RUBBER - BASE CROPPING SYSTEM

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A. INTRODUCTION

Rubber is one of the most important economic crops of Thailand. It is grown widely in all 14 provinces in the South and 4 provinces in the East. For the South, it occupies nearly 1.6 million hectares or about 20% of the regional area (Department of Agricultural Economics, 1983).

A large proportion of rubber areas in Thailand are planted to low yielding clones which yield about 300 kg/ha/year. Annually, the Rubber Replanting Program is scheduled to replace 48,000 ha of old clones with new clones which yield over 2,000 kg/ha/year. During the immature stage of rubber, particularly in the first 2-3 years, a large part of the total field area lies unutilized by the new trees. This area is suitable for growing intercrops from which the farmer can use for family consumption and for extra cash income. The South of Thailand is usually the net importer of many field crops and certain vegetables. The utilization of this area may improve the economy of the South as a whole.

B. PERIOD SUITABLE FOR INTERCEOPPING

Procedures for planting or replanting rubber involve felling of the old rubber stand and preparation of the area for

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planting in the first year. Rubber planting will be done about July through September. The immature rubber trees grow slowly in the first 1-3 years but the assets of soil and the sunshine falling on its surface remain available for productive plant growth. Young rubber can be intercropped during three years from the time of planting budded stumps or over a period of four years when palnting with seed-at-stake (Templeton, 1973). From our observation, many farmers even leave some of their intercrops such as banana and pineapple between rows of rubber unattended longer than four years.

Ages of rubber that can be intercropped may depend on many factors such as the row orientation, spacings of rubber, soil fertility, topography, kind of intercrops, etc. Amount of light transmission through the rubber canopy at different ages is one of the most important limiting factors for intercropping. In an experiment where the rubber rows were arranged in East-West direction and the spacings of rubber were 7 by 3 metres, it was shown that the percentages of light transmission were 89 and 56% for 122 and 163-week-old rubber, respectively (Laosuwan et al., 1985) ZTable 1). This information is necessary for choice of intercrops at different ages of rubber.

C. THE PROPORTION OF AREA TO BE INTERCROPPED

Rubber will normally be planted at interrow spacings of 6 to 8 metres. The intercropped area will occupy only 70 to 75% of the interrow. The intercrop must be planted to within one metre of the rubber rows for the first two years and $1\frac{1}{2}$ metres or more of unplanted strip in the third and fourth year (Templeton, 1973). Laosuwan et al. (1983) gave simple formula for estimating the intercropped area within a square or for the whole area as follows :

$$A(\%) = \frac{(BW - kW)}{BW} \times 100$$

$$= \frac{B - k}{B} \times 100$$

where

A = percentage of interrow area for intercropping

B = between-row spacing of rubber

W = between-plant spacing of rubber

k = 2 x (1 m + half of between-row spacing of each intercrop)

for one and two years rubber, but for three and four years rubber k will increase.

For example, if on the average B = 7.5, k for 1 to 3 years = 2.80 then A = 62.67%. Therefore, if the annual replanting rate is 48,000 ha and this area can be intercropped for three years, the total area for intercropping could be 0.6267 48,000 x 3 = 90,244.8 ha per year.

D. CHOICE OF INTERCROPS

Crops suitable as intercrops must have market potential or are needed by farmers for their consumption. They must be easy to grow without risks to harm the rubber trees. Most of small rubber farmers grow upland rice in the first and second year. Other crops recommended include peanut, sweet potato, sweet corn, soybean, water melon, mungbean, vegetables and banana (Templeton, 1975). In addition to above, other crops were evaluated for their potential as intercrops such as sorghum and sunflower (Wongsukon et al., 1975) etc.

Among all the intercrops, upland rice is grown widely by small rubber farmers, and this is being used for consumption rather than for cash income. After harvesting rice, in the early rainy season of next year the same area can be rotated with short season crop such as mungbean, soybean, peanut, sweet corn, vegetables, etc. Rice may be again planted in the second year before the onset of the monsoon rains.

Certain biennial crops such bananas and pineapple are also popular intercrops among small rubber farmers. They usually are planted after upland rice in the second year and left in the field for several years or until no profitable yields can be obtained.

Most of the studies showed that these crops yield moderately. The question may arise concerning the profitability of different systems of intercropping. Analyses of the cost benefits of various intercrops have yet to be studied. Laosuwan et al. (1984)showed that banana planted in the first year the same time as rubber and intercropped with upland rice is the most profitable system (Table 2).

E. RECOMMENDED SYSTEM

Areas planted to rubber are usually characterized by having long rainfall distribution which takes about 6 to 8 months. The most important area of rubber lies on the eastern plain of Southern Thailand where general rain starts in Apil or May and the rainy season lasts until late December. However, the only crop suitable for intercropping in the first year is upland rice which is planted before the onset of monsoon rains. In the second year, most of the small rubber farmers will plant upland rice in their second year rubber. But before planting rice, a number of alternative crops could be grown between April and September. These crops include water melon, soybean, mungbean, peanut, sweet corn and sesame. Although field corn was not recommended in the first year due to its tall growth and lodging habit that might retard the growth of young rubber plants, it may be introduced into the system by growing the same time as rice from the second year on.

In certain circumstances in which labour and cash inputs are very limited, many farmers are assorted to planting biennial crops such bananas, pineapple, papaya, etc, but usually no

maximization of returns is attempted. Some of the systems being used by farmers or on experimental basis are given in Table 3.

F. LEVEL OF INPUTS USED FOR INTERCROPPING

Many farmers understand that no fertilizers are necessary for intercops as they can utilize the residual fertility accumulated in the soil. If so, intercropping may be harmful to rubber. Fertilizers are required by intercrops, especially in the second to third year in order to get profitable yield. High response of upland rice and corn planted interrows of two and three years rubber was demonstrated in Table 4. (Laosuwan et al, 1985). Other inputs necessary for intercropping are fungicides, insecticides and herbicides. In an on-farm testing in two years rubber, fungicide application increased yield of peanut 78.40% (Laosuwan and Sripana, 1985, unpublished).

G. EFFECT OF INTERCROPS ON RUBBER

One of the key factors in intercropping of rubber is the positive or negative effect that intercrops might have on rubber. Some intercrops may be competitive with rubber for light, whereas others for nutrients. These intercrops, therefore, may retard the growth and yield of rubber. On the other hand, some intercrops may stimulate the growth of rubber. A study made by investigators at the Rubber Research Center showed that practice of intercropping did no harm to the growth in girth of the rubber trees (Wongsukon et al., 1975). Laosuwan et al, (1984) tested different intercropping treatments in one to three years rubber and found no differential growth. The rate of latex flow was also not different (Table 5). However, in one of the on-farm experiments at NaSa-an, Hat Yai, it was found that rubber intercropped with pigeonpea gave higher girth increment than mungbean-peanut (Laosuwan and Sripana, 1985).

H. CONCLUSION

Intercropping of rubber with annual a biennial crops is proved to be practical and profitable as long as adequate inputs such as managements, labour, fertilizers and other chemicals are applied. Many experiments showed that intercrops did not retard the growth and yield of the rubber trees. On the other hand, some intercrops were found to stimute their growth. Therefore, the growing of intercrops for both subsistance and for cash income could be recommended to small rubber farmers.

Crops suitable as intercrops should be easy to grow, known to farmer, suit to the need of farmer, and have adequate outlets to local or regional market. In addition, they must have price incentive or any assurance that the farmer will have reasonable net cash income from his products.

It was noticed in most of the experiments that low yield of many intercrops such as corn, mungbean, soybean and peanut was observed in the firse year. This was due to poor land-preparation in the first year and soil variability which adversely affect the growth of intercrops. However, this situation becomes greatly improved in subsequent years and uniform growth and higher yield of intercrops should be expected. Therefore, the time for rubber intercropping should be longer than that usually practiced by farmers. Profitable yield of intercrops can be obtained in three to four years rubber even though budded stumps were used.

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Table 1 Rates of light transmission through canopy of rubber trees (Laosuwan et al., 1985)

Rubber age	Sample no.	Light transmission (%)(1)
0 week	1	100
122 weeks	1	91
	2	87
	3	89
	mean	89
163 weeks	1	55
	2	61
	3	56
	mean	50
208 weeks	1	7

(1) per cent of full daylight

Table 2 Ranges of net cash income from different intercrops.[1] (Laosuwan et al., 1984)

Crop	Without fertilizer	With fertilizer[2]
	(B/ha)	
Mungbean	9-1,146	491-2,076
Soybean	6,053-8,251	3,550
Peanut	3,636-5,282	2,492-3,846
Upland rice	194-882	2,855-3,628
Corn	-2,168-2,149	2,527-3,609[3]
Banana		28,288
Pineapple		14,728

[1] Net cash incomes for legumes and cereals were estimated by Using 1980-81 production cost, for banana and pineapple the real production cost was used.

[2] Ages of rubber trees intercropped by :

(1) mungbean : 9 and 12 months
(2) soybean : 0 and 12 months
(3) peanut : 0,12 and 24 months
(4) Upland rice : 0,12,24 and 36 months
(5) Corn : 0,12,24 and 36 months

[3] Net cash income from 36 months rubber not include.

Table 3 Planting times of different intercrops interrow of young rubber plants.[1]

Crop	Early rainy season	Late rainy season
1. Upland rice	-	Songkhla : Sep-Feb
		Trang : Aug-Jan
		Yala : Oct-Mar
2. Corn	-	Songkhla : Sep,Oct-Jan
3. Soybean	Songkhla : Jun-Sept	Songkhla : Sept/Oct-Jan
4. Peanut	Trang : Apr-Jul	Songkhla : Sept/Oct-Jan
5. Mungbean	Songkhla : Apr/Jun-jun/Sep	
	Trang : Apr/May-Jun/Aug	
	Yala : May-Aug	
6. Sweet corn	for all locations same	
	as mungbean	
7. Water nelon	Songkhla : Dec-Feb	
	Trang : Nov/Dec-Feb	
	Yala : Jan-Mar	

[1] Adapted from Templeton, 1975 and Laosuwan et al.(1983).

Table 4 Means yield of corn and upland rice applied with different rates of fertilizer.[1]

Crop	Age of rubber	Rate of fertilizer[2]	Seed yield
	(month)	(kg/ha)	(kg/ha)
Corn	25-28	0	88
		312.5	2,823
		625	2,739
	36-39	0	1,876
		312.5	3,128
		625	3,475
Upland rice	25-29	0	1,268
		125	1,952
		250	2,435
	36-40	0	562
		125	2,257
		250	2,192
		375	1,288

[1] Unpublished data from experiment conducted at Thepha Research and Training Station, Prince of Songkhla University, during 1983-1985.

[2] Fertilizers : 15-15-15 and 16-20-0 were used for corn and upland rice, respectively.

Table 5 Girth increments and length of latex flow in three-year rubber (Laosuwan et al., 1984)

Treatment	Girth Increment[1]		Length of latex flow	
	12/4/82 to 1/5/84	7/4/83 to 9/3/84	1/2 min	30 min
	-------(cm)------		-------(cm)-------	
Natural cover	20.09	11.93	10.50	36.00
Legume cover	19.32	11.97	10.33	32.83
Mung-Soybean	20.38	12.12	15.33	33.33
Corn	20.18	12.31	9.50	34.00
Mung-Peanut	19.90	12.51	11.67	34.00
Upland rice	20.17	11.32	9.67	35.25
Banana	18.94	11.15	9.83	32.67
Pineapple	21.65	12.41	11.00	31.85
F-test	ns	ns	ns	ns
C.V., %	5.24	8.60	30.42	19.33

[1] Girth increments between 1982 and 1984 measured at 20 cm height whereas that between 1983 and 1984 measured at 100 cm height.