



Sustainable nutmeg production in coconut plantations: the role of site specific nutrient management

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Nutmeg can be successfully grown as an intercrop in multiple cropping system based on coconut. The available space and shade in the coconut gardens which are more than 15 years old can be best utilized by planting nutmeg as the it is a shade loving plant. Adoption of such multiple cropping system emerges as a viable means for improving the economic status of farmers. The addition of nutmeg crop component in the coconut based cropping system does not reduce the yield of coconut. However, the practice of intercropping nutmeg in coconut plantations is not very common in Kerala except in districts like Thrissur, Ernakulam, Idukky and Kottayam. District wise details of nutmeg cultivation in kerala is furnished in table 1 below. Nutmeg is planted in between two rows of coconut palm so as to accommodate 50-60 plants per acre. Trees of 15 years of age and above will yield about 1000-2000 or more fruits and large trees, which are over 30 years of age, may yield about 3000-10000 fruits per year. The yield per acre may vary from 300-350 kg of nutmeg and 50-60 kg of mace per annum.

There is no specific recommendation for such intercropped nutmeg in coconut-based land use systems. The current levels of output of nutmeg from coconut-nutmeg intercropping system can be enhanced through technology interventions. The studies on agro-ecology and soil qualities pointed to the fact that factors like strong soil acidity, extensive deficiency of secondary nutrients like calcium and magnesium and wide spread deficiency of micro-nutrients tend to limit the productivity of both nutmeg and coconut in Kerala. It was in this context that a focused technology refinement and demonstration programme for addressing such specific constraints was implemented for coconut based nutmeg cultivation.

Based on the detailed background study on intervention points for enhancing sustainable nutmeg production in coconut based intercropping systems, the critical role of site specific nutrient management was identified. A multi Institutional Project led by National Bureau for Soil Survey and land Use planning, focused on developing

Sl No.	District	Area (ha)	Production (tonnes)	Productivity (kg/ha)
1	Thiruvanthapuram	87	38	437
2	Kollam	85	37	435
3	Pathanamthitta	586	209	357
4	Alappuzha	345	113	328
5	Kottayam	2448	1444	590
6	Idukki	4142	3558	859
7	Ernakulam	6637	5214	786
8	Thrissur	6777	3448	509
9	Palakkad	413	150	363
10	Malappuram	479	172	359
11	Kozhikode	782	350	448
12	Wayanad	87	31	356
13	Kannur	302	140	464
14	Kasaragod	159	106	667
Total	23329	15010		
State average				643

(Source : Farm Guide 2022)



- Successful validation and demonstration of the BMP for enhancing crop production in farmer's fields in the selected agro-ecological units

The farmer participatory technology intervention demonstrations were carried out in Mookkannur Panchayath of Ernakulam District.

As part of the study, initial soil samples were collected from varying depths (0-20, 21-40 and 41-60 cm) from coconut and nutmeg basins and from interspaces as per the laid procedures and processed. Leaf samples were also collected, prior to the interventions, and analyzed for nutrient status. For nutmeg, most recently matured leaf from the base of a fruiting terminal/ current season flush (or) last fully matured leaf of the previous year's flush was collected as index leaf. Based on the initial soil and leaf nutrient status best management practice (BMP) were designed and treatments were imposed at both experimental fields and demonstration plots in two splits in each year. The impact of the best management practice was studied by periodic analysis of soil samples at the end of each year. The physicochemical properties along with soil and plant health status was also recorded. The components of the best management practice developed for nutmeg is given in Table 2 below.

Activities/inputs for nutmeg management
Lime/ Dolomite (based on soil analysis) – 2000 g/tree
Urea/Rock Phosphate/MOP – based on the soil test per tree basis (500: 250: 1000 g of NPK is the recommendation per tree of 10 years & above)
Micronutrient spray – thrice (Jan/Feb, March/April and May/June - @ 5 g/ L)
Application of Bordeaux mixture (at onset/ post monsoon)

sustainable soil nutrient management strategies for specific intercrops in coconut was initiated in 2015. The project was funded by Kerala State Planning Board. The collaborating institutes for the nutmeg component included Central Plantation Crop Research Institute, ICAR Indian Institute of Spices Research and the ICAR Central Marine Fisheries Research Institute, Kochi.

Objectives

One of the key objectives of the collaboration was to develop site specific nutrient management strategies for the nutmeg-coconut intercropping system by mitigating the productivity constraints arising from soil related factors. The project also aimed to demonstrate that productivity of coconut–nutmeg intercropping system in Kerala can be substantially enhanced through appropriate external inputs and site specific nutrient management at minimum cost and effort, while maintaining plant health at optimum levels. The project activities included the following.

- Scientific documentation of soil related constraints in cultivation of nutmeg as an intercrop in coconut garden.
- Development of Best Management Practices (BMP), from scientific study based on analysis of soil nutrient status and plant tissue samples from nutmeg gardens in representative agro-ecological unit.



The initial samples from the base and interspace of nutmeg trees showed that the soils are highly acidic with medium to low organic carbon content, which restricted the nitrogen supply to the trees. Available potassium and Boron were also low. The phosphorus availability was high in nutmeg basins with traces of aluminium. The soil nutrient management strategies implemented as part of the best management practice and experimental studies yielded several key insights on soil health management in nutmeg intercropped in coconut gardens.

Key findings on soil reaction and nutrient status

- The soil pH in both surface layer and subsurface soil improved significantly over the initial value with application of Lime (L) or Lime + Gypsum (G).
- With the application of best management practice, there was a significant increase in the soil available K status over the Farmers practice (FP) and the initial status
- The best management practice adopted in the intercropped nutmeg improved the balanced availability of P to its optimum range of 14-22 mg/kg which was slightly higher than in FP.
- The available Calcium and magnesium in the soil increased significantly with the application of Lime and Lime + Gypsum amendment and the increase was 2 fold in case of Calcium as compared to the existing farmers practice.
- Along with other micronutrients, availability of Boron also showed significant improvement with the increase of soil pH on addition of Lime + Gypsum.

Effect of BMP treatments on nut and mace yield

The yield increase was up to 22% in the treated plots in the experimental condition for nut and mace yield. An yield increase of 10-25% in nut and mace from farmer's demonstration plots were observed as compared to the farmers practice (Figure 1 and 2).

A comprehensive evaluation of the intervention strategy was undertaken to understand the economic viability of the interventions in nutmeg intercropped in coconut gardens. The results are presented in Table 3. The additional cost incurred on adoption of the recommended best management practice in nutmeg was justified as the interventions resulted in higher yield with an estimated incremental benefit cost ratio of 2.1. The value of incremental output due to the intervention was estimated to be Rs 103620 per hectare.

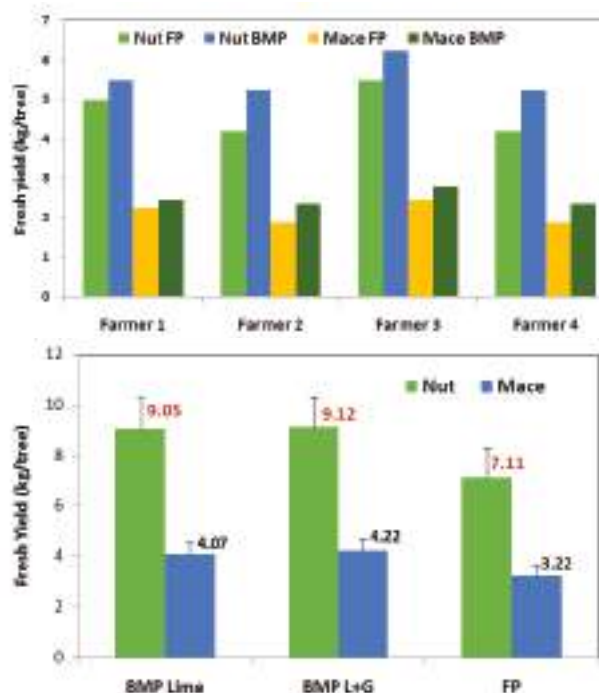


Figure 1 and 2

Project Approval Committee of CDB approved 26 Projects worth Rs 2464.33 lakh

The 58th meeting of the Project Approval Committee (PAC) on Technology Mission on Coconut (TMOC) of CDB was held at Kochi through videoconferencing on 21st March 2022. 'Shri. Rajbir Singh Panwar IFS, Chairman, Coconut Development Board and Chairman PAC chaired the meeting in which 16 projects with an outlay of Rs. 1368.73 lakhs was approved by the meeting. Out of the 16 projects, seven projects were from entrepreneurs for setting up of coconut based industries and nine projects were from various research institutes from across India. 58th PAC also approved 10 projects subject to conditions with an outlay of Rs. 1095.60 lakh. Out of the 10 projects approved by 58th PAC subject to conditions, four projects were from entrepreneurs for setting up of coconut based industries and six projects were from various research institutes all over India.



Particulars	Value
Incremental cost	
Cost of inputs in BMP	Rs 145 per tree
Cost of additional inputs per hectare	Rs 25665
Total additional investment for adopting BMP including labour and input cost	Rs 50665 per hectare (2018-19 prices)
Incremental returns	
Incremental output -nut	159.3 kg/ha
Incremental output -mace	70.8 kg/ha
Value of incremental output@	Rs. 103620/ha
Incremental Benefit Cost Ratio (IBCR)	2.1
#Labour valued at Rs 500 per manday	

soil test values: 800 g Urea, 500 g Factamfos and 1.50 kg Muriate of Potash in two equal splits (rates based on Nutrient Index of Ernakulam District).

- Enrich 100 kg of FYM: neem cake mixture (mixed in 9:1 proportion) with *Trichoderma harzianum* @ 1-2 kg formulation per 100 kg and apply @ 20-25 kg of enriched mixture per tree during the onset of monsoon.

- Apply foliar spray of IISR nutmeg micronutrient mixture - @ 5 g/ L water at flowering and flower development stages at monthly intervals (2-3 sprays).

- Cut and remove the dried or infected branches (due to thread blight infection) and spray Bordeaux mixture (1%) on leaves at the onset of monsoon (May-June).and repeat the spray one month after first application.

Conclusion

Nutmeg is a beneficial intercrop in coconut and can provide a sustainable source of income to the farmer. The economic viability of the soil health centric technology intervention packages including the best management practices in nutmeg clearly demonstrated the superiority of the technologies in enhancing output while maintaining economic viability. The technology dissemination efforts need to highlight the economic viability of the technology package to draw the farming community towards adoption of these technologies. Soil test based site specific nutrient management can enhance the yield levels in nutmeg across the state and enhance the supply of the commodity. ■

The successful implementation and validation of the site specific nutrient management strategy in nutmeg has implications for nutmeg cultivation across the state. The performance and profitability of nutmeg as an intercrop can be enhanced through adoption of the recommendations arising out of this study. The key recommendations are

Recommendations

- For soil acidity amelioration: If the soil pH < 6.0, apply 1kg dolomite lime + 1 kg gypsum along the drip line/ canopy periphery during May-June at the onset of monsoon, every year. For the soil pH > 6.0, this may be applied during alternate years.
- Apply nitrogen, phosphorus and potassium fertilizers at the rates recommended based on