Chapter - 6
SUMMARY & CONCLUSION
Coconut is an important field crop contributing over Rs. 7,000 crores annually to the GDP of the nation (GOI, 1998). Kerala, accounting for only one per cent of the total land area of India, contributes about 57 per cent of the coconut area and 47 per cent of coconut production (Ohler, 1999), and thereby occupies an outstanding position in the coconut map of the country. But, by 1998, her share in the national production has halved from 70 per cent. Productivity of coconut in Kerala is found to be fluctuating very much over the years and is now the lowest among the major coconut cultivating states of India (GOK, 2001a). Productivity in Kerala in terms of number of nuts produced per palm is abysmally low (Ohler, 1999). Under these circumstances, present study makes an attempt to understand the performance of the crop over the years and also carries out an economic analysis of coconut cultivation with particular reference to the profitability and productivity aspects.

The study is in the neo-classical frame and has two dimensions. First, it is a study of the performance of the crop (in terms of area, production and productivity) over the years, using time series data. Secondly, it is a study on the production and productivity aspects of coconut using primary data.

Analysis of time-series data categorically asserts the dominance of area effect of coconut output growth in Kerala over the yield effect. Two phases of growth have been discerned by the analysis of the trend of coconut
production. Trend analysis for the two sub-periods revealed that the performance of coconut in the two periods is not identical in nature. Area effect is identified as the major component of coconut output growth in the state in both the sub-periods. Coconut has become the crop occupying the largest share of net sown area in the year 1999. Correlation studies ascertained that coconut area in Kerala has expanded at the expense of paddy and tapioca lands. But, in a densely populated state like Kerala where the per-capita availability of land under cultivation is 0.077 hectare only (GOK, 2001a), output growth of coconut should be based on growth in productivity rather than on an expansion of area. Thus, a rigorous analysis of the productivity aspects of coconut cultivation in Kerala along with the major constraints encountered by the coconut cultivators in attaining the potential yield levels (as perceived by them) are dealt with in the remaining chapters.

Stratified multi-stage random sampling design is employed for the collection of primary data. The survey has been conducted among a sample of 300 coconut cultivators belonging to six different panchayats of three districts taken from three different agro-climatic regions. A first-hand analysis of the primary data provides an assessment of the farming behaviour of coconut farmers of Kerala. West Coast Tall is found to be the dominant variety in Kerala constituting 87.71 per cent of the total palm population. The insights gained by our discussion with the coconut cultivators enabled us to understand that their preference for WCT is due to their experience of the dependability of WCT in giving uniform yield under average management conditions, withstanding adverse climatic
conditions and tolerance to the common pests and diseases. Komadan and hybrid are also cultivated in considerable shares in 'problem region', accounting for 14.90 per cent and 10.65 per cent respectively of the total palm population. Contrary to the existing notion that the small size of coconut holdings makes it uneconomical to the owners to invest large amounts on irrigation, 59 per cent of the coconut farmers are found to be resorting to regular irrigation in their coconut gardens. Density of coconut planting is found to be varying across the agro-climatic regions and it is found to be altering with the size of land holdings also. It is also observed that owners of smallholdings do not follow recommended spacing of palms. Region-wise analysis shows that per acre density of coconut is maximum in southern region (119) and lowest in northern region with 77 palms per acre. A larger number (60.33 per cent) of coconut cultivators of Kerala is found to be practising inter/ mixed-cropping in coconut gardens and a majority among them are observed to be belonging to the category of small holders. Thus, small holders are intensively utilising the coconut lands by adopting a denser planting as well as inter/mixed cropping so as to augment the total returns from the coconut gardens. While 76 per cent of the cultivators are inter/ mixed-cropping their coconut gardens in the 'problem region', only 42 per cent are having inter/mixed-crops in their gardens in northern region. An important reason for the higher percentage share of coconut cultivators adopting inter/mixed-cropping in the problem region is the high prevalence of root (wilt) disease in this region and the possibility of reducing the intensity of the disease by inter/mixed -cropping.
Information pertaining to the cost of cultivation and returns has been collected for palms of different age groups, namely, pre-bearing, bearing, full bearing and senile. The average per acre variable cost of cultivation (cost A) of coconut in Kerala during the pre-bearing stage is Rs.597. The average annual cost per acre at the bearing stage amounted to Rs.1350. Hired labour, manure and fertilizer accounted for most of the annual cost during this stage. Average annual cost increased to Rs.2926 when the palm reached the full bearing stage and a decline in costs to Rs.280 is observed at the senile stage of the palm. ‘Hired human labour’ is found to be the most prominent item among the various cost components of coconut cultivation. While a larger share (64.99) of the coconut farmers is found to be using manures regularly, only a smaller proportion of 31.67 per cent of the coconut cultivators are applying chemical fertilizers. This could be due to the fact that though the coconut cultivators are quite aware of the role of chemical fertilisers in boosting the level of coconut productivity, farmers are apprehensive of the sustainability of the higher yield levels if there occurs a break in the application of fertilisers. Moreover, costs of plant protection and seedling charges are found to be nominal. Survey results also show that 91.33 per cent of the farmers maintain on-farm nurseries.

Fifty nine percent of the farmers in the state of Kerala are irrigating regularly their coconut gardens. Among the three regions, problem region is identified as the region having the lowest number of irrigating coconut cultivators (24 percent). Majority of the irrigating farmers are having irrigating structures and hence not depending on manual irrigation.
Both palm benefits (returns accrued from nuts as well as by-products) and farm benefits (constituting palm benefits and returns from intercrops) have been computed in order to have a fuller view of the benefits from the palm. Significant regional variations are observed in the cost of cultivation of coconut. Total cost of cultivation is found to be the highest in southern region and lowest in northern region. Significant variations in cost components (except for the seedling cost) are also identified between regions. Farmers in the northern agro-climatic region are observed to be realising the highest net returns from coconut cultivation. This could partly because of the lower operational cost and comparatively higher yield per palm in this region. While the percentage share of palm benefits to farm benefits does not show much variability among regions from the state average of 88.66 per cent, the percentage share of net-returns from palm to net-returns from farm vary drastically, with southern region reporting 58.71 per cent, ‘problem region’ 75.62 per cent and northern region 90.80 per cent. The share of intercrop cost to total cost is found to be 5.45 for southern region, 7.11 for ‘problem region’ and 10.38 for northern region, whereas, the share of benefits from intercrop to gross returns is reported to be 11.62, 11.76 and 9.79 respectively for these regions.

Profitability position of coconut cultivation is assessed with the help of benefit-cost ratio with and without intercropping. Benefit-cost ratio of coconut is found to be the lowest in the southern region and highest in the northern region. Though southern region has the highest returns from coconut cultivation, benefit-cost ratio is found to be the lowest in this region, owing to
the high cost of cultivation. Benefit-cost ratio computed for the state with

cost C (excludes rent of land), arrives at, is only 1.43, which is too low to lure
either new farmers towards the cultivation of coconut or the existing coconut
farmers to bring additional land under the crop. A slight improvement in this
ratio is observed in the state as well in the regions (excepting the northern
region) when costs and benefits from intercrops are also included. The decline
in the benefit-cost ratio in the northern region implies that intercrops in this
region are not as remunerative as that of coconut.

Regional productivity status of coconut cultivation shows that

per palm yield is highest in northern region (41 nuts) and lowest (32 nuts)
in the problem region. Per-acre yield is found to be the highest in southern
region (4245 nuts per acre). Variables having a linear association with
coconut production have been identified, by using simple correlation method
and eight variables have emerged to be significantly related to palm benefit.
Contribution of these inputs towards palm benefit has been ascertained by
resorting to multiple regression, which established that only six variables
could jointly contribute significantly to the variability in palm benefit.
Region-wise resource productivity of palm benefit has been measured using
Cobb-Douglas production model with four input variables, namely, fixed
capital, hired labour, ‘manure + fertiliser’ and spacing. Hired labour is the
lone input in all the three agro-climatic regions, which influence positively
and significantly the palm benefit, implying that palm benefit could be
enhanced by employing more labourers for regular cultural and agronomic
practices of the palm. The input spacing is found to be negatively influencing
the palm benefit in northern region indicating that a denser planting of palms in those farms with low density in that region could augment the palm benefit.

Since significant regional variation in palm benefits has been observed, the study sought to ascertain if this variation in palm benefits was a direct consequence of the varied volume of the inputs applied in different agro-climatic regions. The levels of application of inputs vary significantly from one agro-climatic region to the other. Considerable regional variation is observed in the amounts spent on hired labour. While southern region is spending the highest amount on hired labour, in northern region it is found to be significantly lower. The amounts allocated to fixed capital by southern and northern regions are significantly higher than that of the 'problem region'. Considerable regional variations are observed in the spacing of palms also. While the per-palm land allocation by farmers in northern region is 1.536 cents, the farmers of southern region plant them much closer (0.981 cents per tree). Significant variation between southern and northern regions is noticed in the application of manure and fertilizer.

Resource productivity of farm benefits has also been identified. Cobb-Douglas production model has been fitted to the farm benefit data with three input variables namely land size, intercrop cost and fixed capital. Land size is positively related to farm benefits in all the regions as well as in the state. Intercrop cost, which is the variable cost, incurred for the cultivation of intercrops shows a significant positive association with farm
benefit in the southern region, indicating that more farm benefits could be obtained by resorting to better cultural and agronomic practices in the farm as a whole. Fixed capital is found to be positively related to farm benefits in 'problem' region, implying that more farm benefits could be achieved by the setting up of pump sets, irrigation structures and other fixed assets in the form of farm implements in the coconut gardens in this region.

In order to identify the sources of regional variability in farm benefits Analysis of variance has been done, since significant regional difference in the per-acre farm benefits had been observed. Analysis of variance shows that there is a significant difference in land size among the regions. A significant regional variation is observed in the amounts invested on fixed capital also. No significant variation is observed between regions in the amounts allocated for intercrops.

Productivity index has been computed using Kendrick's Total Factor Productivity Index. Productivity indices reveal that northern region could be considered as the highest yielding region and the other two regions are on a par with each other.

Since much of the variations in output has been left unexplained by the production model and the pilot survey disclosed that the perception on the potential yield of the farmers is much higher than their actual yield, an analysis of the constraints encountered by the coconut cultivators to attain the potential yield levels has been made. Data on three dimensions of the constraints (numbering seventeen), namely, the proportion of area
under coconut that is plagued by the constraint, number of years since affected and severity code denoting the intensity of the constraint, are taken for the constraints analysis. Analysis of the composite index of the constraints (pooled) revealed no significant variation between regions. All the constraints except 'non-availability of chemical fertiliser', 'non-availability of pesticide' and 'poor quality seedling material planted', are perceived by the farmers to be severe in nature and are sustained in the farm for a long period and to a large extent.

**Findings and Recommendations**

The performance of the crop of coconut in the different districts of Kerala over a wide span of time has been scrutinised using three different growth models and the growth and instability of the crop during the period have been ascertained. This revealed, by and large, that the output growth of the crop is sluggish (at the rate of only 1.19 per cent during the period 1960-99). However, output growth of coconut in Kerala has been illustrated to be largely an offshoot of the area expansion - that too at the detriment of growth of other crops - rather than an increase in productivity. But in the context of Kerala, with a fast declining land-man ratio, the strategy for increasing coconut production should be productivity oriented one. In the absence of additional area that could be brought under coconut, improving and stabilizing the yield assumes a high priority task in the development agenda of the crop.

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Hired human labour appropriates the largest share among the cost components of cultivation of the crop. Resource productivity estimates also highlight the prominence of this input, as this was adjudged the most productive input applied in the coconut farm. Coconut, no doubt, is a crop that is highly sensitive to regular cultural operations. Increased demand for labour coupled with non-availability of skilled human labour for harvesting in time, shoots up the wages, which in turn, restricts the use of hired labour by the farmers. However, harvest labour which demands higher skill levels and higher wage rates remains an un-compromised component in the total labour, putting the resultant burden of the cut in total labour input almost fully on the other component of labour that is deployed for cultural and other managerial operations. This eventually turns out to be a direct casualty to the productivity growth of the palm. Harvesting machines, that is the machines that help the farmers or cheaper labour to climb the palms, hence become a bare essentiality. No machine hitherto designed and brought out is reported to be effective in combating this grave challenge of labour pressure. This warrants concerted and relentless research and extension efforts.

Level of education of the farmers is found to have its own impact on the yield level of their palms. The survey results do not also vindicate that the farmer’s education and attitude are too low to make themselves receptive to the new technologies that are made available to them. But the adoption level of many of the technologies, especially the use of pesticides and chemical fertilisers, are found to be woefully low, though majority of farms do warrant the application of these inputs very badly. The low rate
of adoption of such technologies is understood to be either because that these technologies had not been proved economical to them, or that an earlier test-adoption of it had failed to contain the menace effectively. As for the pests and diseases, a control measure taken locally in an isolated manner is bound to fail since the migration of pests and disease organisms from the infected neighbour-farms can not easily be checked in crops like coconut. A collective approach to tackle the pests and diseases problem of the farms would only yield the desired end. The farmers on the other hand should be more vigilant and sensitive to the pest and disease infestation of their palms and adopt the available control technologies in a collective and coordinated way, in tandem with the local coconut development council of the farmers and extension officials. The 'Group management of farms approach', which was successfully introduced and promoted by the state government in the late 80s, must be revitalised and popularised again. The large-scale extension of the concept of 'labour banks' should be explored in the light of the significance of labour emphasised by the study.

An important message of the study is that, though coconut is considered as a crop of varied uses and termed popularly as the "tree of heaven", economic significance of the crop has been dwarfed by limiting the use of palm as simply a nut yielder. Returns from coconut by-products show that coconut market does not appear to appreciate these products and the multi-product nature of the palm has not been harnessed to its fullest capacity. Since coconut farmers are not able to find out a viable market for by-products, local level agencies/organizations should make
necessary arrangements for channelising these by-products into other (state level) marketing organizations. Moreover, large-scale utilization of all palm products and their commercial exploitation by value addition is a possible avenue to be greatly explored. This will require the active involvement of coconut research and development agencies/organizations with adequate financial support.

Though coconut is a crop having a life span of more than seventy years and shares a substantive part of land and other resources with surrounding crops, the study could not acknowledge a corresponding contribution of these crops in the gross output of coconut farms. Moreover, much of the output of these intercrops is being consumed by the farmer-families themselves and hence fetches little cash inflows to them. Systematic and planned crop schedule was found to be lacking in a majority of farms. Though, diversity of crops in the coconut gardens is appreciable, they are grown in the coconut gardens not strictly with an economic motive. The package of practices recommendations of the Kerala Agricultural University also does not appear to address fully the specific needs, perceptions of the farmer and absorption potential of the local market. A separate package with this perspective therefore becomes highly imperative.