	2049.95	85.09	3.47
G22	1500	3900	1358.84	2541.16	108.16	3.61
Average	1457.76	3790.17	1296.62	2493.55	103.05	3.89
Tobacco-tomato-mango						
G11	1778.74	4624.73	1680.5	2944.23	72.33	2.1
G12	1779.45	4626.57	1240	3386.57	116.92	3.97
G21	1563.1	4064.06	1476.42	2587.64	107.06	4.03
G22	1866.56	4853.06	1736.28	3116.78	102.23	3.34
Average	1746.96	4542.11	1533.30	3008.81	99.64	3.36

4.2.3 Tomato Production

Tomato production in Chom Thong LRA was mainly integrated with tobacco. It was dominantly found in the tobacco -tomato-mango cropping system. The varieties planted in the area were VF 134-1-2, Kal-J and L-22. Its season runs from May to September. Its growing period is 100-120 days.

Fertilizers in the forms of 13-13-21 and 15-15-15 were popular and Lasso was a common herbicide. Fertilizer and chemicals were significant component in the total variable cost (Table 4.13).

Table 4.13 shows that the number of tomato growers in both G₁ and G₂ groups were nearly equal. Considering land resource management, it was observed that mango growers in G₁ and G₂ farmers were about the same those farmers who fully and partially cultivated their farm areas.

4.2.3.1 Input Utilization in Tomato Production

Quite a small part of the farm land was used for tomato production (1.06 rai/household). Like tobacco, tomato was a capital and labor intensive crop. On the average, farmers spent 35.08 mandays of total labor and 1321.37 baht of total variable cost to produce 1 rai of tomato. Farmers in all groups spent almost the same amount of labor for crop care and harvesting. However, cash expenses varied considerably.

Table 4.13 Resource utilization of tomato production.

Cropping system	Farmer groups	No. of HH	Total farm area (rai)	Tomato planted area (rai)	Total labor (md/rai)	Total variable cost (baht/rai)	Yield (kg/rai)
	G ₁₁	4	5	1.0	36.04	1666.17	2124.23
Tobacco -	G ₁₂	3	5	0.75	35.29	1007.33	1499.75
tomato -	G ₂₁	2	5	1.5	30.54	1320.83	2000.00
mango	G ₂₂	4	5	1.0	38.44	1258.13	1999.80
Total		13	20	4.25	140.31	5285.46	7623.78
Average			5	1.06	35.08	1321.37	1905.95

4.2.3.2 Costs and Returns on Tomato Production

In 1989/1990, the growers obtained about 1900 kg/rai. The average yield ranged from 1500 to 2100 kg/rai. The price received by the farmers was about 2.00 baht/kg. This brings to the total gross income to approximately 3000-4250 baht/rai (Table 4.14). Farmers in G₁₁ obtained the highest yield and gross income but not the highest net income or return on labor or capital. The maximum net return was obtained by the farmers in G₂₂.

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Table 4.14 Tomato yield, costs and returns of tobacco-tomato-mango system.

Group	Yield (kg/rai)	Gross income (----- baht/rai-----)	Total variable cost	Net income	Return on labor (baht/day)	Return on capital (per baht)
G ₁₁	2124	4248	1699	2549	84.04	3.09
G ₁₂	1499	2999	1007	1992	56.45	2.98
G ₂₁	2000	4000	1320	2679	98.20	2.68
G ₂₂	1999	3999	1258	2741	77.82	3.72
Average	1905	3561	1321	2490	70.13	3.37

Tomato appeared to be the second best income generator in terms of net income per unit of land after tobacco eventhough these two crops required about the same levels of labor and cash investment. Returns on labor and capital of tobacco were obviously higher than those of tomato.

One may conclude that among three annual crops, tobacco provided a higher net return than tomato and soybean provided the least.

4.2.4 Mango Production

The common perennial species in Chom Thong LRA is mango which is always integrated with annual crops. Mango appeared in three cropping systems; they are soybean-mango, tobacco-mango and

tobacco-tomato-mango (Table 4.15). The general varieties of mango are Kaew, Kiew Sa-woei, Nang Klang Wan, Nam Dok Mai, Og Rong and Nga Chang. This perennial bears fruit in the fourth year after planting and by this time the integrated annuals will disappear from the systems.

Mango growers mostly were the same farmers who appeared in tobacco - mango cropping system and soybean - mango and tobacco-tomato - mango cropping systems. Mango was a subsidiary activity.

The resource usage in the forms of labor, capital and return on mango production in Chom Thong LRA is presented in Table 4.15 and 4.16.

Due to the fact that those mango plantations inside the area were at a young age, the data at each age from year 1 to year 10 was not available. Thus, it is necessary to estimate from Lamphun LRA which can give good approximates for the Chom Thong LRA. The Lamphun LRA physical condition is similar to the Chom Thong LRA.

Table 4.15 Resource utilization of mango production in 1989/1990.

Cropping system	Farmer groups	No. of HH	Total farm area	Mango planted area (rai)	Total labor (md/rai)	Total variable cost (baht/rai)	Yield (kg/rai)
Soybean- mango	G11	9	6.7	5.1	2.97	110.88	11.11
	G12	0	-	-	-	-	-
	G21	5	5	3.4	6.32	45.73	-
	G22	1	5	1	2.50	-	-
Tobacco- mango	G11	12	5	4.1	5.21	29.47	6.67
	G12	10	6.25	2.38	7.61	90.93	-
	G21	2	5	4	5.81	-	-
	G22	1	5	1	7.00	-	-
Tobacco- tomato- mango	G11	4	5	3.33	7.42	120.77	-
	G12	3	5	1.17	5.25	123.32	-
	G21	2	5	2	6.62	60.00	-
	G22	4	5	1.5	3.57	47.00	-
Total	11	53	57.95	28.98	60.28	628.10	n
Average			5.27	2.63	5.48	57.10	n

Note: n = not evaluated

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Table 4.16 Cost and return of mango production for 10 years.

Items	Year									
	1	2	3	4	5	6	7	8	9	10
Yield (kg/rai)	-	-	-	704	880	1320	1452	1452	1452	1452
Labor : (nd/rai)										
peak season	5.48	5.48	5.48	5.48	5.48	5.48	5.48	5.48	5.48	5.48
non-peak season	10.96	10.96	10.96	10.96	10.96	10.96	10.96	10.96	10.96	10.96
Production cost : (baht/rai)										
Land preparation	88									
Stocks	220									
Manure	132	132	132	132	154	154	220	220	220	220
Fertilizer 15-15-15	308	308	462	616	770	924	1232	1232	1232	122
Pesticides	44	44	44	88	88	88	88	88	88	88
Miscellaneous	88	22	22	66	66	88	110	110	110	110
Total variable cost (baht/rai)	880	506	660	902	1078	1254	1650	1650	1650	1650

Remark : 44 trees per rai with the spacing of 616 square meters

Source of data : BAAC, July 1986.

4.3 Household Income

The Chom Thong LR farmers were like the other farmers all over the country who earned for their living not only from farm income but also from off-farm activities. The reason they gave was "In order to cope with their household expenses". This can be seen in Table 4.17 which illustrates that among 23 groups of farmers in the 6 cropping systems, those who earned income from farm income

inside LRA varied from 1,550 to 14,000 baht/household. The minimum and the maximum amounts were found in the G22 and G21 farmers who engaged in soybean-mango and mono cropping tobacco systems respectively. Besides this, some groups of farmers also earned income from outside the LRA farms. The incomes ranged from about 2,150 to 4,700 baht/household. Rice was the major crop for this income source.

In examining the total farm income which was claimed as the major source of household income, it was found that about 78% of these farmers groups could not earn adequate farm income to meet their household consumption. They needed supplements from off-farm sources as mentioned before in Chapter III. Those off-farm activities provided about 6,800-11,500 baht per household net profit which enabled farmers to be self-sufficient and to save the rest for production the following year.

Moreover, it was interesting to find out that among those farmers (78%) whose farm incomes were far below their consumption expenses were mainly among the ones who employed soybean as one of the main activity components in mono soybean and soybean-mango cropping systems. This may imply that if farmers owned a small farm size and also selected lower return crop activities for their farms, they tended to achieve barely sufficient farm income to cover their basic needs.

Table 4.17 Farm Size, Cultivated Area, Household Income and Consumption (per year)

Cropping system and farmer groups	No. of HH	Farm size inside LRA (rai)	Cultivated area inside LRA (rai)	Farm income inside LRA (baht)	Farm income outside LRA (baht)	Total farm income (baht)	Off-farm income (baht)	Household consumption (baht)
Soybean								
G11	23	5	5	4573	-	4573	6025	8053
G12	5	5	3.38	2349	-	2349	6960	8075
G21	19	5	5	4517	2522	7039	8409	10685
G22	6	7	3.4	3951	2372	6323	5910	9228
Soybean-tobacco								
G11	7	5	5	6645	-	6645	7499	8867
G12	1	10	4	7887	-	7887	7000	10295
G21	2	5	5	5783	2145	7928	6250	8310
G22	2	7.5	4.5	7144	2318	9462	8500	11488
Soybean-mango								
G11	9	6.7	6.7	3323	-	3323	7318	9452
G12	-	-	-	-	-	-	-	-
G21	5	5	5	2920	4635	7555	5132	8545
G22	1	5	2	1549	-	1549	7800	7880
Tobacco								
G11	16	5	5	10720	-	10720	4100	8420
G12	35	6.15	2.4	6102	-	6102	7512	10630
G21	3	5	5	13917	-	13917	5500	10488
G22	5	5	2.1	7770	-	7770	5482	10853
Tobacco-mango								
G11	12	5	5	6419	-	6419	4948	8101
G12	10	6.25	4.68	6452	-	6452	5964	9529
G21	2	5	5	5125	-	5125	6000	7892
G22	1	5	2	2541	4708	7249	2000	6760
Tobacco-tomato-mango								
G11	4	5	5	7064	-	7064	5658	8703
G12	3	5	4.09	8699	-	8699	2400	9033
G21	2	5	5	11015	-	11015	4230	8413
G22	4	5	4.25	8125	2172	10297	2873	8939

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4.4 Summary

The foregoing sections showed that tobacco or tomato production required labor and capital resources twice those of the requirement in soybean production. Soybean was normally inexpensive to grow, land preparation cost only 170 baht/rai while it cost 250 baht/rai for tobacco.

Tobacco and tomato activities were found more in the farmer groups who partially cultivated their farms. On the other hand, soybean activity was found more in the farmer groups who fully utilized their land resource.

The following observations can be made from this chapter as:

(1) Soybean-mango farmers earned the least per rai and per household especially those who had outside land and partially used their LRA land (G22). Tobacco production alone or incorporated in any system could raise farm income by more than double.

(2) Return on labor of soybean was below (in some cases considerably below), and that of tobacco and tomato were closer or slightly above the market wage rate. However, when the cost of land, fixed input and managerial effort were deducted, return on labor may become nil.

(3) The farmers who faced labor and capital shortage adopted soybean or having soybean in their cropping systems.

(4) For partially cultivating farmers who had only LR land (G12), income, improvement from farm activities would be most limited if they could not obtain credit.

(5) None of the farmers who owned only the LRA land earned enough from their farm to spend on household expenses regardless of cropping systems they practiced. However, some of those who also owned outside land (G22 in tobacco - mango) and G21 and G22 (in tobacco - tomato - mango) had relatively low household expenditure. Thus farm income was sufficient for household consumption.



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