Chapter 6

SUMMARY AND CONCLUSION

This study was conducted at Kerala Forest Research Institute, Peechi, during 2011-2017. The study mainly aimed at assessing soil fertility status and spatial variation through GIS based soil fertility mapping for site specific nutrient management in the agro ecosystems of Thrissur District. This was achieved mainly through three different objectives. The first objective mainly focused on evaluating soil fertility status in various agro ecosystems in Thrissur district. The second objective focused to find out the spatial variation of soil fertility in the study area. The third objective was to develop soil fertility map of the study area depicting extent of deficiency and toxicities**.** The important findings obtained under each objective and the conclusions drawn are given in the following paragraphs.

1. Soil fertility status in various agro ecosystems in Thrissur district

- Soil fertility status of Thrissur district varied widely between various agro ecosystems across different agro ecological units
- The soils of various agro eco systems in general were extremely acidic to slightly alkaline, (pH, 2.9 – 8.4), non saline to highly saline (EC, 0.01 – 5.8 dS m^{-1}) with low to high status of organic carbon (0.04 – 7.6 %).
- Status of N in the soils was low to high (22 – 2845 kg ha^{-1}); P, extremely low to extremely high (0.2 – 848 kg ha^{-1}); K, low to high (1.0 – 2280 kg ha^{-1}); Ca, low to adequate (20.6 - 3515 mg kg^{-1}); Mg, low to high (3- 711 mg kg^{-1}); and low to high S (0.1- 400 mg kg^{-1}).
- The content of all micronutrients also showed wide variation from low to high status. The values of Fe ranged between 0.1 - 675 mg kg^{-1}, Cu between 0.01 – 54 mg kg^{-1}, Zn between 0.01 – 100.2 mg kg^{-1}, Mn between 0.1 – 280 mg kg^{-1} and B between 0.001 – 0.4 mg kg^{-1}
- The decreasing order of deficiency of macronutrients were K (9.2 % - 58.7 %) > Mg (17.7 % - 38.5 %) > Ca (17.8 % - 41 %) > S (3.7 % - 13.9 %) > P (1.9 % - 20.7 %).

- The decreasing order of deficiency of micronutrients in soils of different agro ecosystems in Thrissur district were B (99.3 % – 100 %) > Cu (61.5 % – 84.3 %) > Zn (64.4 % – 75.9 %) > Mn (81.5 % – 98.4 %) > Fe (98.2 % - 99.9 %).
- Among the various agro ecosystems, the deficiency due to B was severe in all the crops, Cu in rubber, vegetables, coconut, banana and arecanut, Zn in rubber, coconut, banana and vegetables, and the deficiency level was negligible in the case of Fe and Mn in all the crops.
- The soil fertility assessment based on soil reaction index showed that in all the agro ecosystems, soils were acidic except arecanut and pepper, wherein the soils were in neutral condition. The value on salt index revealed normal non saline condition in all the cropping systems in the study area. The status of OC, which was evaluated by nutrient index values were high only in the case of nutmeg and rubber. In all the other crops its status was moderate .
- The nutrient index values revealed high N status in the soils of rubber based cropping system, and medium in all other crops. The status of P was high in the soils of all agro ecosystems. The status of K was low in arecanut, high in rubber, and medium in all the other crops. Mg was medium in all the agro ecosystems in the study area. The status of S was high in the soils of rubber, vegetables and pepper.
- The nutrient index values revealed very high status of Zn in the soils of nutmeg and paddy, and high in other agro ecosystems. Status of B was very low in the soils of all the cropping systems. On the other hand, Cu was very high in the soils of paddy and coconut, and high in other cropping systems. The status of Fe and Mn were very high in the soils of all the crops grown in Thrissur district.

2. Spatial variation of soil fertility in the study area

- The study revealed strong spatial dependence for K and B; moderate spatial dependence for pH, EC, OC, N, P, Ca, Mg, S, Cu, Fe, Mn; and weak spatial dependence for Zn.
- The distribution of soil properties showing weak and moderate spatial dependence were highly affected by the extrinsic factors (soil management practices, fertilization etc.) in the study area

- The results from the study of spatial variation call to develop a strategy for site - specific application for the parameters resulted in moderate and weak spatial dependence- pH, EC, OC, N, P, Ca, Mg, S, Cu, Fe, Mn and Zn.
- Distribution of K and B was greatly affected by the intrinsic factors such as climate, topography and parent material in the study area.
- Uniform management strategy is suggested for K and B, which revealed strong spatial dependence.
- Based on the range value obtained for each soil property, optimum sampling interval for spatial analysis can be decided for future studies.

3. Develop soil fertility map of the study area depicting extent of deficiency and toxicities

- The study developed soil fertility index map for all the fertility parameters showing extent of distribution under various classes.
- In Thrissur district, 41% of the area was with optimum soil fertility, most suitable for crop production.
- The low soil fertility status was mainly noted in the coconut dominant areas of northern coastal plain.
- The agro ecosystems belonging to optimum fertile areas were paddy, banana, coconut and rubber.
- The information generated in this study can serve as base line data for developing nutrient management plan in this region.
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4. Future line of work

The results of the study suggest to carry out soil fertility mapping and spatial analysis in other districts of Kerala to facilitate site and crop specific nutrient management practices throughout the State.