Coconut development in Thailand and its stimulation by cocoa (1)

J. DOOTSON (2), MALIWAN RATTANAPRUK (3) and WIT SUWANNAWUTH (4)

Summary. — Coconut plantations in Thailand are low yielding, often failing to meet national requirements for coconut products. The typical Thai Tall coconut has few, large fruits, shows extreme yield heterogeneity and is not precocious. Lack of soil selection and climatic stress limit yields and cause annual and seasonal fluctuations. It is hoped to increase yields by replanting using precocious, homogeneous and high-yielding hybrid varieties, and through rehabilitation. Cocoa is a recent introduction to Thailand and it is thought that the use of cocoa as a perennial intercrop can be used to stimulate coconut replanting and, in particular, rehabilitation projects, allowing for crop diversity and increased land unit returns. This is illustrated both in theory and practice. The importance of rigorous varietal selection is indicated. Two strategies for coconut development are required. That for replanting using modern, high input, agricultural techniques, while appropriate, low input technology is better suited to rehabilitation, in anticipation of lower returns.

INTRODUCTION

Of the estimated 417 600 hectares planted with coconuts in Thailand, the average farm size of 2.4 hectares indicates the predominance of smallholdings. Yields are low, being estimated at 22.1 nuts per palm per year [Office of Agricultural Economics, 1982] although this figure ignores on-farm consumption. The traditional planting of coconuts is in a small house plot, often admixed with fruit trees. A large proportion of coconuts are thus grown for domestic consumption and few farm families are dependent on the crop. Little soil selection is carried out and inputs are low. Despite the large nut, weighing 1.45 kg [Harries, Thirakul & Rattanapruk, 1982], national coconut production is often insufficient to meet internal demand, and imports of coconut products are necessary. In 1982, the Ministry of Commerce estimated that US $ 6 923 096 of coconut products were imported, although imports were greatly curtailed in subsequent years.

The function of the Coconut Development Project is to increase both national coconut production and coconut farmer incomes. This is being done by varietal improvement and promotion of correct cultural practices. Intercropping is considered to be an essential element in the successful implementation of the project. Cocoa is one of the most promising intercrops of coconut, although it is speculative whether symbiotic interactions cause the superior economic performance of the combination [Etherington & Karunanayake, 1981] or that cocoa does not adversely affect coconut yields [Shepherd, Gilbert & Cowling, 1977]. Coconut and cocoa in combination have been shown to be preferable to oil palm or rubber [Lim & Chai, 1978]. The combined coconut/cocoa system is receiving particular attention as a tool for stimulating increased coconut production in Thailand.

(1) This paper was edited in english in *Planter*, Kuala Lumpur, 1986, 62, p. 519-530.

(2) Team leader, ODA Coconut Development Project, Chumphon Horticultural Research Centre, P.O. Box 3, Amphoe Sawi, Chumphon 86130 (Thailand).

(3) Coconut Specialist, Horticultural Research Institute, Department of Agriculture, Bangkhen, Bangkok 10900 (Thailand).

(4) Cocoa Specialist, Horticultural Research Institute, Department of Agriculture, Bangkhen, Bangkok 10900 (Thailand).

COCONUTS IN THAILAND

Varieties.

The coconut genetic resources of Thailand have been reported [Harries *et al.*, 1982]. In summary, the typical Thai Tall (THT), locally known as Maphrao Yai, carries relatively few, large fruit, typically rounded in shape, and is not precocious. Exceptionally large-fruited (ka-loke) and, especially, medium-fruited (Klang) varieties are extremes of the Maphrao Yai population. In addition, Pak Chok, with smaller, elongated fruit, Thalai Roi, with up to one hundred small nuts on a single bunch, and five indigenous dwarf varieties are recognised. Maphrao Yai is the predominant form in cultivation, but is heterogeneous, with a high proportion of low yielding palms (Table I). This, combined with lack of precocity compared with hybrid varieties (Table II), makes it unsuited to rapidly increasing coconut production. Of the hybrid varieties being tested for local suitability, Malayan Yellow Dwarf (MYD) × West African Tall (WAT), and THT × WAT, which combines a large, traditionally acceptable fruit with both precocity and high yield, have the greatest potential.

Environment.

80 per cent of coconuts in Thailand are grown in the central and southern Provinces. There is minimal soil selection and no « typical » environment. Chumphon Horticultural Research Centre (CHRC), responsible for coconut research in Thailand, is situated in Chumphon, the northern most Province of peninsular Thailand (Fig. 1). It can be used to give an « average » meteorological profile for coconut growing areas in Thailand (Fig. 2). Moderately severe dry weather may occur in some years. Conditions associated with the dry season cause pronounced seasonality of yield. Minimum temperatures and percentage of rainy days are positively correlated with yield 12 months later, while sunshine hours show a negative correlation [Dootson, 1983]. Absolute rainfall did not affect seasonal yield trends, but the lowest two consecutive months rainfall was strongly correlated with total yields in the following year [Dootson, 1983 ;

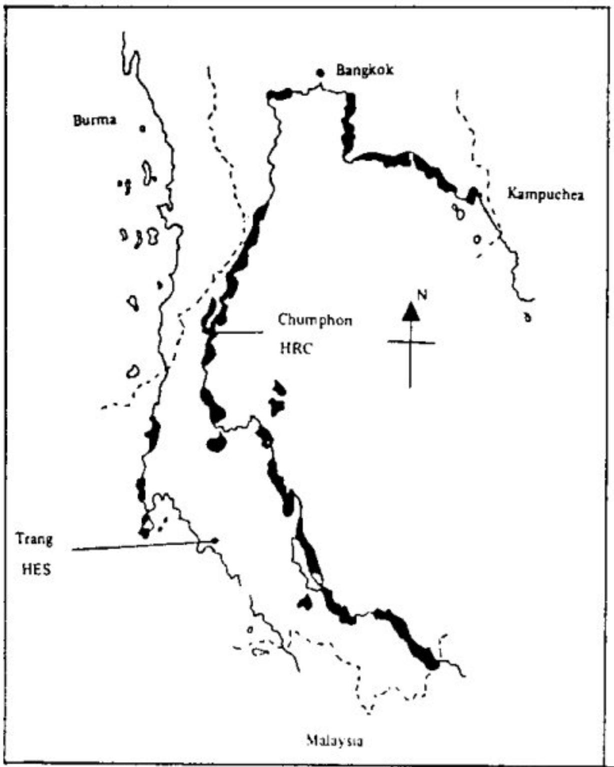

FIG. 1. — Southern Thailand showing main coconut growing areas *(Thaïlande du sud, principales régions de culture du cocotier).*

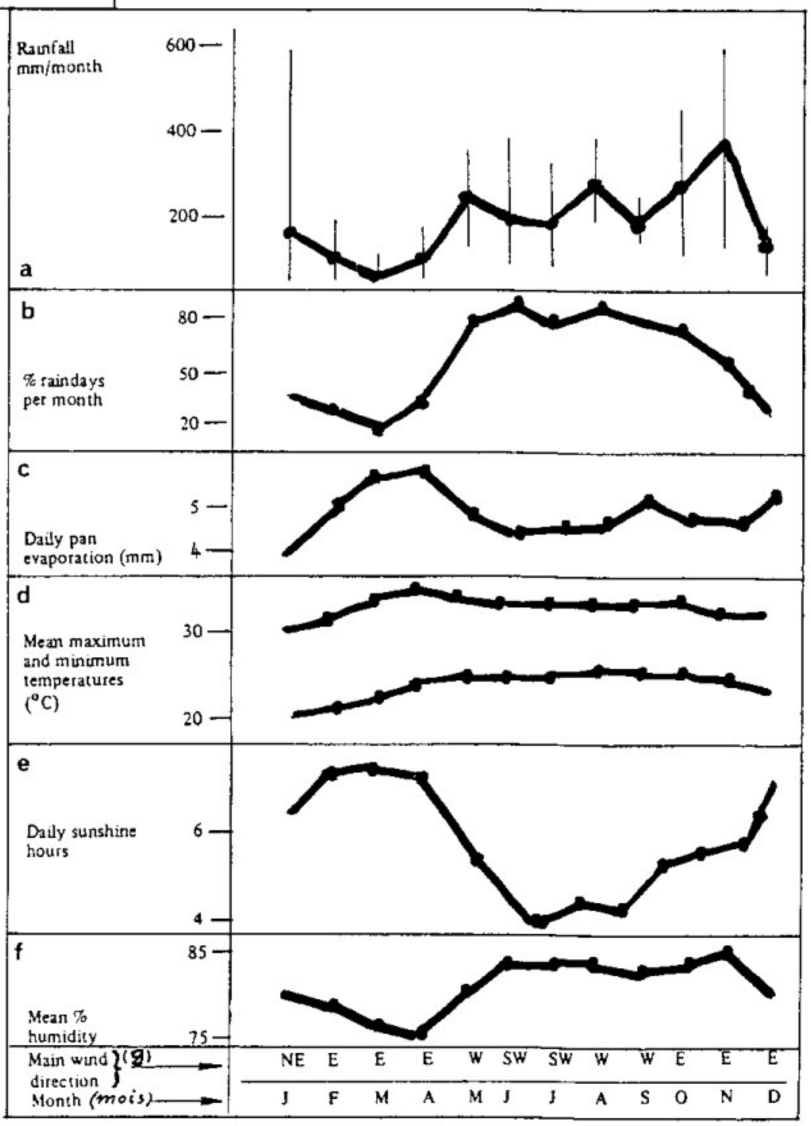

FIG. 2. — Meteorological profile for CHRC for 8 years *(Profil météorologique sur 8 ans pour le CHRC).*

a) Pluviométrie (mm/mois) ;

b) % jours de pluie/mois ;

c) évaporation journalière (mm) (bac d'évaporation) ;

d) températures moyennes (minima et maxima) ;

e) insolation journalière (heures) ;

f) % hygrométrie moyenne ;

g) direction principale du vent.

TABLE I. — **Percentage of palms from two populations of unfertilised 20-year old Thai Tall coconuts in each of five nut count ranges**

(P. 100 d'arbres de 2 populations de cocotiers Grands thaïlandais, âgés de 20 ans sans engrais pour 5 catégories de noix)

	Nuts/palm *(Noix/arbre)* (≥ 10 cm)					Mean/palm *(Moyenne/arbre)*
	0-19	20-39	40-59	60-79	80-99	
Population 1	53.9	37.5	6.3	1.6	0.8	18.83
Population 2	22.7	37.5	28.9	9.4	1.6	35.27
Mean *(Moyenne)*	38.4	37.5	17.6	5.5	1.2	27.05

TABLE II. — **Number of 7-year old palms from three varieties of fertilised coconuts in each of four yield ranges**

(Nombre d'arbres âgés de 7 ans de 3 variétés de cocotiers avec engrais dans chacune des 4 catégories de production)

Variety *(Variété)*	Yield (nuts/palm) *(Production - noix/arbre)*				Mean *(Moyenne)*	% palms bearing *(% arbres en production)*	kg copra nut *(kg coprah/noix)*	kg copra/ha *(kg coprah/ha)*
	0	1-40	41-80	81 +				
THT *(GTH)*	44	35	1	0	7	45	0.344	385
THT × WAT *(GTH × GOA)*	17	36	26	1	28	79	0.285	1,276
MYD × WAT *(NJM × GOA)*	1	24	35	20	57	99	0.221	2,014

TABLE III. — **Annual yields, in kg copra/ha, of MYD × WAT coconuts under different fertiliser regimes**

(Rendements annuels en kg de coprah/ha des hybrides NJM × GOA selon des barèmes différents de fumure)

Nutrient level *(Doses d'engrais)* kg/ha/year *(/an)*	kg copra *(coprah)*/ha				Total cost of fertiliser [d] *(Coût total des fumures)*	Return at *(Revenus à)* 7 Baht/kg
	Year *(Année)* 4	Year *(Année)* 5	Year *(Année)* 6	Year *(Année)* 7		
Nil *(Nul)*	0	41	35	142	0	1,526
Nitrogen[a] *(Azote)*						
0	0	129y	417	2,047	20,890	18,151
32	7	826x	317	2,248	22,648	23,786
64	0	747xy	239	1,937	24,409	20,461
96	43	832x	294	1,812	26,167	20,867
Potassium[b]						
0	0	13y	56	454y	12 084	3 661
115	14	691x	236	1,898x	18,248	19,873
230	0	747x	239	1,937x	24,409	20,461
345	47	1,012x	222	1,989x	30,572	22,890
Magnesium[c]						
0	0	716	201	1,565	19,151	17,374
22	21	753	295	1,762	21,782	19,817
43	0	747	239	1,937	24,409	20,461
65	63	1 169	423	2,275	27,040	27,510
p	ns	**	*	***		

a — Nitrogen as nutrient N supplied as ammonium sulphate, always with 45 kg triple superphosphate, 230 kg muriate of potash and 43 kg kieserite (all to nearest kg) *(Azote, N, apporté sous forme de sulfate d'ammoniaque, avec toujours 45 kg de superphosphate triple (SPT), 230 kg de chlorure de potasse et 43 kg de kiesérite - arrondis au kg).*

b — Potassium as nutrient K_2O supplied as muriate of potash, always with 64 kg ammonium sulphate, 45 kg triple superphosphate and 43 kg kiesreite (all to nearest kg) *(Potassium, K_2O, apporté sous forme de chlorure de potasse, avec toujours 64 kg de sulfate d'ammoniaque, 45 kg de SPT et 43 kg de kiesérite - arrondis au kg).*

c — Magnesium as nutrient MgO supplied as kieserite, always with 64 kg ammonium sulphate, 45 kg triple superphosphate and 230 kg muriate of potash (all to nearest kg) *(Magnésium, MgO, apporté sous forme de kiesérite, avec toujours 64 kg de sulfate d'ammoniaque, 45 kg de SPT et 230 kg de chlorure de potasse - arrondis au kg).*

d — Total cost of fertiliser since planting. In years 1 to 4, 12.5, 25, 50 and 75 p. 100 of the final rates are applied *(Coût total des fumures depuis la plantation. De l'année 1 à l'année 4, respectivement 12,5 p. 100, 25 p. 100, 50 p. 100 et 75 p. 100 des doses définitives sont apportées).*

Lower case letters x and y indicate where treatments within a comparison are significantly different at the 5 p. 100 level using Duncan's New Multiple Range Test *(Les lettres x et y en minuscules indiquent les traitements qui, dans une comparaison, sont significativement différents à 5 p. 100 d'après le nouveau test de Duncan de gammes multiples).*

p — This indicates the probability of a real effect-occurring as indicated by analysis of variance (ns = not significant. *, ** and *** represent 5, 1 and 0.1 p. 100 probabilities). This notation is also used in Tables IV and VII. *(p indique la probabilité de l'existence d'un effet réel mis en évidence par l'analyse de la variance (ns = non significatif, *, ** et *** représentent respectivement une probabilité de 5, 1 et 0,1 p. 100. Ces symboles sont également utilisés dans les tableaux IV et VII).*