CHAPTER- V
SUMMARY, SUGGESTIONS AND POLICY IMPLICATIONS

Fruits are important in improving the diet by supplying vitamins and minerals, the fruits have also entered in the Indian religious and functional ceremonies. Probably to ensure its consumption by all sections of the people. Fruit growing serves as the mother of many industries and it reduces the seasonal unemployment. The important fruits grown in India are mango, banana, citrus, apple, gava, pineapple, papya, grapes, sapota etc. India produces a number of varieties of citrus fruits including sweet orange, santra, kinnow, lemon, mosambi etc, citrus fruits occupy third position in volume after mango and banana in the production of fruit.

In India lemon crop occupies an area of 129.8 thousand hectares with a production of 11.01 lakh tonnes, and in Karnataka it occupies an area of 12933 hectares with a production of 254.25 thousand tonnes. Lemon is cultivated in all the districts in Karnataka, the predominant lemon growing districts are, Bijapur, Gulbarga and Kodagu. In Bijapur district where the study was conducted lemon is being grown on commercial basis the area under lemon in Bijapur district is 6813 hectares with a production of 2,54,249 tonnes (2002-03) Lemon fruits are available throughout the year they are not only delicious and refreshing to eat, but also provide vitamins, minerals and many other essential substances which are vital for human health.
Lemons are used for pickles, India exports pickles to the gulf countries like Iraq and Kuwait and also to East Asian countries like Thailand and Malaysia.

Importance of the Study:

Bijapur is the main lemon cultivating district in Karnataka. The district is known for cultivation of horticultural crops in general and fruit crops in particular. The fruits grown in the district are known for their qualities. As the lemon production involves heavy initial investment and subsequent high maintenance expenses, its economic analysis is of great importance and it is worth here to note that the studies conducted on economic analysis of lemon cultivation are very few. The present study covers economic aspects of production and marketing of lemon cultivators and marketing aspects and suggests possible corrective measures for bringing about the required improvement in production and marketing of lemon. The following are the specific objectives of the study.

Objectives of the Study:

1. To analyses the costs and returns structure and to work out financial feasibility for lemon cultivation in the study area.

2. To study the resource use efficiency and productivity of various factors involved in lemon production.

3. To identify the marketing channels and costs of the marketing.
4. To analyse the trend and seasonal variations in arrivals and prices of lemon in the study area.

5. To assess the problems confronting the lemon cultivators and to suggest possible corrective measures.

Hypothesis of the Study:

1. There are higher returns than costs in the production of lemon.

2. Investment in lemon orchard is economically feasible in the study area.

Selection of the Study Area:

Lemon cultivation is practiced throughout the Karnataka (12.933 hectares (2002-03). However, the large scale cultivation of lemon is concentrated in Bijapur district occupying an area of 6813 (2002-03) hectares and forming 52.68 per cent of the total area under lemon in Karnataka. Hence, Bijapur district is specifically selected. Lemon cultivation is increasing and it is popular with the farmers of the region. These reasons led to the choice of Bijapur district as the area of the study.

There are five taluks in Bijapur district. Out these taluks, Indi, Sindagi and Bijapur taluks are selected for the field study. It is because the large scale cultivation of lemon is concentrated mainly in these taluks, occupying an area of 6528 hectares and forming 95.82 per cent of the total area (6813 hectares) under lemon in the district. Hence, the taluks are found appropriate for the present study.
A list of villages in Indi, Sindagi and Bijapur taluks having an area under lemon cultivation was obtained from the Tahsildars office of each taluka. From each taluka five top villages having area under lemon were selected for the study.

From the selected five villages the sample farmers were selected randomly. The total size of sample selected for the study was 250 respondents. Out of these 250 sample farmers 145 farmers are selected from Indi taluk, 80 farmers from Bijapur taluk and other 25 farmers from Sindagi taluk. The farmers were then post classified into three groups, based on the size of the area under lemon namely, Small with 0-0.64 hectare under lemon, medium with 0.65-2 hectare and large more than 2 hectares.

Nature and Sources of Data:

For evaluating the specific objectives of the study necessary data were obtained from the selected sample lemon cultivators through personal interview method with the help of pre-tested questionnaire. The data collected from the respondents include some general information about the lemon cultivators, area under lemon, age of the orchard, details on the various inputs like, farm yard manure, chemicals. Etc. yields and returns from the intercrop during gestation period of the orchard. Details on the annual cost of cultivation during bearing period yield level and returns, method of sale and cost of marketing etc.
Secondary data were also collected from Directorate of Horticulture, Bangalore, District statistical office, Bijapur. District Horticultural office Bijapur etc.

Intercrops:

The lemon cultivators took up intercrops in the orchards for the first four years. Later it was not possible for them to take up intercrops because of the growth and spread of lemon plants. While calculating the maintenance cost of the orchard for the first four years the costs and returns pertaining to the intercrops were also considered.

Analytical Techniques:

Tabular Analysis:

The technique of tabular analysis was employed to determine the distribution pattern of citrus cultivation in Karnataka, cost of establishment of lemon and to determine costs and returns structure and profit. The cost concepts, used in the farm management studies in India were adopted in this study. The following cost concepts were used.

In this study cost “A”, cost “B” and cost “C” are used.

Financial Analysis:

To evaluate the financial feasibilities of investment in lemon orchard, the standard tests Viz., Net present value, Benefit-cost ratio, pay back period and internal rate of return were estimated by using the discounted cash flow techniques.
Functional Analysis (Production function analysis):

After a series of tests on the fitness of the type of production function, a Cobb-Douglas type of production function was fitted to evaluate the resource use efficiency in the production function of lemon.

The form of production function fitted was as follows.

\[ Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4}. \]

Time Series Analysis:

For computing trend of arrivals and prices, the least squares method was employed, the linear of the type \( Y = a + bX \) equation was adopted for this purpose.

Where,

\[ Y = \text{arrivals/Prices} \]
\[ X = \text{period} \]
\[ a = \text{intercept} \]
\[ b = \text{slope} \]

For computing the seasonal indices the original data relating to original arrivals and prices were subjected to simple average method.

Findings of the Study:

1. The present study covered 250 lemon orchards, consisting of 90 small, 90 medium and 70 large sized orchards. The average size of lemon holding of sample orchards were 0.64 hectare, 1.24 hectare
and 2.14 hectare respectively. The variety of lemon grown in the study area was Kazi lemon. The range of age of bearing orchards were five to thirty years. The expected life span of plants per hectare was 250 compared to 300 as advocated by horticulturist. This was because of larger spacing followed by the respondents.

2. The establishment cost consists of investment cost and maintenance cost during gestation period. The first four years absorb heavy amount of capital which the farmer has to invest, which form the gestation period. Hence, the establishment of lemon orchard calls for investments in land, fencing, layout of field, planting material etc, which together have been grouped as investment costs of establishment and which have to be invested during the year of the establishment of the orchard.

3. During the four years, the farmers have to maintain the orchard by spending money on manures, plant protection chemicals, spraying irrigation, earthingup, pruning etc. All these items have been grouped as maintenance cost. However, in lemon orchards the farmers raised inter crops in the first four years which also yielded returns. The returns from the inter crops reduced the burden of maintenance of the orchard to the farmer to a great extent.

4. The total establishment cost was higher in the case of small orchards at Rs.97,751.24 per hectare, while for the medium and
large orchards were Rs. 85,062.69 and Rs. 81,499.88 per hectare respectively. However, the cost on plant material was high in both the orchards (medium, large) compared to small orchard, because of the fact that medium and large orchard owners had brought the seedlings from the other orchards, which added to the transportation cost. The small orchard owners prepare the seedlings and even they were involved in selling the seedlings to others. Rental value was Rs. 5000.00 per hectare and fencing Rs.4427 per hectare.

5. The cost of maintenance during the gestation period of the orchards showed that small orchards required more amount, (71.34 per cent of the total establishment cost) than medium and large orchards this was so because, the farmers with small orchards used more of variable inputs, indicates intensive practices followed by farmers with small orchards. The maintenance costs were Rs.69741.65 per hectare for small orchards, Rs.57,146.47 for medium orchards and Rs.53,701.14 for large orchards.

6. The maintenance cost during the gestation period is divided into, material costs, labour costs and costs of intercrops. The share of maintenance costs during the gestation period to the total establishment cost were 71.34 per cent, 67.18 per cent and 65.89 per cent in small, medium and large orchards respectively.
The farmers cultivated intercrops during first four years of the establishment of the orchards, the crop grown were, groundnut sunflower, onion, Chilli, Jowar, Bajra, and wheat. The costs and returns of intercrops decreased year after year in all the size groups, as the main crop developed and the space for cultivation of intercrops decreased.

The total four years costs incurred in growing intercrops on small orchards were Rs.15,077.17 per hectare with the total gross returns of Rs.58,086.34 the net returns for four years of intercropping were Rs.43,009.17 per hectare. The gross returns per hectare for the four years on medium orchards were Rs.44,505.08 with costs of Rs.13,720.42 the consequent net returns for four years of intercropping were Rs.28,174.93.

The gross returns per hectare for the for years on large orchards were 38,678.34 with the cost of Rs.10,503.41 the consequent net returns for the four years of intercropping were Rs.28,174.93. The cumulative costs, gross returns and the net returns were more in small orchards followed by medium and large orchards. This is because of small orchard owners had taken intercrops which were commercially important and medium and large orchards grow more of fodder crops for their animals. The intercrops covered the establishment costs by 59.42 per cent in small, 52.32 per cent in medium and 47.45 per cent in large orchards respectively.
10. Cost of cultivations of lemon during the bearing period were divided into three parts material costs labour costs (variable costs) and fixed costs. The variable costs included the cost of farm yard manure and cost of plant protection chemical, and the labour costs for various operations in the lemon orchard. Fixed cost includes the rental value of leased in land and apportioned establishment cost.

11. The contribution of material costs to total variable cost in small medium and large orchards were 18.67 per cent 23.01 per cent and 26 per cent respectively, and the share of labour costs to the total variable cost were 81.33 per cent, 76.99 per cent and 74 per cent in small, medium and large orchards respectively. The results indicated that the operation like irrigation, earthingup and weeding contributed more to the variable costs among the labour costs. The total variable cost was slightly less than the medium orchards because of the operation of economies of scale in large orchards.

12. None of the orchards had used chemical fertilizers, during the survey the farmers have expressed the strong conviction about the adverse effect on the quality of fruits and also the variation in yield in subsequent years if chemical fertilizers were used. In view of this there is a need for proper research regarding the application of fertilizer to lemon in short and long run periods.
13. The total labour required for lemon cultivation consisted of labour for all operations during the bearing period upto harvesting. For convenience all the woman labour employed was converted into standard mandays of eight hours on the basis of wage ratios. Thus 1.66 women days were considered as equivalent to one manday.

14. The total labour used per hectare in all orchards were 334.48 mandays in small, 371.77 mandays in medium and 327.94 mandays in large orchards. The proportion of family labour contribution was 59.67 per cent and that of hired labour was 40.33 per cent in small orchard, 30.01 per cent of family labour and 68.98 per cent of hired labour in medium orchard, and 25.17 per cent of family labour and 74.83 per cent of hired labour for large orchards.

15. The yield rate in lemon orchard varies with the size of orchard as well as age of the tree. During the initial bearing years 5th to 9th year age, the yield was 144.20 quintals in small orchard, 154.35 quintals in medium, and 155.75 quintals per hectare in large orchards. The yield was maximum from 16th year and remained constant upto the 29th year. The yield decreases from 30th year onwards.

16. The average yield of lemon was 195.57 quintals per hectare in small orchard, 210.76 quintals in medium and 228.59 quintals in large orchards.
17. The costs and returns of lemon were worked out by using cost concepts namely, cost "A", cost "B", and cost "C". The total cost of cultivation cost "C" was Rs.24,826.38 per hectare for small size orchards, Rs.27,051.09 for medium, and 25,238.31 for large orchard. The returns over cost "C" was 55,639.09 per hectare in case of small orchards, returns over cost "C" represent the net returns of cultivators over total cost of cultivation.

18. The highest cost "C" was observed in medium orchards, this was due to fact that the labour cost was more in medium orchards. The average gross returns were increased with the size of the orchards, this was due to the more use of variable inputs like farmyard manure and plant protection chemicals.

19. The annual costs per hectare in all the orchards increased from first year to fourth year, from the fifth year the costs remained constant upto the 40th year which were Rs.19,897.17 per hectare in small, Rs.21,795.09 in medium and Rs.21,060.83 in large orchards.

20. The annual returns on the other hand decreased from the first year to the fourth year. When the orchard starts yielding the returns were increased from 5th year to 16th year. The returns were maximum from 16th year and remained constant upto the 29th year, from 30th year the returns were decreased upto the 40th year.
21. The net returns per hectare in all the orchards were negative in first four years. The net returns increased from 5th year 16th year, and net returns maximum from 16th year and remained constant upto 29th year. From 29th year the net returns decreased to Rs.65,152.84 in small orchard, Rs.73,334.91 in medium and Rs.74,384.17 per hectare in large orchards. The annual cost per hectare in the small orchard were higher than those in medium and large orchards in the first four years mainly because, the farmers with small orchards practiced intensive cultivation for the intercrops. The least annual cost during gestation period was in large orchards due to extensive cultivation adopted by them.

22. When the annual net returns were discounted at 14 per cent discount rate the net present value in the large orchard was more than the medium and small orchards. This is because of the two important factors Viz., a) the initial investment in large orchards per hectare were lower than in medium and small orchards b) the annual returns were higher in large orchards.

23. For evaluating the investments in lemon orchards the standard tests were used. They are net present value, benefit-cost ratio, internal rate of return, and pay back period. The analyses were done for small, medium and large orchards separately.

24. The annual net returns were discounted at 14 per cent discount rate, the net present values were Rs.253,956.10 in small orchard, 295,053.20 in medium and 3,02,619.47 in large orchards.
25. The benefit-cost ratios were 3.59, 4.46 and 4.71 in small, medium and large orchards respectively. The discounted benefit-cost ratio indicates the net return per rupee of investment in projects or enterprises. The internal rate of return was 23 per cent in small, 28 per cent in medium and 29 per cent in large orchards. The internal rate of returns were higher than the discount rate (14 per cent) considered in the analysis. The pay back period was 6.02 years in small, 5.70 years in medium, and 5.63 years in large orchards.

26. All the four criteria of project evaluation Viz., net present value, benefit-cost ratio, internal rate of return and pay back period indicated that, investment in lemon orchards was financially feasible proposal for all the size groups of orchards.

The sensitivity analysis was carried out to know the sensitivity of the lemon cultivation to risk factor. The following were the norms to measure the risk.

a) 10 per cent increase in costs.

b) 10 per cent decrease in returns and

c) 10 per cent increase in costs and 10 per cent reduction in returns.

27. Even with the sensitivity analysis, the net present value was positive, benefit cost ratio was more than unity, and internal rate of return was more than the discount rate (14 per cent) in all the size groups of orchards.
28. An attempt is made to study productivity of resources involved in the production of lemon, by fitting Cobb-Douglas type of production function separately, for small, medium and large orchards. And results showed that land had maximum influence on gross returns of small, medium and large orchards. The regression coefficient for land was 0.88 in small, 0.80 in medium and 1.13 in large orchards, which were statistically significant at 1 per cent level. The regression coefficient of labour was non-significant in medium and large orchards. The negative regression coefficients were with respect to labour (-0.01) and plant protection chemical in small (-0.12) orchard, and with respect to farm yard manure (-0.03) in medium orchard.

29. The MVP of land was more than MFC (4.98, 7.99 and 21.01 in small, medium and large orchards respectively. This indicated that, there is a scope to increase the returns of lemon by using more land, and MVP of labour was more than MFC (4.99) in medium and (0.11) large orchards, and it was less than MFC in small (-3.10) orchards.

30. The MVP of farm yard manure was more than MFC in small (0.98) and large (0.48) orchards, where as it was less than MFC in medium orchards (-0.25), and the MVP of plant protection chemical was more than MFC in medium (0.62) and large (0.34) orchards, and it was less than MFC in small (0.01) orchards. The value of coefficient
of multiple determination (R²) were 0.68, 0.43 and 0.40 in small, medium and large orchards respectively, this means, 68 per cent, 43 per cent and 40 per cent of variation in dependent variable are explained by the independent variables.

31. It was a common practice of the lemon cultivator to sell the crop to the traders in the district market (Bijapur) through commission agents. None of them was found to sell the crop to the pre-harvest contractors.

32. There are three marketing channels were identified in the study area 1) producers to commission agent to wholesaler to Retailer to consumer 2) producers to commission agents to Retailers to consumers 3) producers to commission agents to processor to consumer. The producer himself brought the produce to the district market and it was sold through commission agents. It may be noted that the commission agent did not take title to goods. The producer paid them charges for the services, the produce so assembled at district market moves to different destinations.

33. Marketing costs are picking and grading, packing material, transportation, loading and unloading, commission in district market and commission to local agent. The per bag (35.kg) total marketing costs were Rs.45.09 for small, Rs.45.53 for medium and Rs.39.07 for large orchard owners. The major item of marketing cost
was transportation which accounts for 55.64 per cent in small, 52.62 per cent in medium and 58.87 per cent in large orchards. The next highest marketing cost was commission which accounts Rs.36.03, Rs.35.34 and 31.76 per cent in small, medium and large orchards respectively.

34. Average monthly arrivals and prices in Bijapur market during the period from 1983-84 to 2002-03 was calculated. The highest arrival was 31907.08 tonnes in the month of August. The maximum price prevailed in the market was in the month of April and the price per bag (35 kg) of lemon was Rs.378.05 in the market, where as the minimum price was in the month of July (Rs. 153.00).

35. The trend value of arrival was maximum in the year 2002-03. It was 124608.21 in the market and the trend values of prices in the market had increased upto 311.74 and was maximum during 2002-03. the annual market arrivals and prices had an increasing trend in Bijapur market. The rate at which the arrivals and prices increased are 6282.78 and 6.84 respectively.

36. The higher indices of market arrivals of lemon were observed in the month of June, July, August and September and lower indices in the month of January, February, March, April and May. In the case of price indices, the lower indices were observed in the month of January, June, July and November and higher in the month of February, March, April and May.
37. More than seventy per cent of the lemon cultivators in all the category have expressed about the scarcity of water during summer as the main problem. The non availability of labour was problem with large orchards owners i.e. 70 per cent very few of small farmers (17.80%) have expressed about non availability of labour and 50 per cent of the medium farmers .Lack of technical guidance was the main problem for the production. Which was 81.20 per cent of small farmers, 64.50 per cent of medium, and 42.85 per cent of large farmers. In adequate availability of manure was the main problem with the small farmers (60%) 51.20 per cent of medium farmers and few of large (12.85) farmers have expressed about the inadequate availability of manure.

38. Absence of processing facility, absence of cold storage facility. Fluctuation in prices of lemon. Almost 100 per cent of the farmers have expressed these problems. Absence of co-operative marketing for lemon was expressed by 35.60 per cent of small farmers, 42.22 per cent of medium farmers and 40 per cent of large farmers. Non availability of packing material at a reasonable price was expressed by 40 per cent, 30 per cent and 20 per cent of small, medium and large orchards respectively. Very few of them expressed about difficulty in transportation.
Conclusions:

The cost of establishment was higher in the small orchards followed by medium and large orchards. And maintenance cost was higher in small orchards compared to medium and large orchards. Among the total variable cost per hectare the labour cost contributed the major portion i.e. more than 70 per cent. The net returns in large orchards i.e. returns over cost “C” which were higher than those in medium and small orchards. These were due to high yields per hectare in large orchards, followed by medium and small orchards. The net present value benefit-cost ratio and IRR of investments were higher in large orchards, whereas the payback period was lower than small and medium orchards. The functional analysis for small, medium and large orchards revealed that, 68.00 per cent 43.00 per cent and 40.00 per cent of the variation in lemon production was explained by the four independent variables included in the function. It was a common practice of the lemon cultivator to sell the crop to the traders in the district market through commission agents. None of them was found to sell the crop to the pre harvest contractors.

All the four criteria of project evaluation techniques namely, Net Present Value, Benefit-Cost Ratio, Internal Rate of Return and Payback Period indicated that, lemon cultivation in Bijapur district is economically feasible and financially sound proposition.
Suggestions:

1. An in-depth study is needed regarding the relationship between availability of water and extent of orchards. That can be maintained keeping in view the rain fall pattern and availability of water particularly during critical period which will help the farmers in taking decision.

2. In order to augment the supply of nutrients through organic manure it was found necessary to improve the quality of organic manure by adopting scientific procedure to prepare farm yard manure. In addition growing of green manure crops on the orchards found to be necessary to augment the organic manure.

3. Since there is no processing unit and scientific storage facility in the study area, the farmers are compelled to sell their produce immediately after harvest. Hence there is a need to establish these facilities so that farmers can get remunerative price for lemon.

4. Adoption behaviour of farmers depends on the extent of contact with extension agency Hence, the field extension staff of Department of Horticulture should be strengthened to play a prominent role in educating farmers about lemon cultivation on profitable lines.

5. Majority of the lemon growers of the area have expressed low prices during rainy seasons, scarcity of water and irregular supply of
electricity as constraints. Hence, the concerned authorities must help the farmers to find solutions to these constraints.

6. As indicated by the resource use efficiency measures (MVP:MFC), the resources like Plant Protection Chemical (P.P.C), human labour and farm yard manure were over utilized by the farmers in the study area, which brought unnecessary huge expenditure. Hence the cultivators should adopt recommended package of practices which in turn would result in increasing the return by minimizing the costs. For this it is advisable to educate the lemon cultivator for this an intensive training is necessary. Which can be provided by Horticulture, Agriculture departments.

7. The study revealed that major proportion of human labour was used for irrigation of lemon crop, hence there is a need to encourage the farmers to adopt drip irrigation method which is somewhat costly but most labour saving method of irrigation.

8. As indicated by the benefit-cost ratios, large orchards have showed more economies of scale (3.59, 4.46) than small orchards. Hence, cultivators have to cultivate at least one hectare of plantation, wherever irrigation facilities are available.

9. As indicated by financial measurements the investment made on lemon cultivation was found to be financially feasible. The other
farmers can also undertake lemon cultivation as it is more profitable. For that they can avail loans for establishing the orchards at the prevailing the rate of interest charged by the financial institutions.

10. Marketing co-operative society should be established exclusively for the marketing of lemon and other horticultural products to collect and transport to distant markets like, Bangalore, Bombay and Hubli. This would help in minimizing the transportation cost and getting better prices for the lemon in these and other far off markets.

11. Lemon cultivators were unable to get the adequate planting materials (budded plants) in the study area. Therefore, farmers should be encouraged to prepare their own planting material. For this the training and financial assistance should be provided.

12. Government should provide crop insurance facilities and minimum support prices to provide security to the lemon cultivators.

13. To strengthen the lemon cultivation there is an urgent need to strengthen lemon cultivation by providing adequate financial facilities, particularly to the small and medium farmers in Bijapur district.

14. In order to reduce the packing cost modern packing materials should be used.

15. Government should provide proper road network. Road transport facilities should be improved so as to reduce the transport cost.
16. There is a need to set up proper co-operative societies and provide market information among the lemon growers.

17. There is much export like pickle etc., of lemon and lemon products. It can earn more foreign exchange. There is much scope for home industries in rural areas and employment opportunity increased. Hence for this there is the necessity of cold-storage facilities and encouragement of export of lemon and lemon products.