Profitability of Fertilizing Young Coconut: Results of Three Long-Term Field Experiments

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ABSTRACT

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Two long-term field experiments on newly cleared lands carried out in the intermediate rainfall zone of Sri Lanka showed that profits of the order of Rs 3560 to 7120/ha/yr could be obtained during the initial bearing period from systematic NPK fertilizer application to young palms. Total income from the fertilized palms during this period is around Rs 6230 to 13350/ha/yr. The corresponding figures obtained from a third experiment carried out on underplanted young palms in the same rainfall zone are Rs 315 to 3950/ha/yr and Rs 1580 to 7900/ha/yr respectively.

Break-even point of net present value of investment in the early years and the returns fall on the 6th and 9th year in the new plantations and 15th year in the underplanted land.

In the underplanted experiment, palms which had not received fertilizers for the initial 17 years, had not recovered, even after continued fertilization subsequently for 10 years.

INTRODUCTION

Systematic manuring with balanced fertilizer mixtures from the time of field planting of seedlings is an essential practice in the cultivation of coconut. Experiments carried out in Sri Lanka and other countries have shown that fertilizer application markedly increase vegetative growth and nut yield and promote early bearing. However, very little quantitative information on the long term profitability of fertilizer application is available. This paper reports the yearly profits one could expect from fertilizer application for over 15 years from the time of field planting. The results are based on three long term field experiments—two on sandy soils and one on lateritic gravels, carried out in the intermediate rainfall zone of Sri Lanka.

MATERIALS AND METHODS

Experiment 1—Pothukulama Research Station, Pallama (Puttalam District)

This experiment was commenced in 1961 with the planting of *typica* x *typica* progeny derived through hand pollination on recently cleared secondary jungle. The soil in the area is classified as a Regosol (Entisol) and the texture is loamy sand at the surface grading into sandy loam at depths. The mean annual rainfall of the area is 1370 mm. The experimental layout consisted of a confounded 4 x 4 x 4 factorial arrangements of N, P and K in 64 plots in four blocks, each plot with 18 experimental palms. Planting density was 178 palms/ha.

As the highest yield in this experiment was obtained from treatments $N_2P_4K_4$ and $N_3P_4K_4$ (Loganathan and Balakrishnamurti, 1980), the average yield of these treatments is selected to represent the yield of fertilized plots. Average rate of application of the fertilizer mixture was 1.7 kg/palm/yr in the early years and 5.5 kg/palm/yr in later years. The treatment $N_1P_1K_1$ represents the no fertilizer plots.

Experiment 2—Ratmalagara Research Station, Madampe (Puttalam District)

This experiment was commenced in 1948 on a newly cleared secondary jungle with 6 months old seedlings of variety, *typica* derived through open pollination. The soils belong

to the Red Yellow Podzolics (Ultisol) and the texture is loamy sand to sandy loam at the surface overlying sandy loam with lateritic iron stone gravels, the content of which increases with depth. The mean annual rainfall of the area is 1600 mm. The experimental layout was a confounded 3 x 3 x 3 factorial arrangement of N, P and K replicated twice, each replicate having 3 blocks. There were 18 palms per experimental plot and 135 palms/ha

The $N_1P_1K_1$ and $N_3P_3K_3$ plots are selected to represent the no fertilizer and fertilizer treated plots respectively. $N_3P_3K_3$ plots had the highest yield in this experiment (Loganathan and Balakrishnamurti, 1975). Rate of fertilizer application increased from 1.4 to 4.1 kg/palm/yr as the age of palms increased.

*Experiment 3—Letchemy Estate, Nattandiya (Puttalam District)*underplanted

This experiment was commenced in 1940 with 2 year-old seedlings of variety, *typica* derived through open pollination. The soils belong to Regosols (Entisol) and the texture is loamy sand at the surface grading to sandy loam at depths. The mean annual rainfall is 1730 mm. The experimental treatments were cover vs no cover and O, NK and NPK in 5 random-ised blocks of 6 plots each—a plot consisting 18 palms. There were 158 palms/ha. Rate of application of fertilizer mixture increased from 0.7 to 1.8 kg/palm/yr as the age of the palms increased. Commencing December 1955, the zero plots received complete NPK fertilizer. The zero and NPK plots are selected for the analyses.

RESULTS AND DISCUSSION

Results of all three experiments very clearly show that one could obtain very high profits from investments on fertilizers (Tables 1—3). The current (April 1979) prices of fertilizers and nuts are used in the analyses of profits. The fertilized palms had yields 2 to 6 times, those of unfertilized palms. The order of magnitude was higher in the initial years of bearing and narrowed down as the palms get older. Beyond 6th to 11th year, nearly 100% profit was obtained from fertilizer usage.

TABLE 1

PROFITABILITY OF FERTILIZING YOUNG COCONUT AT PALLAMA

		1	2	3	4	5	6	7	8
Year	Age	Control	$N_2P_4K_4$, $N_3P_4K_4$	Income from control	Income from $N_2P_4K_4$, $N_3P_4K_4$	Cost of fertilizer	Cost of application of fertilizer	Nett income from fertili- zed land	Profit from fertilization
		Nuts/ palm	Nuts/ palm	Rs/palm	Rs/palm	Rs/palm	Rs/palm	Rs/palm (4)-(5)-(6)	Rs/palm (7)-(3)
1961	1	0	0	0	0	1.71	0.50	—2.21	—2.21
1962	2	0	0	0	0	1.71	0.50	—2.21	—2.21
1963	3	0	0	0	0	1.71	0.50	—2.21	—2.21
1964	4	0	0	0	0	1.71	0.50	—2.21	—2.21
1965	5	0	0	0	0	1.71	0.50	—2.21	—2.21
1966	6	4	26	3.40	22.10	1.71	0.50	19.89	16.49
1967	7	6	38	5.10	32.30	5.49	0.50	26.31	21.21
1968	8	13	48	11.05	40.80	5.49	0.50	34.81	23.76
1969	9	27	58	22.95	49.30	5.49	0.50	43.31	20.36
1970	10	17	36	14.45	30.60	5.49	0.50	24.61	10.16
1971	11	29	69	24.65	58.65	5.49	0.50	52.66	28.01
1972	12	31	71	26.35	60.35	5.49	0.50	54.36	28.01
1973	13	20	72	17.00	61.20	5.49	0.50	55.21	38.21
1974	14	34	76	28.90	64.60	5.49	0.50	58.61	29.71
1975	15	43	91	36.55	77.35	5.49	0.50	71.36	34.81

Price of sulphate of ammonia (20.6%N)	= Rs 1179/metric ton
Price of saphos phosphate (27.5% P_2O_5)	= Rs 783/metric ton
Price of muriate of potash (60% K_2O)	= Rs 1132/metric ton
Price of nut	= 85 cts/nut.

At Pallama (Experiment 1) the present value of the net returns in the 6th year outweighs the present value of the investment on fertilizers in the first 6 years *(Table 1). Thereafter, the income from investments on fertilizers is in the region of Rs 20 to 40/palm/yr or Rs 3560 to 7120/ha/yr. The total income from the fertilized land is about Rs 35 to 75/palm/yr or Rs 6230 to 13350/ha/yr.

* The discount rate was 14%

The income from investments on fertilizers obtained in the experiment at Madampe (Experiment 2) is nearly the same as at Pallama except that the break-even point of net present value of investment in the early years and the returns fall on the 9th year.

TABLE 2

PROFITABILITY OF FERTILIZING YOUNG COCONUT AT MADAMPE

		1	2	3	4	5	6	7	8
		Control	$N_3P_3K_3$	Income from control	Income from $N_3P_3K_3$	Cost of fertilizer	Cost of application of fertilizer	Nett income from fertilized land Rs/palm	Profit from fertilization Rs/palm
Year	Age	Nuts/palm	Nuts/palm	Rs/palm	Rs/palm	Rs/palm	Rs/palm	(4)-(5)-(6)	(7)-(3)
1949	1	0	0	0	0	1.41	0.50	—1.91	—1.91
1950	2	0	0	0	0	1.41	0.50	—1.91	—1.91
1951	3	0	0	0	0	1.41	0.50	—1.91	—1.91
1952	4	0	0	0	0	1.41	0.50	—1.91	—1.91
1953	5	0	0	0	0	2.11	0.50	—2.61	—2.61
1954	6	0	0	0	0	2.11	0.50	—2.61	—2.61
1955	7	0	2	0	1.70	2.82	0.50	—1.62	—1.62
1956	8	2	13	1.70	11.05	2.82	0.50	7.73	6.03
1957	9	13	35	11·05	29.75	4.23	0.50	25.02	13.97
1958	10	22	41	18.70	34.85	4.23	0.50	30.12	11.42
1959	11	29	57	24.65	48.45	4.23	0.50	43.72	19.07
1960	12	31	64	26.35	54.40	4.23	0.50	49.67	23.32
1961	13	41	76	34.85	64.60	4.23	0.50	59.87	25.02
1962	14	38	87	32.30	73.95	4.23	0.50	69.22	36.92
1963	15	45	87	38.25	73.95	4.23.	0.50	69.22	30.97
1964	16	38	86	32.30	73.10	4.23	0.50	68.37	36.07
1965	17	46	104	39.10	88.40	4.23	0.50	83.67	44.57

The underplanted palms at Nattandiya (Experiment 3) came into first bearing in the 9th year (Table 3). The break-even point of net present value of investment in the early years and the returns fall on the 15th year. Income from fertilization in the bearing period is about Rs 2 to 25/palm/yr or Rs 315 to 3950/ha/yr. Total income from the fertilized land is in the region of Rs 10 to 50/palm/yr or Rs 1580 to 7900/ha/yr. Lower returns at Nattandiya are due to the young palms competing with the old stand of palms for sunlight, moisture and nutrients in the early years, lower fertility status of the sandy soils and lower rates of fertilizer application compared to those in the other two experiments.

TABLE 3

PROFITABILITY OF FERTILIZING UNDERPLANTED YOUNG COCONUT AT NATTANDIYA

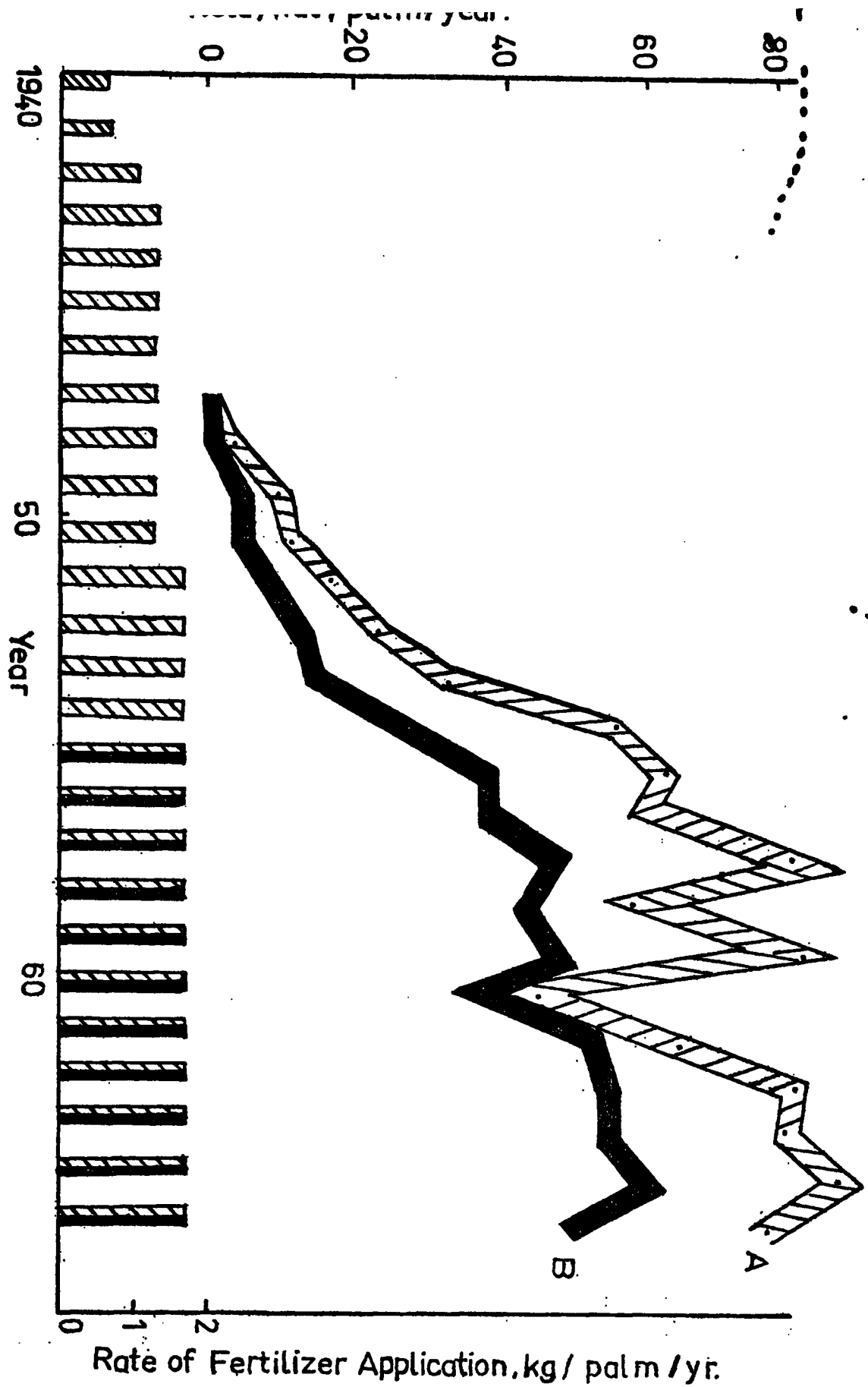|		1	2	3	4	5	6	7	8
		Control	NPK	Income from control	Income from NPK	Cost of fertilizer	Cost of application of fertilizer	Nett income from fertilized land Rs/palm	Profit from fertilization Rs/palm
Year	Age	Nuts/palm	Nuts/palm	Rs/palm	Rs/palm	Rs/palm	Rs/palm	(4)-(5)-(6)	(7)-(3)
1940	2	0	0	0	0	0.71	0.50	—1.21	—1.21
1941	3	0	0	0	0	0.71	0.50	—1.21	—1.21
1942	4	0	0 ·	0	0	1.06	0.50	—1.56	—1.56
1943	5	0	0	0	0	1.41	0.50	—1.91	—1.91
1944	6	0	0	0	0	1.41	0.50	—1.91	—1.91
1945	7	0	0	0	0	1.41	0.50	—1.91	—1.91
1946	8	0	0	0	0	1.41	0.50	—1.91	—1.91
1947	9	1	1	0.85	0.85	1.41	0.50	—1.06	—1.91
1948	10	2	4	1.70	3.40	1.41	0.50	1.49	—0.21
1949	11	5	10	4.25	8.50	1.41	0.50	6.59	2.34
1950	12	5	12	4.25	10.20	1.41	0.50	8.29	4.04
1951	13	9	19	7.65	16.15	1.93	0.50	13.72	6.07
1952	14	13	25	11.05	21.25	1.93	0.50	18.82	7.77
1953	15	15	33	12.75	28 05	1.93	0.50	25.62	12.87
1954	16	27	57	22.95	48.45	1.93	0.50	·46.02	23.07
1955	17	38	65	32.30	55.25	1.93	0.50	52.82	20.52

Fig.1. Effect of NPK fertilizer on coconut yield at Nattandiya. A-Palms fertilized from 1940. B-Palms fertilized from 1955.

Yields of palms in the control and NPK treated plots at Nattandiya are shown in Figure 1. In spite of the palms in control plots receiving, from the 17th year onwards, the same fertilizer treatment as those in the NPK plots, the yield of palms in the control plots continued to be lower upto the 27th year. Fremond and Ouvrier (1971) also observed the same effect on potassium fertilization in Ivory Coast. This shows that palms which have been neglected in the pre-bearing period would not recover even after continued fertilization subsequently. The systematic manuring of young palms must therefore be considered an indispensable item of capital expenditure in coconut cultivation.

ACKNOWLEDGEMENTS

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