References

1. Balachandran C and Arumugham C 1992. Solubility and electrophoretic characteristics of protein in different regions of coconut endosperm.J.Foof Sci. Technol, 29(2): 91-96.
2. Canto et al. 1992. Biochemical markers of variety in cocos nuciferae Turrialba L (11cA) 42 (3) : 375-381.
3. Laemmli U K 1970. Cleavage of structure proteins during the assembly of the head of bacteriophage T4. Nature, 227:680-685.
4. Maniatis. et al. 1982. Molecular cloning laboratory manual. Gold spring Harbour Laboratory Press, New York. 100-110.
5. Nambiar, M C and M S Swaminathan 1961. Chromosome morphology. microsporogenesis and pollen fertility in some varieties of coconut Indian J Genet, 20:200-211.
6. Sadasivan S and Manickam A 1992 Biochemical meth Agricultural sciences. Wiley Fastern Ltd. New Del
7. Shivasanker S 1988 Polyphenol isozymes in coconut geno under water stress. Plant. Physiol. Biochem., 1 87-91.
8. Uta pich and Indo Schubert. 1993, Midiprep method of isol of DNA from plants with high polyphenol con Nucleic. Acid Res., 21:14.
9. William.et al. 1990 DNA polymorphism amplified by arbit primers are useful as genetic markers, Nucl. Acid R 18:6531-6535.

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05-02

INFLUENCE OF LONG TERM FERTILIZATION ON THE PRODUCTIVITY OF COCONUT I SANDY LOAM SOIL OF TAMIL NADU

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1. Introduction

The productivity of coconut although expected to be very high on the sea coast, the yield of coconut could be increased substantially in the inland semi arid ecosystem through judicious nutritional management. The best soil for achieving high productivity of coconut is laterite followed by red and red sandy loam. (Ramanandan et al.,1961.) . However, even in other category of soil types viz. alluvial, sandy and sandy loam, the productivity of coconut can be improved through the application of appropriate agrotechniques. In this direction, the fertilizers constitute a major role followed by irrigation in enhancing the yield.

2. Materials and Methods

A long term field experiment was laid out in sandy loam soil series at Athivetti in Pattukottai in Thanjavur district on VHC-2 (ECT x MYD) hybrid for a period of 12 years. The fertilizer treatment consists of N-0:500:1000, P_2O_5-0:250:500, K_2O-0:1000:2000 g/palm/year laid out on a factorial confounded design to study the response of coconut to the application of graded dose of NPK fertilizers. The yield data have been recorded and soil and tissue samples have been drawn from all the treatments for laboratory analysis. These samples were processed and analysed for pH, organic carbon, available phosphorus and potassium in soils and nitrogen, phosphorus and potassium in tissues by following standard analytical techniques (Jackosn,1967). Yield as well as nutrient data have been statistically processed. The yield data from $N_0P_0K_0$ (Control) , $N_1P_1K_1$ (500:250:1000g/palm/year) and $N_2P_2K_2$ (1000:500:2000g/palm/year) along with corresponding soil data were used to compute M-B model (Mitscherlich-Bray) and response equations to evolve site specific fertilizer recommendation under Thanjavur conditions.

According to M-B model, $\log (A-Y) = \log A - C_1 b - C_2 x$ ....(1) where,

A-maximum possible yield.

Y-yield expressed in percentage of maximum yield at any given dose of fertilizer.

C_1-efficiency of soil nutrient.

C_2-efficiency of fertilizer nutrient.

b-soil test value. x-dose of fertilizer tested.

SSRF=(4-B.U of soil nutrient) B.E of fertilizer nutrient....(2) (Hameed Khan et al. 1986)

Response equation is $A+Bx+Cx^2$.....(3) and

Optimum fertilizer requirement =B/2C....(40

3. Results and Discussion

Table1. Influence of graded dose of NPK in the yield of nuts/palm/year (1996-97)

	N_0	N_1	N_2	Mean	K_0	K_1	K_2
P_0	76.30	125.87	140.60	114.26	105.50	117.00	120.27
P_1	94.50	140.27	168.90	134.56	113.90	131.13	158.63
P_2	89.27	135.33	172.00	132.20	118.57	150.43	127.60
K_0	88.17	115.77	134.03	112.66			
K_1	89.73	140.93	167.90	132.85			
K_2	82.17	144.77	179.57	135.50			
Mean	86.69	133.82	160.50				

S.E./plot= 12, 15, G.M = 127, C.V (%) =9.57, C.D. for N, P, K. = 14.02

The yield of nuts as a function of graded dose of fertilizer application summarised in table 1 indicated that there was a significant reponse to nitrogen fertilizer. The mean yield of 87 nuts was recorded in control as against 160 nuts at N_2 level. However, the application of P and K has shown the response up to first level of fertilizer beyond which the increase was marginal, It is also evident from the data that the two factor interaction was highly significant where N_2K_2 recorded highest yield of 180 nuts palm/year followed by N_2P_2(172). N_2P_1(169), N_2K_1(168) and K_2P_1(159) indicating that $N_2P_1K_2$(1000:250:2000g/palm/year) is the best dose for achieving maximum productivity under semi arid condition of Tamil Nadu.

Table 2. The yield data at $N_0P_0K_0$, $N_1P_1K_1$ along with soil test values at control plot.

Yield of nuts/palm/year				Soil test value at M0 treatment (ppm)		
Theoretical yield	Realised yield					
	M_0	M_1	M_2	N	P	K
177.8	76.5	153.2	171.6	74.31	13.588	77.5

M_0-Control, M_1-500:250:1000 g and M_2-1000:500:2000 g N, P_2O and K_2O respectively.

The yield data from $N_0P_0K_0$, $N_1P_1K_1$and $N_2P_2K_2$ along with soil data at zero level fertilization have been used for deducing M-B equation. It is seen from the data (table 2) that the maximum possible yield was worked out to be 177 nuts/plam/year under. Thanjavur condition. The efficiency of soil nutrient indicated that soil phosphorus was most efficient followed by nitrient indicated that soil phosphoruse was most efficient followed by nitrogen and potassium which indirectly indicated more potassium followed by nitrogen needs to be applied in the form of fertilizers to achieve maximum yield . The efficiency of fertilizer nutrient also followed the same trend as that of C_1 where efficiency of phosphorus was high followed by nitrogen and potassium. The site specific recommendation of fertilizer computed from this model indicated that 1573 g of K_2O, 780 g of nitrogen and 390 g of P_2O_5/palm/ year is necessary to achieve 93,75% of maximum yield under Thanjavor condition.(table 3)

The same data has used to compute response curve $Y=A+Bx+Cx^2$. When fertilizer requirement was computed through response equation, the NPK requirement for achieving the maximum productivity was 1900g nitrogen, 910 g P_2O_5 and 1742 g K_2O/palm /year. This dose seems to be unusually very high when compared to the fertilizer requirement computed by using M-B model.

4. Soil Fertility Status

Table 4. Changes in soil pH as a function of graded level of NPK fertilization

Treatment	Soil depth		
	0-25 cm	25-50 cm	50-100 cm
Main effect of nitrogen			
N_0	6.88	7.07	6.97
N_1	7.00	7.08	7.12
N_2	7.07	7.27	7.16
Main effect of phosphorous			
P_0	6.97	7.09	7.09
P_1	7.04	7.16	7.13
P_2	6.94	7.17	7.03
Main effect of pottassium			
K_0	7.04	7.24	7.21
K_1	6.72	7.01	6.98
K_2	7.19	7.17	7.07
S.E/plot	0.324	0.225	0.315
C.D.	NS	NS	NS

Table 3. Efficiency of soil and fertilizer nutrients, B.E, B.U and site specific recommendation of fertilizer to coconut

Nutrients	C1	B.E for soil nutreint	B.U	C2at M1 level	B.E for fertilizer nutrient	C1/C2	S.S.R.F
N	0.00329	91.48	0.81	0.00123	244.715	2.6748	780.08
P	0.01798	16.74	0.81	0.00246	122.357	7.3089	390.11
K	0.00315	95.56	0.81	0.00061	493.44	5.1639	1573.59

The data summarised in table 4 indicated that there was no significant influence of fertilizer application on the changes of soil pH in all the three depths . However, sub soils recorded slighty higer pH value when compared top soils. (Hameed Khan et al., 1978).

Table 5. Changes in organic carbon status (%) as a function of graded level of NPK fertilization

Treatment	Soil depth		
	0-25 cm	25-50 cm	50-100 cm
Main effect of nitrogen			
N_0	0.441	0.261	0.197
N_1	0.283	0.190	0.183
N_2	0.362	0.186	0.155
Main effect of phosphorus			
P_0	0.330	0.209	0.165
P_1	0.402	0.212	0.244
P_2	0.354	0.216	0.126
Main effect of potassium			
K_0	0.368	0.213	0.197
K_1	0.400	0.198	0.185
K_2	0.317	0.227	0.153
S.E./plot	0.062	0.072	0.083
C.D for main treatment (1%)	0.071 (N)	NS	NS
C.D for interaction (5%)	0.1229 (NP, NK)	NS	NS

In the case of oranic carbon, (table 5) the application of graded dose of nitrogen showed significant variation in the organic carbon status in the surface soils. Whereas, in sub soils, none of the treatment influenced organic carbon content. Normally higher dose of nitrogen application reduces the organic carbon content when compared to control in all the three depths of the soil.

Table 6. Changes in available phosphorus status (ppm) as a function of graded level of NPK fertilization.

Treatment	Soil depth		
	0-25 cm	25-50 cm	50-100 cm
Main effect of nitrogen			
N_0	11.40	3.525	2.178
N_1	7.20	0.790	2.477
N_2	12.18	2.595	3.642
Main effect of phosphorous			
P_0	5.87	1.564	2.771
P_1	18.18	3.775	2.550
P_2	6.73	1.571	2.975
Main effect of pottassium			
K_0	10.82	4.867	3.192
K_1	14.39	1.283	3.343
K_2	5.56	0.760	1.761
S.E/plot	12.05	3.916	3.533
C.D.	NS	NS	NS

The available soil phosphorus status (table 6) did not appear to be influenced by the application of NPK fertilization in all the three depths of soil. However, the available phosphorus status was high in the top soil which drastically reduced with increasing depth of the soil. (Hameed Khan et al., 1983) The changes in available potassium content has once again not been significantly influenced by potassium fertilization in all the three depths of soil (table 7) It is apparent from the data that the potassium content was found to increase with increasing depth of soils.

Table 7. Changes in available potassium status (ppm) as a function of graded level of NPK fertilization

Treatment	Soil depth		
	0-25 cm	25-50 cm	50-100 cm
Main effect of nitrogen			
N_0	72.93	105.67	179.56
N_1	86.50	142.89	129.94
N_2	97.83	221.50	220.58
Main effect of phosphorus			
P_0	59.28	108.72	125.61
P_1	110.66	219.28	207.08
P_2	87.33	142.06	197.39
Main effect of potassium			
K_0	78.11	172.17	217.92
K_1	93.50	146.44	137.00
K_2	85.66	151.44	175.17
S.E/plot	47.49	89.43	141.19
C.D. for Main effect	NS	NS	NS
C.D. for interaction (5%)	94.88 (NP)	178.68 (NP)	NS

5. Nutrient Status in the Plant

The data summarised in table 8 indicated the content of nitrogen, phosphorus and potassium in the index leaf of coconut under different fertilizer treatments. The result revealed, that the continous fertilization of NPK for a period of time did not significantly increased the leaf nutrient status of nitrogen, phosphorus and potassium. In general, the nitrogen content in the leaf was at sufficiency level while that of phosphorus and potassium was more than the sufficiency level. In fact the potassium concentration was so high which would imbalance the phosphorus and nitrogen in the plant. Normally, the optimum concentration of phospherous and potassium in the index leaf has been fixed as 0.08 to 0.1%

Table 8. (a) Changes in leaf N status (%) as a function of graded level of NPK fertilization

	N_0	N_1	N_2	Mean	K_0	K_1	K_2
P_0	1.957	1.829	1.925	1.904	1.755	1.997	1.960
P_1	1.941	1.755	1.912	1.869	1.816	1.897	1.896
P_2	1.959	1.960	1.823	1.914	1.840	1.943	1.959
K_0	1.885	1.717	1.808	1.804			
K_1	1.939	1.941	1.955	1.945			
K_2	2.032	1.885	1.897	1.938			
Mean	1.952	1.848	1.887				

S.E/ Plot= 0.143, G.M =1.896, C.V (%) = 7.53

(b) Changes in leaf Physophorus status (%) as a function of graded level of NPK fertilization

	N_0	N_1	N_2	Mean	K_0	K_1	K_2
P_0	0.192	0.178	0.173	0.181	0.194	0.174	0.175
P_1	0.188	0.179	0.172	0.180	0.167	0.193	0.180
P_2	0.207	0.192	0.177	0.192	0.202	0.290	0.183
K_0	0.208	0.189	0.166	0.188			
K_1	0.201	0.176	0.180	0.186			
K_2	0.179	0.184	0.176	0.179			
Mean	0.196	0.183	0.174				

S.E/plot = 0.021, G.M = 0.184, C.V (%) = 11.29

(c) Changes in leaf potassium status (%) as a function of graded level of NPK fertilization

	N_0	N_1	N_2	Mean	K_0	K_1	K_2
P_0	1.600	1.792	1.567	1.653	1.767	1.500	1.692
P_1	1.517	1.758	1.750	1.675	1.792	1.675	1.558
P_2	1.808	2.067	1.792	1.889	1.792	2.150	1.725
K_0	1.558	1.925	1.867	1.783			
K_1	1.667	1.892	1.767	1.775			
K_2	1.700	1.800	1.475	1.658			
Mean	1.642	1.872	1.703				

S.E/plot = 0.163, G.M. = 1.739, C.V. (%) = 9.37, C.D for P = 0.1880

for phosphorus and 0.9 to 1.2% for potassium. The tissue concentration exceeding this limit would normally imbalance nitrogen and other secondary and micronutrients in the plant, which ultimately reflected in the productivity of coconut.

6. Conclusion

Under the Thanjavur conditions of Tamil Nadu, the best treatment was $N_2P_1K_2$ (N-1000, P_2O_5-250, K_2O-2000g/palm/year) to achieve the maximum productivity of nuts of about 180/palm/year. From the leaf nutritional data, it is inferred that the phosphorus and potassium content were more than the sufficiency level, which imbalance the other nutrients in the plant. It is suggested to bring down the content of phosphorus and potassium to the sufficiency level inorder to balance optimum nutrient ratios in the plant to achieve maximum productivity.

References

1. Hameed Khan H H., Sankaranarayanan M P and Narayana K B Characteristics of coconut soils of India. *placrosym*-1 54-79. 1978.
2. Hameed Khan H., Sankaranarayanan M P, George M V and Narayana K B. Effect of phosphorus skipping on the yield and nutrition of coconut palm. *Journal of Plantation Crops* 11 (2) 129-134, 1983.
3. Hameedi Khan H, Biddappa C C, Joshi O P, Manikandan P and Gopalasundaram P 1986 Fertilizer recommendation for coconut based on Mitschcrlich-Bray Equation. *Journal of Plantation Crops* 14 (1) 65-73.
4. Jackson M L 1967 Soil chemical analysis. Prentia Hall of India Pvt Ltd., New Delhi.
5. Ramanandan P.L. Nambiar C K B and Pandalai K M 1961. Soil classification and fertility survey of the Central Coconut Research Station, Kasaragod, *Indian coconut journal* 15 (1) 20-27.

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05-03

PROBLEMS AND PROSPECTS OF DAIRYING IN RURAL AREAS OF KERALA

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Abstract: The study indicated that there is very high prospects and feasibility for dairying as a source of income and employment in rural areas provided the major problems faced by the rural dairy farmers such as lack of feasible herd strength, poor productivity of majority of animals, lack of market and feasible price for milk, high cost and non-availability of food quality feed and fodder, lack of awareness of scientific feeding and management, lack of facility for adequate cooperative and organisational movements in dairy sector, lack of awareness of economic feasibility of integrated, co-operative and mixed farming systems and also other related problems are solved. Voluntary agencies, extension people and the Government have to give more importance to these thrust areas to revive and improve the dairy sector in rural areas.