CHAPTER 5

SUMMARY AND CONCLUSION

Coconut plays a major role in the economic and social life of the people of more than eighty countries of the world. India is one of the chief producers of coconut and among the different coconut growing states of India, Kerala accounts for the largest area and production. But the rate of growth in production of coconut is the lowest in Kerala, when compared to the national rate and it is much lower than that of the neighbouring state of Tamil Nadu, where the productivity is reasonably high.

The level of production of coconut in the country is mainly determined by the productivity levels in Kerala, which is the prime producer of coconut. But the productivity of coconut is less in Kerala, when compared to other states, especially the non-traditional areas. Even though several experts have given their views on the reasons for the low productivity of the coconut in Kerala, research studies related to the determinants of productivity of coconut in different regions are very less. Also, the interactive effects of the various personal, socio-psychological and biological factors to productivity are not yet studied.

Against this background, the present study was undertaken with the following specific objectives.

1. To assess the level of knowledge of the coconut growers and the extent of adoption of the recommended technologies related to coconut cultivation, contributing to productivity.
2. To study the personal, socio-psychological, economic and biological determinants of knowledge, technology adoption and productivity of coconut.
3. To assess the recommended technologies based on their level of appropriateness, knowledge and adoption.

4. To find out the association and contribution of the determinants towards knowledge, adoption and productivity.

5. To draw a general picture of the coconut cultivation and allied enterprises in Kerala and Tamil Nadu through multidimensional analysis and to suggest a model transfer of technology network for improving coconut production.

The study was conducted during 1998 - 2000 in Kerala and Tamil Nadu, comprising Alappuzha and Palakkad districts from Kerala and Coimbatore and Kanyakumari districts from Tamil Nadu. From each district, five blocks were randomly selected from among the extensive areas of coconut cultivation and from each block, one village/ panchayat was selected at random. Thus 20 villages/panchayats were selected for this extensive study. Ten farmers each from the above villages/panchayats were selected at random to constitute a sample of 200 coconut growers.

The dependent variables of the study were the level of knowledge of the coconut growers, extent of adoption of recommended coconut technologies and the level of productivity of coconut. The personal, socio - psychological, economical and biological determinants selected as independent variables were education, occupation, farming experience, size of coconut holding, cropping intensity, perception on planting and cultural management, irrigation, moisture conservation, perception on soil fertility management, perception on genetic quality of palms, pest and disease incidence, media utility, perception on coconut promotion strategies of Government, extension orientation, dependence on agriculture, personal supervision of crop, economic motivation, labour utility, investment
index, perception on market infrastructure, perception on appropriateness of technology and 
product diversification.

The level of knowledge of the coconut growers was measured in terms Knowledge Index developed by Bhaskaran and Praveena (1982), later on modified and used by Kalavathi and Anithakumari (1998). The extent of adoption of coconut cultivation practices was measured in terms of Adoption Quotient developed by Chattopadhyay (1963) with modifications. The farmers productivity of coconut was measured in terms of Crop Yield Index, as used by Prakash (1989).

The independent variables were quantified by using already existing scales or scoring procedures developed for the study purpose.

The data were collected through personal interviews with the coconut growers by using structured and pre-tested interview schedule developed for the purpose. Arithmetic Mean, Percentage Analysis, Cumulative Root Frequency Method, Friedman Two-Way Analysis of Variance, Kruskal - Wallis One Way Analysis of Variance, Correlation Analysis, Step-wise Regression Analysis and Path Analysis were employed in the analysis of data and in interpreting the results.

The results of the major survey was supplemented with data collected through other methods such as situational analysis of product diversification units, case studies, expert interviews, rapid rural appraisal and secondary data.

Salient Findings of the Study

1. Majority of the coconut growers possessed medium to high level of knowledge in Coimbatore (78.00 per cent), followed by Alappuzha (72.00 per cent) whereas it was medium to low in Palakkad (76.00 per cent), followed by Kanyakumari (74.00 per cent).
2. Highest knowledge index was recorded for planting time (99.50), followed by application of organic manure (94.25), recommended spacing (91.25) and irrigation (90.75). The lowest was recorded for application of bio-fertilizers / Micronutrients (17.50), followed by biological control of pests (21.74), management of Tanjore wilt (34.62) and management of Root (wilt) disease (35.90).

3. The level of adoption was medium to low in all the four districts. Among these, Coimbatore was better placed in terms of high adopters (32.00 per cent), whereas in Kanyakumari, the percentage of low adopters (44.00 per cent) was high.

4. The adoption indices of traditional practices like correct planting time (92.00), recommended spacing (87.00), depth of planting (86.50) and application of organic manure (85.75) were found to be very high, while the adoption of modern technologies like biological control of pests (2.92), use of bio-fertilizers / micronutrients (3.25) and application of magnesium sulphate (12.50) was found to be low.

5. Majority of the holdings had low to medium productivity in all the four districts. Number of holdings with high productivity was found to be low in all districts except Coimbatore (32.00 per cent).

6. The application of bio-fertilizers and micronutrients (95.24) was rated as the most appropriate technology, followed by irrigation (91.42), moisture conservation (89.72) and use of hybrid varieties (86.55) in order by the coconut growers, who have adopted, while the least appropriate technologies perceived by them were management of root (wilt) disease (43.54), management of Tanjore wilt (50.37) and intercropping / mixed cropping (57.18) in order, as indicated by the appropriateness indices.
7. The knowledge on chemical fertilizer application and its adoption were observed to be medium, in spite of having high appropriateness index.

8. The perception on the appropriateness and knowledge of most of the technologies on pest and disease management was found to be low to medium, while the adoption was found to be medium.

9. Adoption is not only decided by knowledge about the technology and its appropriateness in terms of relative advantage, simplicity, trialability, observability and compatibility, but also influenced by the urgency of the problem and the social as well as environmental consequences of the technology.

10. The four districts varied significantly in terms of the levels of knowledge, adoption and productivity.

11. The coconut growers of Coimbatore possessed highest level of knowledge and adoption followed by Alappuzha. Productivity was also found highest in Coimbatore, while in Alappuzha, it was found to be the lowest.

12. Significant difference was observed among the four districts in terms of all independent variables other than education, farming experience, perception on planting and cultural management and media utility.

13. Majority of the coconut growers from Coimbatore had farming as their major occupation and they stood first in terms of size of coconut holding, irrigation, moisture conservation, perception on soil fertility management, perception on genetic quality of palms, dependence on agriculture, personal supervision of crop, economic motivation, labour utility, investment index and product diversification.
14. Along with several positive characteristics like perception on coconut promotion strategies, extension orientation, perception on market infrastructure and perception on appropriateness of technology, the most negatively contributing factor like pest and disease incidence was also highest in Alappuzha.

15. Irrigation and perception on genetic quality of palms showed significant positive relationship with knowledge, adoption and productivity in all the four districts as well as in pooled data.

16. Positive and significant correlations were also observed in case of variables like perception on planting and cultural management, moisture conservation, media utility, perception on coconut promotion strategies, extension orientation, personal supervision of crop and investment index in most of the cases.

17. Inter - correlation among knowledge, adoption and productivity was positive for all the four districts and pooled data, but it was significant only in case of Palakkad, Kanyakumari and pooled data.

18. The results of the step-wise regression indicating variables contributing to knowledge level of the coconut growers of the four districts and pooled data are given below:

i. Five variables namely education perception on planting and cultural management, media utility, perception on coconut promotion strategies and personal supervision of crop contributed to 57 per cent variation in case of Alappuzha district.

ii. Four variables namely education, perception on planting and cultural management, economic motivation and perception on appropriateness of technology contributed for 77 per cent variation, of which 61 per cent variation was contributed by perception on the appropriateness of technology alone in case of Palakkad district.
iii. Three variables namely size of coconut holding, media utility and extension orientation contributed for 67 per cent variation, of which 54 per cent variation was due to extension orientation alone in case of Coimbatore district.

iv. Six variables namely cropping intensity, moisture conservation, incidence of pests and diseases, media utility, personal supervision of crop and investment index, contributing to 81 per cent variation in case of Kanyakumari district.

v. Thirteen variables namely education, occupation, size of holding perception on planting and cultural management, moisture conservation, perception on soil fertility management, perception on genetic quality of palms incidence of pests and diseases, media utility, extension orientation, labour, utility, investment index and appropriateness of technology, contributed 72 per cent variation of which 51 per cent variation was due to extension orientation alone in case of pooled data.

19. Media utility was observed as the most common variable influencing knowledge in all areas except Palakkad and the factors were found varying from region to region.

20. Media utility, education, perception on planting and cultural management, perception on appropriateness of technology and personal supervision of crop were found to influence knowledge of the coconut growers of Kerala whereas in Tamil Nadu, factors like size of coconut holding, moisture conservation, extension orientation and investment index contributed much.

21. The variables contributing to adoption of coconut technologies in the four areas, as revealed by step-wise regression analysis with 23 variables is furnished below.

i. In Alappuzha, 81 per cent of the total variation in adoption was due to four variables namely cropping intensity, perception on planting and cultural management,
perception on soil fertility management and knowledge, of which 65 per cent variation was due to the single variable knowledge.

ii. In case of Palakkad, moisture conservation, perception on appropriateness of technology and knowledge alone could contribute to 96 per cent of the variation in adoption of which perception on appropriateness of technology alone contributed for about 90 per cent variation.

iii. Two variables namely knowledge and perception on coconut promotion strategies alone contributed for 81 per cent variation in adoption, of which 71 per cent variation was due to knowledge alone.

iv. In Kanyakumari, knowledge alone contributed for 83 per cent variation in adoption.

v. The overall data indicated that 84 per cent of the variation in adoption was contributed by six variables namely cropping intensity, perception on planting and cultural management, moisture conservation, perception on soil fertility management, dependence on agriculture and knowledge, of which the variation contributed by knowledge alone was 80 per cent.

22. From the results of step-wise regression, knowledge was emerged as the crucial factor in the adoption of technologies.

23. The characteristics contributing to the productivity of coconut in the four districts and for the overall data based on step-wise regression with 24 variables are as follows:

i. Four variables namely perception on planting and cultural management, moisture conservation, perception on genetic quality of palms and incidence of pests and diseases contributed for about 73 per cent variation in the productivity of coconut in
Alappuzha district. Out of this, 65 per cent variation was contributed by perception on genetic quality of palms and incidence of pests and diseases.

Merely two variables such as moisture conservation and perception on genetic quality of palms contributed for about 62 per cent variation in productivity of coconut in Palakkad district, of which 51 per cent was accounted by perception on genetic quality of palms alone.

In Coimbatore, four variables namely perception on genetic quality of palms, investment index, perception on market infrastructure and size of coconut holding contributed for 65 per cent variation in productivity, of which the contribution by size of coconut holding was negatively significant. Out of this, 51 per cent variation in productivity was due to investment index and perception on market infrastructure alone.

Four variables namely irrigation, moisture conservation, perception on genetic quality of palms and perception on appropriateness of technology contributed for 77 per cent variation in the productivity of palms in Kanyakumari district, while two variables namely moisture conservation and perception on genetic quality of palms alone contributed 67 per cent variation.

The overall data revealed that 69 per cent variation in productivity of coconut was contributed by eight variables such as cropping intensity, perception on planting and cultural management, moisture conservation, perception on genetic quality of palms, incidence of pests and diseases, dependence on agriculture, investment index and perception on market infrastructure, of which 61 per cent contribution was due to
three variables namely perception on genetic quality of palms, investment index and
pest and disease incidence.

24. Based on the overall results of step-wise regression analysis, the perception on genetic
quality of palms emerged as the most vital factor in determining the productivity of
cocoanut.

25. The overall results of path analysis revealed that perception on appropriateness of
technology, perception on planting and cultural management, perception on genetic
quality of palms and media utility which possessed high direct effects, maximum indirect
effect and maximum number of indirect relationships had high impact on the level of
knowledge of coconut growers.

26. Results of path analysis further revealed that the biologically related variables directly
contributed to knowledge, whereas the extension or development-related variables
indirectly contributed much to knowledge, even higher than all direct effects.

27. Directly contributing variables like perception on appropriateness of technology,
perception on planting and cultural management, labour utility, incidence of pests and
diseases and moisture conservation were found to be linked with each other and
indirectly influenced by extension orientation and media utility.

28. The most important factor that contributed much to adoption was knowledge in terms of
its direct effect, positive indirect effect and maximum number of indirect contributions
through almost all other variables.

29. Apart from the very high direct effect by knowledge, several other factors like extension
orientation, media utility, perception on soil fertility management, planting and cultural
management, genetic quality of palms, appropriateness of technology and coconut
promotion strategies, investment index, personal supervision of crop, incidence of pests and diseases, moisture conservation, irrigation and size of coconut holding were found to have substantially high indirect effects, which were again routed through knowledge.

30. Factors like cropping intensity, labour utility and dependence on agriculture were found to hinder the adoption through their negative indirect effect.

31. Perception on genetic quality of palms emerged as the most contributing factor to productivity directly as well as indirectly.

32. Investment index, dependence on agriculture, moisture conservation and perception on planting and cultural management were enhancing the productivity directly as well as indirectly, while knowledge, adoption, extension orientation, perception on soil fertility management and irrigation were highly contributing through their indirect positive effects.

33. Incidence of pests and diseases was found to reduce the level of productivity through its direct and indirect negative effects, followed by perception on appropriateness of technology and cropping intensity.

34. Genetic potential of the palms was adjudged as the most influential factor in deciding the productivity of coconut, as per the conclusions drawn from expert interviews, case studies and major survey.

35. The overall picture revealed moisture conservation as more important than irrigation in deciding productivity, especially in the rainfed tracts, by way of ensuring optimum moisture conditions.

36. Tremendous decline in the price of coconut coupled with severe incidence of pests and diseases made coconut cultivation unmanageable for the average farmers.
37. Farmers in general perceived organic tanning as a better proposition than chemical farming in sustaining the yield of coconut, even if the chemical fertilizers were found to give immediate response.

38. Situation analysis of product diversification units revealed that the potential for fast establishment of coconut-based industries was mostly confined to conventional products like copra, oil, coir and coir products. Manufacture of other non-conventional products is still in the infancy stage.

39. The success of product diversification units mainly depended on the quality standards of the products and the effort put forth in marketing and popularization of products.

40. Inadequate institutional support in strengthening existing units, inadequate research and development efforts to replace or refine inefficient technologies, capital inadequacy for advertisements and marketing, procedural difficulties related to inter-state trade and export and violent market fluctuations were found to affect the growth of the already established product diversification units.

From the findings of the study, it can be concluded that the highest levels of knowledge, adoption and productivity were observed in Coimbatore district due to several positive characteristics. High knowledge and adoption were observed in case of traditional practices, while most of the modern technologies recorded low level of knowledge and adoption.

Study results clearly revealed genetic quality of palms as the most crucial factor, contributing both directly and indirectly to productivity of coconut. However, none of these factors were found to contribute individually, but through their interactive effects with other variables. Among such interactions, the indirect influences of knowledge, adoption and
extension orientation to productivity were found to be very high, besides having reasonably high direct and indirect contributions by investment index, dependence on agriculture, moisture conservation, perception on planting and cultural management and irrigation. The direct and indirect negative effects of pest and disease incidence were found conspicuous in reducing the productivity level of coconut.

Fluctuating price of coconut emerged as another factor influencing coconut cultivation and industry. The prospects of product diversification, which is suggested as a measure for stabilizing price was not found to be bright, except for the traditional products like copra, oil, coir and coir products. Marketing of products was found to be the major problem for the units manufacturing non-conventional products, especially the small-scale ones with low capital investment.

**Implications of the Study**

The problems related to coconut cultivation were studied under real field conditions and as such the solutions arising from the field level might prove to be more practical than external solutions. The suggestions thus collected together with some working suggestions based on study results for improving the present situation of coconut cultivation and industries are given below.

1. Mass media was found to play a great role in enhancing the level of knowledge and adoption of the coconut growers. Hence, the potential of mass media should be fully utilized to transfer need-based information on coconut cultivation and care should be taken to make it clear and understandable to the farmers. Also, it is suggested to undertake simultaneous follow-up by the extension agencies for reinforcement and proper adoption of technologies.
2. The most important factor contributing to adoption was knowledge, the contribution of which was not only direct, but also indirect through several other variables. Based on several such conspicuous effects, it was suggested that the coconut growers should be convinced on the appropriateness and importance of genetic quality maintenance, pest and disease management, fanning system management, planting and cultural management, irrigation and moisture conservation practices through regular educational programmes, demonstrations and field visits.

3. Technology development should be need-based and location-specific, coupled with quick and efficient dissemination mechanism.

4. Technologies should be periodically assessed for their appropriateness under field conditions and refine them to become farmer-friendly.

5. Consequences of technologies and technological changes should be informed to the farmers in time, rather than giving repeated information of the same technology from various sources. Awareness should also be created on the consequences of improper adoption of technologies.

6. Coconut development programmes should be formulated on the basis of location-specific priority of problems.

7. The results of the survey as well as the observations from case studies revealed a higher level of adoption for traditionally followed practices, when compared to modern technologies. Hence, while developing and disseminating technology, it should be integrated with traditional techniques so as to contribute to environmental preservation and sustainable production. Moreover, the concern for traditional culture along with
proper awareness of the consequences of technology adoption can lead to effective
implementation of the development programmes for the rural folk.

8. Genetic quality of palms emerged as the most crucial factor in deciding the productivity
of coconut. Hence, utmost care should be given for seed nut and seedling selection in a
perennial crop like coconut. Further, the research and extension system should be
equipped for adequate production and supply of good quality planting materials. It is also
highly desirable to regulate the production and distribution of low quality seedlings.

9. Farmers’ experience proved that the soil condition was deteriorated with long term use of
inorganic fertilizers alone, which adversely affected the sustainability in coconut
farming. Therefore, the Government programmes for coconut development should
include provision for application of organic manures, moisture conservation measures
and farming system management so as to ensure sustainable yield from coconut.

10. While planning for intercropping in coconut gardens, care should be taken to plant ideal
intercrops with adequate spacing and to provide separate management for individual
crops.

11. Integrated approach including crown cleaning is suggested for management of pests and
diseases and the government should provide continuous support to the implementation
of plant protection activities on a group basis in case of widely spreading pests and
diseases.

12. Reasonable price should be assured for coconut and its products through cooperative
marketing and processing.

13. Investments on rural infrastructure like irrigation, provision (or proper storage and
marketing have to be made active by Government so as to protect the coconut
14. The scope of product diversification in coconut was found to be confined to the manufacture of conventional products such as copra, oil, coir and coir products. So it is suggested to promote the use of diverse products of the palm for value addition by attracting with new variety products. Promoting the use of tender nuts and coconut oil by popularizing its health-friendly nature can also enhance the demand for coconut. In addition, integrated arming should be encouraged in coconut holdings for augmenting income from unit area.

15. Research and development efforts should be strengthened to evolve new improved processing technologies and substitute the inefficient ones.

16. The condition of small scale units, which manufacture non-conventional coconut products seemed to be not encouraging, mainly due to marketing problems. Hence, it is advisable to provide institutional support for marketing by way of product popularization till they establish well in the field.

17. Young generation should be attracted to farming as a profession by elevating the social status of coconut farming as a sustainable enterprise.

Future Areas of Research

1. Farming System Research involving assessment and refinement of coconut technologies with farmer participation.

2. Studies on sustainability of coconut cultivation under intercropping, mixed cropping and mixed farming conditions, comparing organic and inorganic farming systems.

3. Evaluation of different coconut varieties in farmers’ field for their performance in terms of yield and tolerance to pests, diseases and moisture stress under different
management conditions, along with phenotypic characterization of genetically superior palms.

4. Action Research on value addition of coconut at the farm household and community levels in rural areas.

5. Cost-Benefit analysis of coconut cultivation in different regions of the country with special emphasis to price and wages.

6. Extensive studies in the same line, with broader coverage of respondents from research, extension, client and support systems and others including traders, middlemen, labourers and entrepreneurs.

7. More elaborate studies with more number of variables related to economic, policy-linked and biological aspects with more sample size could be replicated in different coconut tracts of the country for drawing general conclusions on a broader perspective.