Forages for Plantation Crops

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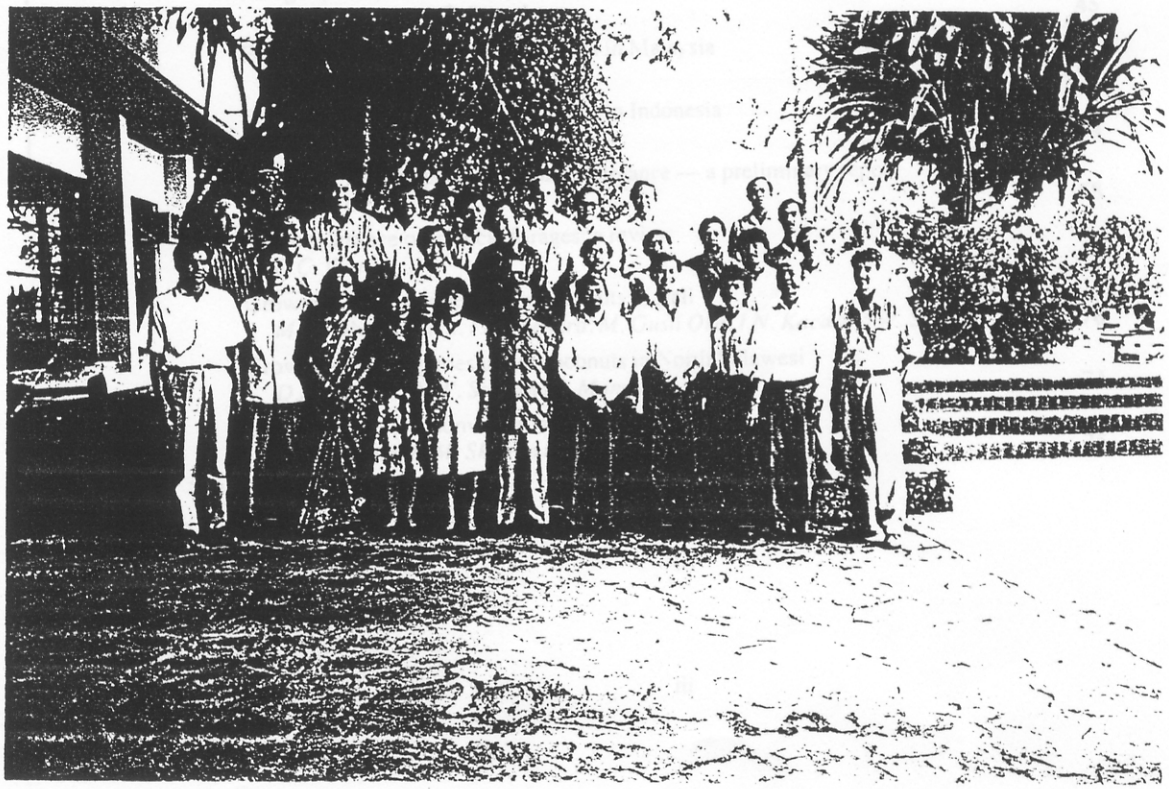

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Integration of Forages for Cattle and Goats into Plantation Systems in Thailand

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Abstract

The integration of forages for livestock has considerable prospects in Thailand. Forage species must be shade-tolerant and must not be too competitive.

The prospects for integration appear to be best for the higher light transmission and lower value plantation crops such as coconuts and fruit trees, where additional income from livestock would be of major benefit to the farmer. In high value plantation crops such as rubber trees and oil palms, livestock will always be of secondary importance.

Major constraints are the lack of pasture seed and the low and slow return from investment in livestock.

PLANTATION crops occupy about 11% of the total agricultural land in Thailand. The southern region has the highest proportion of land used for plantation crops, and accounts for 74% of the total plantation area in Thailand (Table 1). Rubber is the most important plantation crop in terms of planted area (Table 1) and contribution to the economy of Thailand (Table 3). Although not all of these plantation areas are suited for forage-livestock enterprises, they represent a significant potential for livestock production.

The majority of rubber holdings are small (< 2 ha) while the majority of oil palm producers have large estates (> 500 ha) (Table 2). Most of the smallholder oil palm plantations are organised by government cooperative programs. Coconut plantations are also small in farm size. A large proportion of Thai farmers also own some paddy rice and upland areas.

Livestock in Plantation Systems

No statistics are available which detail the number of animals under the various plantation crops. However, large numbers of cattle and goats are raised in southern Thailand (Table 1) and many of these are raised in plantations, especially coconuts.

In northern Thailand cattle and buffalo are also grazed under tea, coffee, fruit trees and forests (Falvey 1977). Animals are kept primarily for weed control and animal manure rather than for meat or milk production. Therefore livestock production is always of secondary importance. Inputs are minimal and animals graze crop residues and unimproved natural pasture under plantations. A list of the species commonly found in the plantations is given in Table 4.

Table 1. Plantation crops and cattle and goat numbers in Thailand.

	North	North-east	Central	East	South	Total
Plantation crops ('000 ha)						
Rubber	–	n.a.	–	162	1525	1687
Oil palms	–	–	–	–	105	105
Coconuts	–	–	–	–	188	188
Fruit trees	116	12	274	114	152	668
Cattle and goat number ('000)						
Cattle	1171	1786	1130	48	826	4969
Goats	–	–	n.a.	–	81	81

n.a.— data not available
Source: Anon. 1988a, b.

Table 2. Average farm size (ha/household) and percentage of each size category in southern Thailand.

	Coconut[a]		Oil palm[b]		Rubber[c]	
	Size	(%)	Size	(%)	Size	(%)
Small	2–5	80	3–5	15	2	60
Medium	–	–	30–50	28	2–4	25
Large	–	–	500	57	4	15

Sources: [a]Terakul and Ratanapruk 1988; [b]Pongmanawa 1989; [c]Panomthareerak 1987.

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Naturalised legume cover crops such as *Pueraria phaseoloides*, *Calopogonium mucunoides* and *Centrosema pubescens* are sometimes present in pastures. The carrying capacity on native pasture varies with shading and fertility but is usually in the range of 1-2 ha per animal.

Table 3. Production statistics and export value of major plantation crops in 1988.

Crop	Production ('000 tons)	Farm value (million Baht)	Export value (million Baht)
Coconut	1 311	2 715	–
Oil palm	728	1 406	5
Rubber	851	15 462	23 328
Kapok	49	253	212

Source: Anon. 1988a.

Table 4. Naturally occurring forage plants in the plantations of Thailand (Manidool 1985).

Species	Environmental conditions
Arundinaria pusilla	Slightly shaded, light soils, moderate rainfall. Northeast.
Axonopus affinis	Moderately shaded, light to heavy soils, high rainfall.
Chrysopogon orientalis	Slightly shaded, sandy coastal soils, high rainfall. Southern area.
Coelorachis glandulosa	Slightly shaded, light soils, moderate rainfall. Northeast.
Cyrtococcum sp.	Moderately shaded, light soils, high rainfall.
Desmodium ovalifolium	Densely shaded, light soils, high rainfall. Southern area.
Heteropogon contortus	Slightly shaded, moderate rainfall, light to heavy soils. North and west.
Imperata cylindrica	Slightly shaded, upland soils all over the country.
Microstegium ciliatum	Densely shaded, very high rainfall, light soils. Southern area.
Ottochloa nodosa	Densely shaded, light soils, high rainfall. Southern areas.
Oplismenus burmanni	Densely shaded, light soils, high rainfall. Southern and eastern areas.
Paspalum conjugatum	Slightly shaded, moderately high rainfall, light soils, all over the country.
Rottboellia exaltata	Slightly shaded, light soils, moderately high rainfall.
Setaria verticillata	Slightly shaded, light to moderately heavy soils, high rainfall.

The use of improved pasture species and good management can raise animal production drastically. For example, one dairy farmer at Pakchong grew one ha of guinea grass (*Panicum maximum*) between rows of mango trees. He applied 125 kg/ha of urea and cut the grass every 30–40 days. This produced enough feed for eight dairy cows which produced an average of 10–12 L milk/day. The returns from milk alone were approximately 500 Baht/day.

The success of livestock–plantation systems often depends on the prospects for marketing. The major reason for the success of dairying is the government Dairy Promotion Scheme. This is in contrast to the often low farm-gate price for beef which, in turn, results in little interest by farmers in pasture improvement.

Potential and Prospects for Forage Integration

The success of forage–livestock integration depends on government policy, socio-economic factors, type of plantation, pasture species, ease of utilisation, type of livestock and marketing system.

Government policy

The government has indicated strong support for the development of dairy and beef industries in the country. Currently, only 13% of the total raw milk demand is produced in the country. The government plans to increase the number of dairy cows to 200 000. The production of beef and draft animals is also promoted.

Economic considerations

Plantation crops are likely to influence the prospects for livestock integration as the income from the different types of plantation crop varies greatly (Table 5). The return from coconut and kapok plantations is low and coconut and kapok farmers need to increase their income through intercropping with field crops or pastures. Farmers growing other higher value plantation crops such as fruit trees, rubber and oil palms may not be willing to integrate livestock since the main incentive is clearly to take care of the plantation crop.

Table 5. Yield and income from various plantation crops.

Plantation	Income/ha (Baht)	Yield (kg/ha)
Rubber	11 065	609
Oil palm	20 325	10 531
Kapok	7 217	1 144
Coconut	8 184	3 950
Mango	34 688	3 438
Cashew nut	32 635	1 625
Tamarind	112 500	1 250
Longan	67 250	3 363

Source: Anon. 1988, Rawanghet 1989.

Plantation type

Another factor affecting prospects for integration of forages is the type of plantation crop as this determines light transmission and competition. Coconut is probably the most suitable plantation crop. More than 50% of coconut plantations in Thailand are mature (>25 years old) and light transmission is high. Intercropping with forage crops can help in recovering the cost of replanting or of new plantings by providing income from otherwise unprofitable land. The total productivity of the area of mature coconut is increased and security is provided against the risk of low copra prices.

In rubber plantations, the highest potential for integration of forage crops occurs during the first three years. After this period, the growth of pasture species is increasingly restricted by decreasing light intensity. This also applies to oil palm. However, rubber and oil palm are high-value crops and the owner may not accept integration for fear of a possible reduction in yield of the main crop and the extra labour requirements.

Integration potential also exists in mango, kapok, tamarind and cashew plantations. The wide spacing of these plantations (8 x 8 m) allows light penetration to the ground.

Pasture species

Most pasture research on improved pasture under plantations has been conducted with coconuts. Boonklinkajorn (1978) reported that guinea and signal grass (*Brachiaria decumbens*) performed well on a poor soil under a coconut plantation when utilised in a cut-and-carry system. On a more fertile soil, para grass (*Brachiaria mutica*) grew well and competed successfully with weeds. The average yields of these three species were 58, 51 and 41 t/ha of fresh material for guinea, signal and para grass respectively. In coastal areas with poor soils and a lower light transmission, cori grass (*Brachiaria miliiformis*) showed good adaptation and was responsive to fertilizer. In older coconut plantations, ruzi grass (*Brachiaria ruziziensis*) grew well on both medium and fertile soils. Recently, the Department of Livestock Development reported a species comparison TRIAL under coconut and rubber plantations at Narathivat. Of the nine grass species, *B. miliiformis* and *B. humidicola* gave the highest yield under 31% of full sunlight (Egara et al. 1989).

Little research has been carried out under other plantations. Jewtrakul (1989) reported that a number of grass species can be intercropped with young rubber (Table 6). Yield of these species decreased gradually with increasing growth of the rubber. Jewtrakul also stressed that star grass (*Cynodon plectostachyus*) should not be intercropped with rubber since it has aggressive growth characteristics.

Table 6. Yield of pasture species under 2-5-year-old rubber.

Species	Dry matter yield (kg/ha) Years after rubber planting			
	2	3	4	5
Para	1 260	4 910	130	0
Ruzi	710	8 380	3 710	1 010
Signal	2 200	19 820	6 540	2 340
Guinea	1 710	11 494	4 960	1 240
Hamil	1 880	13 690	4 110	640
Green panic	310	6 850	1 640	440
Napier	4 580	13 330	2 660	520
Setaria	2 080	8 840	2 330	580
Guatamala	1 900	9 260	4 030	1 310

Source: Jewtrakul 1989.

Buranatham et al. (1989) reported that guinea grass mixed with *Centrosema pubescens* cannot be recommended for intercropping since this mixture restricted the growth of rubber significantly.

Data on forage production under fruit trees and forests are scarce. Manidool (1986) reported that under 10-year-old tamarind trees, ruzi, hamil and siratro (*Macroptilium atropurpureum*) produced good yields. In a mango orchard (8 × 8 m spacing) at Pakchong, 230 km northeast of Bangkok, guinea and ruzi grew well between the rows of mangoes when cut close to ground level for 2–3 years. Verano stylo (*Stylosanthes hamata*), guinea, hamil and ruzi grass grew well in a two-year-old *Eucalyptus* plantation (Manidool 1985).

While the technology for pasture species is ready for plantation crops such as coconut and rubber, the long-term effect of pasture species on plantation crops has not yet been determined.

Utilisation

The cut-and-carry system is suitable for all plantation crops particularly when the plantation trees are young. Jewtrakul (1989) suggested that grazing rubber is not practical because of the high risk of crop damage and interference with latex collection cups.

Grazing of cattle under coconut is common in Thailand. Boonklinkajorn et al. (1982) reported that 1.5 head/ha was an optimal stocking rate for signal–centro swards under mature coconuts, and was twice the stocking rate achieved on native pastures.

Type of livestock

The integration of dairy cattle with oil palm or rubber plantations is not practical since forage produces a high yield for the first few years only. Other plantation crops such as coconut, mango, cashew, and tamarind are more suitable for beef and dairy cattle.

Marketing

One of the most serious problems in beef production is marketing as there is no premium for quality. The marketing system favours the production of cheap meat from draught animals. High-grade beef fetches a good price only in the city. On the other hand, the relatively high, guaranteed price of milk represents a real attraction and provides considerable confidence to the farmers.

Constraints and Recommendations

One of the most important constraints is the lack of an adequate seed supply of promising grass and legume species. It is estimated that at least 1257 t of pasture seed are needed to meet the demand for sowing in 1990, and local supply can only satisfy 40% of the demand (Manidool and Leeratanachai 1990).

A further factor is the attitude of farmers. The plantation crop is the main source of income and the raising of animals is secondary to the needs of the plantation. The long period before a farmer sees a return on his investment in animals is also a disincentive. On the other hand, the return of investment in cash crops may only take 2–3 months. Furthermore, the required investment in animals is high when compared to crops. As labour inputs are already high for plantation crops the husbandry of animals may create a labour shortage.

Conclusions

The integration of pasture for livestock under plantations has considerable prospects. However, the possibility of conflicting management requirements and especially the extra labour required needs to be carefully considered.

The desired forage species must be highly shade-tolerant and should not be excessively competitive with the main crop. Cut-and-carry appears to be an appropriate utilisation system for rubber, while grazing is preferable for coconuts. Little experience with pasture and livestock integration under oil palm is available. More detailed investigations of species adaptation and appropriate management systems are urgently required if successful farmers' adoption is to be expected.

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