6. SUMMARY AND CONCLUSION

The findings from the present investigation entitled “Studies on integrated nutrient management in mulberry for sustainable leaf yield, quality and cocoon yield in traditional sericulture area of Karnataka” are summarized as follows:

1. The rate of adoption of newly evolved sericultural technologies was not significantly related to the personal and socio-economic characters of the participant farmers. The study emphasized that for successful and effective technology diffusion and adoption, a farmer-participatory extension approach would be more effective to motivate the farmers. The findings showed farmers preference and willingness to adopt the cost-effective and sustainable methods of the supply of plant nutrients. This would result in higher crop production without any adverse social consequences.

2. High degree of variations existed in soil physical, chemical, and biological properties in the three clusters located in identical agro-climatic pockets. This may be chiefly due to different agronomic inputs/crop husbandry practices followed by the farmers. The initial soil test results showed that there was no strong correlation between the inorganic inputs applied and availability of major plant nutrients in the soil. This clearly suggested that there is a need for adoption of integrated plant nutrient supply system comprising judicious application of chemical fertilizers and systematic use of more organic inputs including bio-fertilizers at field level. Besides, other factors associated with nutrient use efficiency such as crop geometry, methods and time of application of inputs, quantity, and resource management would be of much use for increasing mulberry productivity in a longer run.

3. The trials conducted on green manure cover cropping showed that the contribution of green biomass to the soil from sunhemp (C. juncea) was significantly higher than cowpea (V. sinensis) and daincha (S. aculeata). The seed sowing of 25 kg
/ha/crop was found economically feasible and effective in utilizing the available mulberry inter-row space. Seed treatment with *Rhizobium* inoculants and sowing the seeds 5 days after mulberry pruning was found advantageous in getting better root nodulation and biomass in turn to achieve higher nitrogen fixation in the soil. Incorporation of green manure on the 45th day after sowing or when 50% initiation of flowering in plants has been found to be ideal for proper decomposition and release of plant nutrients in the soil.

4. Intercropping by green manure cover crops has found beneficial in weed suppression which in turn reduced the cost towards weed control.

5. Improvement in the soil physico-chemical properties of irrigated mulberry gardens due to combined effect of using *Azotobacter*, PSB and VAM as co-inoculants with 50% reduction in the chemical fertilizer application.

6. There was a positive effect on soil physical properties at RSRS Farm and at farmers’ field level due to practice of INM but requires long-term studies to record significant level of improvement as the fertility building is a slow and continuous process.

7. The INM effect was significant in improving the soil chemical properties especially on soil reaction as indicated by pH reduction. The reduction was seen initially at soil surface level and gradually reflected at deeper levels. Therefore, a long-term strategy implementing INM practice can be much use to contain salinity and alkalinity of soils. This would help in increased nutrient availability to crop.

8. The soil EC was managed to keep it well within the safer limits in spite of higher EC level before imposition of INM, higher calcium and magnesium salts in irrigation water and continuous and indiscriminate application of chemical fertilizers followed earlier by the farmers.
9. The impact of INM on soil organic carbon content was perceived only from the second year onwards suggesting that the effect of INM in the soil was felt only after the build up of organic matter up to a certain level. Further, the study revealed that the conventional practice of chemical farming without proper use of bulky organic manures resulted in severe depletion of soil OC content in most of the mulberry gardens. This has also resulted in reduction in soil microorganisms, especially the beneficial ones.

10. Significant improvement in the available phosphorus and potassium contents in soil is realized to be a reflection of the beneficial effect of INM practice in the solubulization and mobilization of these available plant nutrients, especially phosphorus.

11. No significant difference in soil micronutrient status was recorded between INM and control gardens at both RSRS Farm and farmers’ level even after 50% reduction in the chemical fertilizers application. However, this factor needs further study for at least 2 more years to realize draw a definite and quantifiable effect.

12. Enhanced activities of beneficial and saprophytic microflora were observed due to application of various biofertilizers and organics with reduced dose of chemical fertilizers. The increased populations concentration of beneficial microflora in the soils have led to reduction in pest and disease incidence in mulberry.

13. The adoption of INM at both RSRS Farm and farmers’ filed level fulfilled the main objective of achieving sustainability in mulberry leaf yield, leaf quality, and silkworm cocoon yield.

14. The study has facilitated to develop and to validate a cost effective INM package at farmers’ level by adopting the use of various organic manures and biofertilizers in combination with limited use of inorganic fertilizers (only 50% of
recommended dose) in the most prosperous sericulture area in the State of Karnataka which is again a leading silk producing state in India.

15. By following the INM package, it was also possible to develop eco-friendly sericulture in the study area for sustainable mulberry crop production and via a vis cocoon production without sacrificing the overall health of soil.

16. The INM package thus developed has been found cost effective as it facilitates a saving of Rs. 5455/- per ha/yr on the cost of inorganic fertilizers alone. Finally, the returns from cocoon sales also showed higher income (Rs 8981.65 per 100 dfls or two boxes of eggs) over the income from the conventional practice (Rs 7871.13 per 100 dfls).

In any agricultural crop production, while achieving sustainable crop production, the indicators like farm productivity, net farm income, nutrient balance, soil quality, farm water use efficiency, pH, soil organic matter, and surface and ground water quality should not show any negative trends as opined by Rao and Reddy (2002). The present findings, therefore, support the above statement by showing a positive trend in soil fertility status with concomitant sustainability in mulberry crop production at farmers’ level also showed besides sustainable mulberry. Undoubtedly, this would certainly become a means for crop production without ecological and socio-economic threat to future mulberry sericulture in India. The study conclusively demonstrates the two most important findings viz.,

1. Adoption of integrating nutrient management facilitates maintenance of soil fertility and improvement soil health.

2. Sustainability in crop yields can be accomplished through adoption of integrated nutrient management package in mulberry.
Hence, INM can be included as an indispensable component in mulberry cultivation practices for Kolar and Bangalore Urban Districts that have a lion’s share in the production of cocoons in the State of Karnataka. Further, the recommendation is also being extended to other sericulture areas that exhibit similar soil and climatic conditions.