Chapter - VIII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A brief summary of the findings derived in the previous chapters are presented here to draw appropriate conclusions and suggestions.

The story of arecanut chewing dates back to antiquity. Reference to arecanut is found in Rigveda Mandala (10) Suktha (145) more than 4000 years ago. Innumerable references are found in several ancient Sanskrit texts to the areca palm, the arecanut and its uses. Among most important one quoted is being Anjana Charitha by Sisumayana (B.C. 1300) and also references are made in Sisupalavadha by famous Sanskrit poet (650 B.C. not later than 900 B.C.) and Amarakosha etc.

In Ajanta caves in central India from 2nd century B.C. to 9th century A.D. certain extremely artistic picture of areca palm is made in cave no. 17. In padmapani cave areca palm provides a backdrop to Bodhisattava Padmapani in cave no.1.

The five natural aromatics connected with betel chewing is mentioned in ancient texts of ayurvedic medicine Dhanvantari Nighantu, are which includes piper chaba, puga, clove, nutmeg, camphor. Areca nut is rich in several essential nutrients and it is supported by the research work carried out by the central Food Technological Research Institute, Mysore.

The medicinal values of arecanut is immense and is used in the following ailments. Urinary stones, Heart burn, Jaundice, Flutulence of the abdomen, Abdominal colics, Dysentry, Diarrhea, Leucoderma,
Leprosy, Cough with phlegm Anamia, Nasal ulcers, used as an universal antidote in emergencies, as an antihelminthic in dogs.

The arecanut palm, Areca catechu Linn is the source of common masticatory nut popularly known as arecanut, betel nut or supari. It is extensively used in India by all sections of the people as a masticatory, and is an essential requisite for several religious and social ceremonies. Consequently arecanut occupies commercial, economic, religious, cultural and medicinal importance in India. The arecanut palm occupies a prominent place among the cultivated crops in the states of Karnataka, Kerala and Assam are the largest producers of arecanut in India, other producing states are West Bengal, Maharastra and Andhra Pradesh.

Many of the arecanut farmers have this crop as the only source of income. In this context diversifying arecanut farming with other crops such as banana, pepper, cocoa, clove etc. which are all high cash value crops which will be more helpful for the farmers.

The cultivation of areca palm providing livelihood more than 5 lakh farm families in Karnataka, majority of these are small farmers and landless labourers. It provides assured employment opportunity to the extent of 5 crore mandays is created in its cultivation annually in India.

In Karnataka the total area under arecanut cultivation in 1998-99 was 98.047 hectares and arecanut is being cultivated in Dakshina Kannada(22.13%), Shimoga (19.54%), Chickmagalur (12.87%), Uttara Kannada (9.92%) out of 98,047 hectares of areca land in 1998-99.
The percentage of area under arecanut cultivation has increased by 0.796% in Dakshina Kannada, 16.00% in Uttara Kannada and 49.26% in Shimoga district between 1990-91 to 1998-99.

Shimoga district recorded the highest increase in area under arecanut cultivation in the last decade (1990-91 to 2000-01) as compared to other districts.

In the intention of getting an additional income in the first stage the areca growers chose growing banana as an intercrop and in the second stage pepper and cocoa as mixed crops.

The returns from intercrop and mixed crop will help the areca farmers to overcome the cost incurred in the areca cultivation and mixed cropping does not effect the yield of main crop rather it is beneficial.

Apart from the income from banana as an intercrop, pepper and cocoa as mixed crops, value added arecanut products such as ghutka has given a real boost to the arecanut economy in India.

When the era of value addition started large scale of industrial processing of arecanut with diversified products in attractive packets and labels such as scented supari, pan masala, herbal supari, kaju supari and ghutka flooded the Indian retail market.

This enhanced the choice and convenience for the consumers as a result of which the consumption of arecanut especially in northern states such as Uttara Pradesh, Gujarath, Delhi, Maharashstra increased by many folds.

As the value addition is the stated objective under our agricultural development policy, this in the case of arecanut is viewed
as a step in the right direction. This impact enhanced greatly the earning capacity of arecanut farmers in India.

Out of total production of arecanut in India 50% goes towards the preparation of ghutka and scented supari, 47% for panbeedas and remaining 3% for home consumption. One estimate says that around 2 crore people are consuming these products in India.

In a span of just 15 years from 1985 to 2000, area under arecanut cultivation in Karnataka has almost doubled and the increase in price for rawnuts has increased by 500%. It enabled even small farmers with below 01 hectare under arecanut to earn an assured income sufficient enough to lead descent living.

Average price for white chali variety reached as high as Rs. 13,000 qtls in the year 2000, the average yield of around 10 qtls. the farmers in the district could easily realise a net income of around Rs. 50,000 to Rs. 70,000.

As a result, the consumer durable such as two wheelars, TV, refrigerators, four wheelars which are otherwise confined only to the Urban upper middle class become common household items in the regions growing arecanut.

India is the largest producer of arecanut in the world. India stands first both in area (57%) and production (53%) of arecanut in the world. In India, Karnataka state stands first both in the area and production of arecanut when compared to other states.

In Karnataka among the 27 districts Shimoga district stands first in area under areca cultivation in 2002. In addition to this, Shimoga district recorded the highest increase in area under arecanut
cultivation in the last decade (1990-91 to 2000-01) as compared to other districts.

Apart from this Shimoga district comprise both traditional and non traditional areas of arecanut cultivation as compared to other districts. Further, Shimoga district very well represents all the stages of areca gardens (first, second and third stages) as compared to other districts. The above reasons made us to select Shimoga district as case study.

The Shimoga district for administrative purpose is divided into seven taluks and two sub divisions. Sagar subdivision and Shimoga sub division in which Sagar and Shimoga taluks were selected for the study as the traditional and non traditional areca gardens respectively.

From each sample taluk, four villages were selected. The major arecanut growing villages, having all the stages (first, second and third) and all the categories of farmers (small, medium and large) were selected for the study. From each village 25 sample farmers were selected randomly from each village equally from different farm categories and also from different stages of areca gardens.

Assuming the life span (economic bearing) of the areca palm as 50 years the present study has divided this period into three stages.

1. First stage (1 to 7 yrs.)
2. Second stage (8 to 40 yrs.)
3. Third stage (40 to 50 yrs.)

In all 48 first stage gardens, 36 second stage gardens and 16 third stage gardens were selected from each taluk.
The farmers of the sample villages were divided into three categories as small (up to 1 hectare), medium (1.01 to 2 hectares) and large farmers (above 2 hectares). This criterion is adopted by IRDP.

In order to study marketing Sagar and Shimoga markets were selected. The study has been carried out with the following objectives.

1. To study the cost of cultivation of arecanut among different categories of farmers in all the three stages.
2. To study the returns of arecanut among different categories of farmers in all the three stages.
3. To assess evaluation of investment in areca garden among different categories of farmers.
4. To study cost and returns of intercrop in the first stage/mixed crop in the second stage in areca gardens among different categories of farmers.
5. To study the marketing price spread effect of arecanut.
6. To make suitable policy recommendations in the light of analysis to influence the public policy.

**Hypotheses:**

The following hypotheses have been tested in the study.

1. The cost of cultivation of arecanut is more among large farmers as compared to medium and small in all the three stages in Shimoga district.
2. The returns of arecanut is more among large farmers as compared to medium and small in all the three stages in Shimoga district.
3. The large areca farmers are benefited more by cultivating intercrop/mixed crop as compared to medium and small in Shimoga district.

4. Areca nut plantation is economically viable among all the categories of farmers in Shimoga District.

To ascertain the influence of arecanut cultivation on the cultivation practices and socio-economic status of the arecanut farmers is made and it is evident from the analysis for the district as a whole and in both the taluks, the large farmers' socio economic status is better when compared to medium and small farmers.

Between the taluks all the categories of farmers of Sagar taluk is better when compared with the conditions of Shimoga taluk.

The cultivation practices of sample areca cultivators in the study area exhibits the different methods of cultivation adopted, types of irrigation, variety of seedlings, intercrops and mixed crops, method of processing, grading all these will have an impact on cost of cultivation and yield.

The method of cultivation in traditional areca growing area is markedly different from the methods adopted in non-traditional areca growing area.

The heavy monsoon, the broken hilly nature, steep and narrow valleys alternating with jungles and slopes are the special characteristics of malnad tract when compared to Shimoga taluk where arecanut gardens occupy large area of levelled fields and the rainfall is less. The important difference in cultivation is that of no prominence given to irrigation channel and almost discarding the
drainage channels. The cultivation of these gardens is neither so elaborate nor systematic as in the areca gardens of traditional taluk.

The weeding, light digging followed by application of fresh earth and farm yard manure, mulching, selection of seeds makes the difference between the traditional and non-traditional growing area.

All the sample farmers in both the taluks will grow banana as a intercrop in the first stage basically for the shade and for the improvement of subsoil moisture and to get some additional income, but in the second stage pepper and cocoa will be grown as mixed crops in traditional and non-traditional area respectively in their areca gardens to get substantial additional income, which will help the areca farmers in the study area to maintain the areca garden in the second stage.

The majority of sample farmers in the study area will market their produce through APMC, Co-operative societies and few of them sell their produce in the local markets.

The sample farmers of Sagar taluk are more efficient in adoption of cultivation practices and marketing of arecanut as compared to sample farmers of shimoga taluk.

In agriculture cost of cultivation definitely has its impact on yield from crop. Here an attempt has been made to estimate the cost of cultivation of arecanut garden in different stages with the help of information provided by the sample farmers of the study area in Shimoga district.

To establish an arecanut garden it requires huge amount of investment, as it is a perennial crop. Areca palm takes seven years to establish and start bearing economic yield in the gestation period.
During this period i.e. in gestation period, banana is grown as an intercrop mainly to provide shade to the young areca palm and to get some early returns in the study area. The banana suckers will be removed once the areca palm attains four years of age.

In the second stage of the arecanut garden i.e., 8-40 yrs in the study area the farmers grow pepper and cocoa as mixed crops to get additional income.

As it is already mentioned earlier that arecanut is a perennial crop, the cost of cultivation consists of establishment cost and maintenance cost. In the first stage of the garden it is the establishment cost which constitute considerable proportion of cost and at later stages it will be maintenance cost which becomes important, but both of them will have a bearing on yield from the crop. Hence the relative role of establishment cost and maintenance cost need to be examined so as to see which cost is most influential in determining the yield. For this purpose the analysis of cost of cultivation among different categories of farmers in two taluks is considered in the present study.

The establishment cost is one time investment on arecanut garden. The amount of establishment cost sometime determines the healthy growth of a plant and its yield. Thus it is necessary to examine it.

In the present analysis establishment cost consists cost incurred on land levelling, fencing, openwell, pumpsets, sprinkler, conveyor pipes, processing yard, interest on fixed capital, land revenue seedlings, red earth etc.
The maintenance cost consists items like wages paid to labourers, hiring costs of bullocks and machines, cost on chemical fertilizers, farm yard manure, green leaves, pesticides and insecticides, irrigation cost etc.

In the gestation period the total establishment cost of Sagar and Shimoga taluks and in the entire district the share of the first year establishment cost in highest because expenses made on irrigation infrastructure which includes open wells, pumpsets, sprinklers, conveyor pipes, pumphouse and for intensive labour is high.

The cost incurred on labour cost which includes activities like land levelling, digging of pits, planting the seedlings, irrigating the garden, application of organic manures and chemical fertilizers etc.

In the first year, the expenses incurred on hired machines is high for the preparation of land, whereas in Sagar taluk it is still higher as compared to Shimoga taluk because of geographical conditions.

Expenses made on nursery of seedlings have considerable impact on the economic bearing of the areca garden subsequently investment made from second year to sixth year on irrigation of the garden manuring, plant protection chemicals which inevitably includes labour cost also.

In the life of areca palm the sixth and seventh year is considered as the penultimate year, before which bears nuts hence fertilizers will be applied more in quantity. Hence in the gestation period the share of establishment cost as well as maintenance cost is considerably high as compared to second and third stages among all the categories of farmers.
In the gestation period, the average amount of investment per hectare in the study area is Rs.2,11,969.80 more than half of this constitutes maintenance cost. The establishment cost accounts for 37% of the total investment. The amount of investment per hectare varies among different categories of farmers. The percentage gap between establishment cost and maintenance cost is not as much as it is for the entire district. In case of large farmers per hectare investment, is more than the overall average for the district. Whereas in case of medium and small farmers category the average investment per hectare is less than the overall average investment. The investment made by the medium farmers is slightly more than the small farmers.

It is clear from the data that the proportion of maintenance cost is found increasing as the size of holding decreases. In other words, in case of small farmers the proportion of maintenance cost is more than the establishment cost. This ratio decreases with increasing size of holding. It means maintenance cost is more and establishment cost is less in case of small farmers and this gap declines with increasing size of holdings.

The talukwise comparison of the volume of investment depicts a different picture. In Sagar taluk the per hectare investment is much above the overall investment in the study area whereas in case of Shimoga taluk it is very much below the overall position. It may be concluded that farmers in Sagar taluk are investing more as compared to farmers of Shimoga taluk.

But in Shimoga taluk the percentage Share of establishment cost is more than the maintenance cost but this ratio is less in Sagar
taluk that means establishment cost is less than the maintenance cost in Sagar taluk.

Within the taluk the percentage share of establishment vs maintenance cost varies between different farm categories. For example, in Sagar taluk the share of maintenance cost is more than establishment cost. This share decreases as size of holding increases. It is evident that there is not much difference between small and medium farmers as regards the share of establishment and maintenance cost.

But it is totally different in case of large farmers where in the percentage share between the two costs is not much. For this it may be concluded that in Sagar taluk in case of small and medium farmers more money is spent in maintenance of areca farms than on establishment. Whereas large farmers in the same taluk spend relatively more on establishment of the areca farms. Such variation will have some impact on the yield from the palm.

In Shimoga taluk the investment picture is altogether different as compared to Sagar taluk. In this taluk percentage share of establishment cost is more as compared to Sagar taluk. It is on higher side in case of large farmers categories wherein the proportion of establishment cost is more than the maintenance cost.

This is the distinct feature of large farmers category in Shimoga taluk which is not found in the entire study area.

It is clear that the average per hectare investment is highest in Sagar taluk, and much less in Shimoga taluk when compared to entire study area. Another special feature of investment in the study
area is that per hectare investment by large farmers is much above the overall average investment for the study area in both taluks.

Among them it is found to be highest in Sagar taluk followed by the District and Shimoga taluk. Even the small and medium farmers in Sagar taluk are found investing more as compared to Shimoga taluk and the District.

In Sagar taluk in the first stage the large farmers invests more as compared to medium and small farmers. The total maintenance cost is also more when compared to total establishment cost among all categories of farmers.

In the maintenance cost all the categories of farmers made more investment on human labour followed by organic manures, cost on irrigation, interest on working capital, bullock power, on hired machines and plant protection chemicals.

In the establishment cost medium and large categories of farmers made more investment on irrigation infrastructure, followed by land levelling red earth, fencing, land revenue, interest on fixed capital, processing yard, seedlings.

Whereas in small farmers category in the total cost the share of seedlings is little higher than land revenue, interest on working capital and processing yard.

The expenditure made on total maintenance cost is high among large farmers as compared to other categories of farmers. Large farmers have made more expenditure on human labour, chemical fertilizers, manures, irrigation cost with interest on working capital, plant protection chemical as compared to medium and small farmers. The total establishment cost is high among large farmers as compared
to remaining categories of farmers. Because they have made more investment on irrigation infrastructure that too sprinkler and conveyor pipes.

Whereas in Shimoga taluk the total establishment cost is higher than the maintenance cost among large farmers category as compared to other categories of farmers as they have made more investment on irrigation infrastructure.

In the maintenance cost small farmers have made more investment on human labour followed by irrigation and interest on working capital, organic manures with chemical fertilizers, bullock power, hired machines and plant protection chemicals whereas medium and large farmers have made more investment on human labour, irrigation cost, interest on working capital, bullock power in combination with hired machines, farm yard manure, green leaves, chemical fertilizers and plant protection chemicals.

In the establishment cost all the categories of farmers invested more on irrigation infrastructure i.e. openwell, pumpsets, sprinkler, conveyor pipes, pumphouse followed by land levelling, red earth, fencing, land revenue in combination with interest on fixed capital, processing yard and seedlings.

The expenditure made on total maintenance cost is high among large farmers as compared to other categories of farmers because they made more expenditure on all components of maintenance cost.

In the district in the total establishment cost all the categories of farmers have made more investment on irrigation infrastructure, land levelling, red earth, fencing, land revenue, interest on fixed capital, processing yard in this order.
All the categories of farmers in their respective maintenance cost made more expenditure on human labour, organic manure, chemical fertilizer, irrigation cost and interest on working capital, bullock power, hired machines and plant protection chemicals in this sequence.

In the second and third stages in Sagar taluk large farmers invested more as compared to medium and small. The total maintenance cost is more as compared to total establishment cost.

In the maintenance cost all the categories of farmers made more investment on human labour followed by organic manures, chemical fertilizers, irrigation cost, interest on working capital and plant protection chemicals.

All the categories of farmers in their respective establishment cost have made more investment on red earth, interest on fixed capital and land revenue which is comparatively negligible.

The expenditure incurred on total maintenance cost is high among large farmers as compared to remaining categories of farmers as larger farmers invested more on all components of maintenance cost.

In considering the total establishment cost, among large farmers it is high compared to other categories of farmers because of the same reason, where the investment is more on red earth, interest on fixed capital and land revenue.

Whereas in Shimoga taluk in second and third stage large farmers invested more when compared to remaining category of farmers. Further in comparison with the maintenance cost the establishment cost is negligible among all the categories of farmers.
In the maintenance cost, small, medium and large farmers have made major investment on human labour followed by irrigation cost, interest on working capital, organic manures, chemical fertilizers and plant protection chemicals.

In the total maintenance cost the expenditure made is high among large farmers category as compared to other categories of farmers, because of large farmers made more investment on various components in the maintenance cost.

In the entire study area within the maintenance cost all the three categories of farmers invested more expenditure on human labour, organic manures, chemical fertilizer, irrigation cost with interest on working capital and plant protection chemicals in that order.

Large farmers made more investment in both the stages as compared to medium and small categories of farmers.

In conclusion the overall investment in both the taluks declined considerably from second to third stage of areca garden among all the categories of farmers.

In the gestation period the areca palms are in growing stage and they will not yield any income till they, attain 4 to 5 years and they start bearing economic yield from the sixth year. During this period farmers have to invest on areca garden without any remuneration. Therefore, to supplement their investment most of the farmers grow an intercrop. Such intercrop not only bring income to farmers but also act as shade to the young areca plants. Basically banana will be grown as a intercrop to give shade to the areca plants in turn they will get income from the intercrop.
Therefore an assessment is made to see how much money is invested on intercrop and what is the return from such an intercrop such an analysis will enable us to know, how far the intercrop will help farmers economically.

The average amount of investment on intercrop per hectare in the study area is Rs. 44,760.83. The amount of investment per hectare varies among different categories of farmers. For eg. in case of large farmers the per hectare investment is more than the overall average for the district.

The talukwise comparison shows that in Sagar taluk the per hectare investment is much above the overall investment in the study area.

With respect to Shimoga taluk it is very much below the overall position. From this it may be concluded that farmers in Sagar taluk are investing more as compared to Shimoga taluk.

From the analysis made it is clear that the average per hectare is highest in Sagar taluk and much less in Shimoga taluk when compared to entire study area.

A special feature of investment in the study area is that per one hectare investment by large farmers is much above the overall average investment for the study area in both the taluks. Among large farmers' category it is found to be highest in Sagar taluk followed by district and Shimoga taluk.

Even the small and medium farmers in Sagar taluk investing more as compared to Shimoga taluk and the district.
It is evident from the analysis that investment by small, medium and large farmers in Sagar taluk is much more than the same in other taluk and the district as a whole.

In Sagar taluk the investment per hectare made by small farmers is almost equal to the investment made by large farmers in Shimoga taluk. It evidently shows the average investment by all categories of farmers in Sagar taluk is much more than the Shimoga taluk.

It is evident that small farmers in Shimoga taluk are found investing least on intercrop as compared to others and further cost of cultivation of intercrop showed increasing trend with the increase in the size of farm holding.

Mixed crop is grown in the second stage in the study area. This crop is grown under the shade of areca palm. For this farmers spend some extra amount and it will bring some additional income to farmers. Hence an assessment is made on the cost of cultivation of these crops and the yield from this crop so as to see the benefit of cultivating arecanut by the farmers.

The average amount of investment per hectare on the mixed crop in the study area is Rs. 31,405.83. The investment per hectare varies among different categories of farmers. For instance large farmers per hectare investment is more than the overall average for the district and also it is clear from the analysis made that the investment increases as the size of holding increases.

In Sagar taluk the per hectare investment is much above the overall investment in the study area whereas in case of Shimoga taluk it is very much below the overall position. From this it may be
concluded that farmers in Sagar taluk are investing more as compared to farmers of Shimoga taluk.

In the analysis made it is clear that the average per hectare investment is highest in Sagar taluk at the same time it is less in Sagar taluk when compared to entire study area. A special feature of investment in the study area is that the per hectare investment by large farmers is much less in Shimoga taluk when compared to entire study area.

Another unique feature of investment in the study area is that the per hectare investment by large farmers is much above the overall average investment for the entire study area in both the taluks.

Among large farmers it is found to be highest in Sagar taluk followed by the district. The medium farmers are found investing more as compared to small category of farmers in Shimoga taluk and the district.

It may be concluded that the investment made by small, medium and large farmers in Sagar taluk is much more than the same in other taluk and the district as a whole.

It is observed in Sagar taluk, the per hectare investment made by small farmers is almost equal to the investment made by medium farmers in Shimoga taluk.

It clearly shows the average investment made by all categories of farmers in Sagar taluk is much more than the farmers of Shimoga taluk.

It is also clear that small farmers in Shimoga taluk are found investing least on mixed crop as compared to others.
The following observations are made why large farmers in the study area of both taluks in all the three stages invest more as compared to medium and small.

The cost of cultivation depends upon the method of cultivation. The cost of cultivation is considerably high among large farmers as compared to medium and small in all the three stages.

Higher investment made on cultivation definitely has its impact on the yield of areca garden. Large farmers adopt planned and scientific cultivation practices followed by better management.

The large farmers' socio-economic background is high with higher educational status and contacts and with, good mass media participation and above all better withstanding capacity in unforeseen conditions and in times of price fluctuations.

Usually large farmers made more investment on irrigation infrastructures, on sprinklers, conveyor pipes with good manuring practices associated with mulching.

Large farmers' resource use management is better than medium and small. They will make use of plant and animal wastes to increase the yield per hectare and even the liquid manuring after filtering will be given to the garden through sprinklers. At the same time they will maintain the fertility of the soil by green leaf manure, mulching and conduct soil testing and counseling with agricultural experts etc. with scientific manuring and good irrigation practices. Further they will take utmost care to increase economic bearing of areca garden and they will keep the garden cool and tidy by maintaining soppina betta and gomala and planting trees at the edge of the garden to withstand the winds and from the sunscorch.
From the analysis it is proved that farmers of Sagar taluk are investing more as compared to farmers of Shimoga taluk because the cost of investment incurred on preparation of land for establishment of the areca garden, seed nursery, irrigation infrastructure, proper manuring, mulching and human labour.

Apart from that selection of suitable area for establishment of the areca garden, fencing, selection and rising of areca nursery, proper preparation of pits followed by trenches, drainages in and around the garden for the flow of excess seepage and rain water, deweeding, periodical manuring, mulching, giving red earth, using slurry as a liquid manure and will be fed to the garden throw sprinklers. The recycling of plant and animal wastes, moreover proper economic usage of land area by adopting intercropping and mixed cropping for economic feasibility. They will take atmost care in preventive measures against pest and diseases periodically.

Apart from this the involvement of human labour in the agricultural practice for manual works in the agricultural practices taken into account. Because human labour is the most important factor which is of primary importance in increasing the production in traditional agriculture. The basic input in production process is human labour.

In Sagar taluk human labour involvement is high because for the following reasons. They are involved in land levelling, fencing, trench, drainage in and around the areca garden, seednut selection, raising and maintaining the nurseries, digging of pits, planting, irrigation maintenance of the garden, application of manures, fertilizers, plant protection chemicals, likewise cultivation activities and supervision etc.
Areca cultivation in Sagar taluk is the way of life as they were cultivating areca since a very long time, and there is no scope for alternative crop to grow apart from areca except intercropping and mixed cropping due to geographical and climatic conditions. Hence they are taking proper care regarding the areca crop.

At the same time some observations is made to bring out the salient features why low investment is made by the farmers of Shimoga taluk as compared to counterparts farmers of Sagar taluk.

Basically farmers of Shimoga taluk are not traditional growers of areca they have not adopted systematic plant cultivation practices in selection of site, proper fencing, selection of nut variety, raising of nursery etc. basically the farmers of Shimoga taluk are the paddy and sugarcane growers, but in recent decades those fields are presently converted into areca garden in the recent decades.

As arecanut is exclusively seed propagated crop. Being a perennial crop it is essential that adequate care is bestowed in the selection of proper planting material.

Four important factors to be observed in selection and raising of arecanut seedlings.

1. Selection of mother palm.
2. Selection of seed nuts.
3. Selection of proper technique in germination and raising seedlings.
4. Selection of seedlings.

There is no proper drainage and trenches. Agricultural (cultural) operations are not followed intensively.
There is no soppinabetta and gomala in Shimoga and moreover the land owners are all absentee landlords because the supervision will be done from their managers or local farmers.

The important factor is the crop is not suitable to local soil and climatic conditions. Due to the fluctuations in areca prices the farmers of Shimoga taluk do not give sole attention towards the establishment and maintenance cost as they are getting main income from other sources. Because they are all professionals either in medical, in engineering or merchants, contractors, lecturers, and retired officials. Hence the income from areca cultivation is secondary to them.

In the present study correlation co efficient is carried out to check for multicolliniarity among the important variables to know.

i. Whether there is any correlation between the variable.

ii. Whether the correlation is positive or negative.

**Sagar taluk**

The correlation co efficient of maintenance cost among various farmers category in Sagar taluk is made. It reveals that all the variables in the equation are highly positively correlated with the total maintenance cost. This indicates that all the variables influences the total maintenance cost.

Within the total maintenance cost all the variables are positively correlated with each other at 1% level of significance.

In Sagar taluk all categories of farmers made more investment on total maintenance cost, in which the dominant variables are human labour, farm yard manure, green leaves, chemical fertilizer,
cost on irrigation with interest on working capital, bullock power, hired machines and plant protection chemicals.

The large farmers in Sagar taluk have made more investment on farm yard manure, green leaves, chemical fertilizers as compared to medium and small farmers in the study area.

Human labour is the highly dominant variable in the maintenance cost among all the categories of farmers, as they are involved in the application of farm yard manure green leaves and chemical fertilizers etc.

**Shimoga taluk**

Statistical analysis with respect to the correlation co-efficient of maintenance cost among various farmers category in Shimoga taluk shows that total maintenance cost is positively correlated with all the variables in the equation at 1% level of significance.

Within the maintenance cost all the variables are positively correlated with each other at 1% level of significance.

In Shimoga taluk, in the maintenance cost the dominant variables are human labour, irrigation cost, farm yard manure, chemical fertilizers, bullock power, machines hired, plant protection chemicals respectively.

As in Sagar taluk in Shimoga taluk also human labour is the dominant variable in the maintenance cost.

**The District**

In Shimoga district the statistical analysis with respect to correlation co-efficient of maintenance cost among various farmers
category reveals that, the maintenance cost is positively correlated with all the variables in the equation at 1% level of significance.

Within the maintenance cost all the variables are positively correlated with each other at 1% level of significance.

In Shimoga district in the maintenance cost the most dominant variable is human labour. Next dominant variables are farm yard manure, green leaves, chemical fertilizers, irrigation cost, bullock power, machines, hired, plant protection chemicals respectively.

In conclusion from the analysis made, there is significant correlation between the variables among the various farmers category in both the taluks in the study area and highly positive correlation is existing between the variables in the maintenance cost.

Multiple Regression is applied to analyse the significance of different variables in the present study and how these variables influence the total maintenance cost. At the same time it will enable us to understand which is the dominant variable in determining the yield of areca and intercrop / mixed crop.

**Sagar taluk**

In Sagar taluk multiple regression of maintenance cost among various farmers category is applied.

The analysis reveals that among small, medium and large farmers category all the variables are dominant at 5% level of significance in the maintenance cost. The R square value for small and medium farmers is 99% each and for large farmers 100%.

In the maintenance cost dominant variables are human labour farm yard manure, green leaves, chemical fertilizers, cost on
irrigation, interest on working capital, bullock power, hired machines, plant protection chemicals which implies that expenditure incurred on each component in the maintenance cost has significant role in enhancing returns of arecanut as well as returns of intercrop / mixed crop.

Human labour is the most dominant variable in the maintenance cost.

**Shimoga taluk**

In Shimoga taluk it is clear from the statistical data that among all the category of farmers all the variables are dominant at 5% level of significance.

The R square value is 99% each for small and medium farmers, 100% for large farmers.

The dominant variables are human labour, farm yard manure, green leaves, chemical fertilizer cost on irrigation, interest on working capital, bullock power, hired machines, plant protection chemicals.

As witnessed in Sagar taluk here also human labour is the highly dominant variable in the maintenance cost.

It evidently shows that the expenses incurred on each component in the maintenance cost has a significant bearing on the returns of areca and returns of intercrop / mixed crop.

**The District**

In the district, the statistical data reveals that among all the categories of farmers all the variables are dominant at 5% level of significance in the maintenance cost.
The R square value is 99% each for all the categories of farmers.

Within the maintenance cost human Labour is proved to be highly significant variable.

With the farmers category the investment per hectare is more among large farmers in both the taluks as compared to medium and small farmers because large farmers are taking several cultivation operations to maintain the garden in good condition.

Within the taluk maintenance cost is highly dominant in Sagar taluk because all the components of the maintenance cost are dominant as compared to Shimiga taluk.

After the cost analysis an attempt is made about the yield and returns of arecanut in the study area.

Yield of any field crop which is the average amount of produce per unit area is simple and definite in conception but biologically is very complex and is influenced by many factors. Normally, type of soil, crop husbandry, season, quality of seed materials, incidence of pests and diseases, management of agricultural practices effect the yield of crop. Areca nut being a perennial crop unlike annuals the yield is further subjected to the influence of the age of the areca palm.

Successful cultivation operation is an individual problem. It involves many physical and economic factors. The success of any particular farmer is determined largely by the resources available and his willingness to work industriously and his ability to manage farms in such a manner so as to get maximum returns.

A farmer must involve himself diligently to his work to be a successful farmer. It addition he must be a skilled manager.
Within this background the evaluation of returns of arecanut per hectare with respect to various stages in traditional as well as non-traditional areas of Shimoga district is made.

In the present study during the gestation period i.e. at the end of 6th and 7th year areca palm starts yielding and in the second stage yield will go on increasing year after year and in third stage yield will slightly decline.

It is clear from the analysis in the study area large category of farmers are getting better yield when compared to medium and small farmers.

With respect to Sagar and Shimoga taluks here also large farmers are in better position compared to medium and small. In taluk wise comparison in the study area, farmers of Sagar taluk are getting better yield as compared to farmers of Shimoga taluk.

It is evident from the analysis, returns of arecanut in the first stage is Rs. 54,204.17 per hectare. The total returns of arecanut per hectare in the district varies among all the categories of farmers.

For instance, in case of large farmers the returns of arecanut per hectare is more than the overall for the district, while in the case of medium and small farmers category the average returns of arecanut per hectare is less than the total returns of the returns of the district. However in comparison the total returns of arecanut is slightly higher among medium farmers category than the small farmers category.

In the study area the taluk wise comparison of total returns shows that in Sagar taluk it is much above the district average,
whereas in Shimoga taluk it is very much below the district average total returns.

When both the taluks are taken into consideration on an average the total returns per hectare is more among large farmers category than medium and small farmers category.

Further, large farmers are getting more returns in comparison with the overall average of the district. While in the case of medium and small farmers on an average the total returns is less than the overall average total returns.

It is clear from the above analysis that on an average, the total returns is highest in Sagar taluk as compared to Shimoga taluk and also the entire study area due to the higher investment made by the farmers of Sagar taluk as compared to farmers of Shimoga taluk.

In addition farmers in Sagar taluk adopt scientific methods of cultivation as compared to farmers of Shimoga taluk. Further, the soil and climatic condition in Sagar taluk are more favorable to arecanut cultivation. That is the reason as to why farmers of Sagar taluk get better returns.

In the second stage farmers can get maximum returns from arecanut garden and make some profits. Therefore, the analysis of returns in the second stage will throw light on the economic feasibility of arecanut cultivation.

Large farmers category in the study area are getting higher yield in comparison to medium and small farmers.

When compared to the farmers of Shimoga taluk and the district, the farmers of Sagar taluk are getting higher yield.
The returns per hectare in the study area is Rs. 2,16,170.66. The total returns of the district of arecanut per hectare varies among different categories of farmers.

In case of large farmers the per hectare total returns of arecanut is more than the overall average for the district, whereas in case of medium and small farmers category the average returns of the arecanut per hectare is less than the overall average.

However, the total returns of arecanut of medium farmers category is slightly more than the small farmers category. It is clear from the analysis the total returns is found increasing as the size of landholding increases.

Between the taluk wise comparison of the total returns depicts a different picture. In Sagar taluk the per hectare total returns is much above the overall total returns in the study area, whereas in case of Shimoga taluk, it is very much below the overall position. From this it may be concluded that farmers in Sagar taluk are getting more total returns as compared to farmers of Shimoga taluk.

Within the district in both the taluks the total returns per hectare is Rs. 2,46,797 and Rs. 1,85,544.33 respectively. In case of large farmers the per hectare total returns is more than the overall average for the respective taluks. Whereas in case of medium and small farmers category the average total returns per hectare is less than the overall average total returns.

However, the total returns of medium farmers is slightly more than the small farmers. From the analysis it is clear that the average per hectare total returns is highest in Sagar taluk and much less in Shimoga taluk as compared to the entire study area.
Large farmers in both the taluks are getting more returns than medium and small farmers due to

1. Higher investment per hectare,
2. Planned and Scientific cultivation practices.
3. De-weeding periodical manuring with red earth, proper irrigation management with sprinklers, mulching operations, proper periodical maintenance of drainages and trenches, disease palms will be removed and after proper processing new sapling will be planted.

All these operations will be carried out properly and meticulously in Sagar taluk, whereas in Shimoga taluk the above mentioned operations are not followed strictly. Hence, returns is comparatively low among large farmers in Shimoga taluk as compared to large farmers of Sagar taluk.

As compared to the second stage the yield of areca palm shows a declining trend after 40 years due to the age of the palm and soil condition.

It is evident from the analysis that in the district as a whole and in both the taluks, large farmers are better position with respect to the yield when compared to medium and small farmers category.

While in talukwise comparison the farmers of Sagar taluk are getting higher yield as compared to farmers of Shimoga taluk. Another special feature to be noted in this stage is in comparison with the second stage the yield is comparatively less among all the categories of farmers in the study area.
In spite of declining returns in the third stage as usual large farmers are getting comparatively higher returns, than the medium and small farmers in the study area, because of their high investment and better farm management. In both the taluks large farmers are getting more returns per hectare as compared to medium and small farmers category.

In the taluk wise comparison as observed in the first and second stages, here also the farmers of Sagar taluk are getting more returns as compared to Shimoga taluk and overall for the study area. Evidently it is due to high investment, better management, eco-friendly nature of the crop, scientific and planned cultivation practices adopted.

Between taluk-wise comparison shows that the Sagar taluk has proved to be more efficient in areca cultivation as compared to Shimoga taluk and even the district.

To know the economic feasibility of investment on arecanut cultivation over a period of fifty years in the study area total returns, net returns, returns over total maintenance cost, returns per Re. Unit cost is calculated.

It is evident from the analysis that the total returns, net returns, returns over total maintenance cost. Returns per Re. Unit cost in the study area varies among different categories of farmers.

In the entire district that the total returns, net returns, returns over total maintenance cost, returns per Re unit cost is high in large farmers as compared to medium and small.

In both the taluks the total returns, net returns, returns per Re unit cost, returns over total maintenance cost is high among large
farmers category. Further, as compared to the entire district large farmers are getting more total returns, net returns, returns per Re unit cost whereas in case of medium and small farmers category the total returns, net returns, returns over total maintenance cost and returns per Re unit cost is less.

The taluk wise comparison shows that in Sagar taluk total returns, net returns, returns over total maintenance cost, returns per Re unit cost is much above the overall position in the study area, whereas in Shimoga taluk it is very much less than the overall district average.

The above analysis shows that total returns, net returns, returns over total maintenance cost, returns per Re unit cost is highest in Sagar taluk as compared to Shimoga taluk and also for the entire study area.

Considering the long pre bearing age of 6-7 years the farmers in the study area grow intercrop to get some subsidiary income from intercrop and also as a shade to the tender areca palm, which will improve the quality and condition of sub soil moisture.

In the entire district and in both the taluks large farmers are more beneficial in cultivating intercrop as compared to medium and small farmers.

Between the taluks intercrop cultivation is more remunerative to the farmers of Sagar taluk as compared to farmers of Shimoga taluk.

Mixed crop grown in the second stage in the study area. Pepper will be cultivated by the farmers of Sagar taluk and cocoa by the farmers of Shimoga taluk as a mixed crop. Mixed crop brings
additional income to farmers hence it is worth analysing the income received from mixed crop so as to see to what extent it helps to farmers in recovering cost of cultivation incurred on areca garden in that stage or to what extent the income from mixed crop can subsidise the cost of cultivation during the second stage. This analysis will throw light on economic benefit of cultivating mixed crop in the study area.

For the district as a whole net returns received from mixed crop among small farmers is Rs. 32,270 which is about 78.08% of the total cost incurred on arecanut cultivation in the second stage. In case of medium farmers category the net returns received from the mixed crop is Rs. 43,972.50 which is more than the total cost of cultivation incurred on arecanut cultivation in the second stage.

In large farmers category the net returns received from mixed crop is Rs. 58,290 which is very much higher than the cost of cultivation of arecanut.

The overall position for the district shows that the net returns received from mixed crop is Rs. 44,844.17 which fully covers the entire cost of cultivation of areca garden during the second stage. From this it may be concluded that the income received from mixed crop gives substantial relief to farmers in the study area.

In Sagar and Shimoga taluk also the cultivation of mixed crop is quite beneficial among all the categories of farmers.

It is evident from the results of the evaluation of investments (NPV, IRR, B:C, payback period) in the entire district and in both the taluks large farmers are more beneficial as compared to medium and
small farmers. Between the taluks farmers of Sagar taluk are more benefited as compared to farmers of Shimoga taluk.

Agriculture plays a vital role in providing employment for rural folk. Areca cultivation provides a major employment generation for the rural community in Shimoga district. The garden provides work throughout the year, since it involves various cultivation operation like land levelling, fencing, pit preparation, nursery rising, planting of areca seedlings, de-weeding, mulching, manuring, irrigation management, maintenance of drainages and trenches, plant protection activities, harvesting, processing, watch and ward, transportation and allied activities.

Human labour is the dominant variable in the maintenance cost and also in determining the returns of arecanut. In the present study the involvement of human labour in the areca cultivation is evaluated.

In the first stage the total labour employment in mandays is more among large category as compared to medium and small in both the taluks of the study area due to intensive cultivation practices adopted. Between the taluks total labour employment (mandays) is high among all the categories of farmers of Sagar taluk as compared to the farmers of Shimoga taluk and it is even more than the overall average of the district due to meticulous cultivation practices.

As compared to the first stage, in second and third stages in the study area employment of human labour is less because only maintenance of the areca garden will be followed.
By and large it may be concluded that areca cultivation is more labour intensive in nature. This will help in solving the problem of rural unemployment in the study area.

Hence encouraging the farmers in arecanut cultivation will serve as an effective step in solving the problem of unemployment in the study area.

An analysis on returns of arecanut is made, the correlation coefficient is carried out to verify multicollinearity among the dependent variables to know.

i. Whether there is any correlation among the variables.

ii. Whether the correlation is positive or negative.

The correlation coefficient of dependent variables with respect to returns of areca, intercrop / mixed crop, establishment cost and maintenance cost, cost of cultivation of intercrop / mixed crop among various farmers category is taken into account.

Sagar taluk

It is clear from the analysis that in all the categories of farmers the cost of cultivation of intercrop/ mixed crop is highly negatively correlated at returns of intercrop / mixed crop and also the returns of arecanut at 1% level of significance.

This indicates that over a period of time cost of cultivation declines as the returns increase.

In all the categories of farmers the returns of intercrop / mixed crop is highly negatively correlated with all the variables in the equation with 1 % level of significance except returns of arecanut. Because banana as an intercrop increases the returns of arecanut as
it will improve the sub soil moisture and also helpful to increase the pH level of the soil.

Among all the categories of farmers returns of arecanut is highly negatively correlated with all the variables in the equation at 1% level of significance except maintenance cost for small and medium farmers their correlation is low negative. Because, over a period of time cost of cultivation of arecanut decline but at the same time returns of areca increase.

Establishment cost is highly negatively correlated with returns of intercrop / mixed crop and returns of arecanut at 1% level of significance among all the categories of farmers. Because in the areca gardens the initial investment is high but, in the second and third stage the component of establishment cost is very much negligible in the total cost. Establishment cost declines substantially over a period of time.

Among all the categories of farmers maintenance cost is highly negatively correlated with the returns of intercrop / mixed crop and also with the returns of arecanut at 1% level of significance. The reason is over a period of time maintenance cost declines substantially stage by stage but the returns arecanut increases considerably up to the end of second stage of the areca garden.

In the third stage, returns of arecanut slightly declines. Due to this reason maintenance cost is perfectly negatively correlated with returns of intercrop / mixed crop and also with returns of arecanut.

Among all the categories of farmers the maintenance cost is also highly positively correlated with establishment cost at 1% level of significance. Hence, maintenance cost has direct relationship with
establishment cost. But, the relation is inverse with respect to returns of intercrop/ mixed crop.

Shimoga taluk

Correlation co-efficient of dependent variables of various farmers category in Shimoga taluk is made with respect to returns of arecanut, returns of intercrop / mixed crop, maintenance cost, establishment cost, cost of cultivation of intercrop / mixed crop.

It is evident from the data that the returns of intercrop / mixed crop is highly negatively correlated with all the variables in the equation at 1% level of significance among all the categories of farmers except for returns of arecanut which has highly positive correlation in case of medium and large farmers but low positive correlation for small farmers.

As the intercrop / mixed crop helps to increase the yield of areca palm it is positively correlated with returns of arecanut at 1 % level of significance.

Among all the categories of farmers cost of cultivation of intercrop/ mixed crop is negatively correlated with returns of intercrop / mixed crop and with returns of arecanut at 1 % level of significance. Because, over a period of time cost declines and simultaneously returns increase.

Among all the categories of farmers returns of arecanut is negatively correlated with all the variables in the equation at 1 % level of significance. Because, over a period time the cost declines returns increase.
Whereas establishment cost is positively correlated with the maintenance cost at 1 % level of significance among all the categories of farmers, because in each and every stage there is direct relation between the establishment cost and the maintenance cost.

Among all the categories of farmers maintenance cost is negatively correlated with returns of intercrop / mixed crop and also with returns of arecanut at 1 % level of significance. Because, the cost of maintenance made on areca garden declines gradually at the same time areca yield per hectare increases.

**The District**

Correlation co-efficient of dependent variables with respect to returns of arecanut, returns of intercrop / mixed crop, maintenance cost, establishment cost and cost of cultivation of intercrop / mixed crop an analysis is made.

It is clear from the data that among all the categories of farmers the returns of intercrop / mixed crop is negatively correlated with all the variables at 1 % level of significance except for returns of arecanut. Because banana which is grown as an intercrop will improve the subsoil moisture and also helps to maintain the pH level of soil. Thereby improve returns of areca.

Likewise pepper as a mixed crop will also influence on the yield of areca and does not compete with the nutrients of the manure given to the areca palm.

The additional income received from the intercrop / mixed crop gives relief to the farmers in the study area.
Whereas cost of cultivation of intercrop / mixed crop is negatively correlated with returns of intercrop / mixed crop and also with returns of arecanut, at 1% level of significance among all the categories of farmers.

This shows that over a period of time cost of cultivation declines and the returns increase.

Returns of arecanut is negatively correlated with all the variables at 1% level of significance. Because, over a period of time cost of cultivation of arecanut declines and at the same time returns increase. But in case of small and medium farmers their correlation is low negative.

Establishment and maintenance costs are negatively correlated with the returns of intercrop / mixed crop and also with returns of arecanut at 1% level of significance. Whereas establishment and maintenance costs are positively correlated with each other at 1% level of significance among all the categories of farmers.

In conclusion, in the entire district and also in both taluks in large farmers categories returns of arecanut, returns of intercrop / mixed crop is highly negatively correlated with the maintenance cost and the establishment cost and cost of cultivation of intercrop / mixed crop as compared to medium and small farmers which indicates large farmers are more beneficial.

Between the taluks, in Sagar taluk returns of intercrop / mixed crop and returns of arecanut is highly negatively correlated with the maintenance cost and establishment cost and with cost of cultivation of intercrop / mixed crop which implies that farmers of Sagar taluk
are more beneficial as compared to farmers of Shimoga taluk and the entire district.

The results of correlation coefficient further subjected for verification by the multiple regression with respect to returns of arecanut and linear regression with respect to returns of intercrop / mixed crop is made.

**Sagar taluk**

Multiple Regression of returns of arecanut among various farmers category is made, from the data it is evident that among all the categories of farmers the establishment and maintenance costs are dominant at 5% level of significance in determining returns of arecanut, which shows the expenditure incurred on establishment and maintenance costs are significant in enhancing returns of areca.

Within the maintenance cost, dominant variables are human labour, farm yard manure, green leaves, chemical fertilizer and cost on irrigation.

R square value for medium and large farmers is 98% each and for small farmers it is 96%. This indicates the R square is found to be fairly high among all the categories of farmers in Sagar taluk, indicating a fact that it fits in well with the data.

Further, it is clear from the statistical data that large farmers are more beneficial as compared to medium and small farmers.

**Shimoga taluk**

Multiple Regression analysis on returns of arecanut among various farmers category in Shimoga taluk is made.
It is evident from the data that among all the categories of farmers, in determining the returns of arecanut establishment and maintenance costs are significant at 5% level of significance.

In the maintenance cost human labour, farm yard manure, fertilizers and irrigation cost are dominant variables.

R square value for small, medium and large farmers is 11%, 39% and 71% respectively.

The R square value is found to be fairly high among large farmers category as compared to medium and small farmers.

It is proved from the statistical data, that the expenses incurred on establishment and maintenance is significant in determining the returns of areca and also it is evident from the analysis that large farmers are more beneficial as compared to medium and small farmers.

**The District**

Multiple Regression analysis on returns of arecanut among various farmers category is made.

It is clear from the data, among all the categories of farmers, in determining the returnis of arecanut establishment as well as maintenance costs are significant at 5% level of significance.

Which clearly indicates the investment made on establishment and maintenance has significant influence on the areca yield.

The maintenance cost is dominant in all the three stages. Within the maintenance cost the dominant variables are human labour, farm yard manure, green leaves, chemical fertilizer, cost on irrigation.
R square value for small, medium and large farmers category is 11%, 30% and 76% respectively. The R square value is fairly high among large farmers as compared to medium and small farmers category.

In the gestation period large farmers made more investment on irrigation infrastructure that too on sprinklers and conveyor pipes as compared to medium and small farmers category.

Large farmers made more investment on maintenance cost in all the three stages as compared to medium and small farmers.

In conclusion it is clear from the above statistical analysis that in the entire district and also in both the taluks, large farmers are benefited as compared to medium and small farmers.

Between the taluks, the farmers of Sagar taluk proved to be more beneficial as compared to farmers of Shimoga taluk.

**Sagar taluk**

Linear Regression of dependent variable (returns of intercrop / mixed crop) among various farmers categories in Sagar taluk is made.

It is clear from the data that among all the categories of farmers cost of cultivation of intercrop / mixed crop is significant at 5% level of significance with the returns of intercrop / mixed crop.

It implies that cost of cultivation of intercrop / mixed crop influence significantly in determining the returns of intercrop / mixed crop. Further, among all the categories of farmers there is 99% of variation is existing between the variables, (R square value is 99%) which implies that all the categories of farmers in Sagar taluk is proved to be beneficial in intercrop / mixed crop cultivation.
**Shimoga taluk**

Linear Regression on returns of intercrop / mixed crop among various farmers category in Shimoga taluk is made.

It is clear from the data that in Shimoga taluk also among small, medium and large farmers category the cost of cultivation of intercrop / mixed crop is significant at 5% level of significance, with returns of intercrop / mixed crop, which implies that the cost of cultivation of intercrop / mixed crop influences significantly in enhancing the returns of intercrop / mixed crop. The R square value for medium and large farmers category is 99% each, whereas for small farmers it is 97%.

**The District**

Linear Regression of returns of intercop/ mixed crop among various farmers categories in the district is made.

It is evident from the data, that the cost of cultivation of intercrop/ mixed crop is significant with the returns of intercrop/ mixed crop at 5% level of significance. Because farmers in Sagar taluk are giving equal prominence to the cultivation of intecrop / mixed crop. As a result returns are more.

The R square value is 22%, 64% and 94% for small, medium and large farmers category respectively which indicates clearly that large farmers are more beneficial as compared to medium and small farmers in the study area.

From the above statistical analysis made it is clear that in the entire district and in both the taluks large farmers evidently benefited more than medium and small farmers category.
Between the taluks, farmers of Sagar taluk proved to be more remunerative in intercrop / mixed crop cultivation as compared to farmers of Shimoga taluk and the entire district.

In the marketing aspect a brief note on price movement and growth in areca plantation is mentioned.

There is high correlation between plantation and price. With prices picking up arecanut gained importance as a cash crop. Increasing in prices attracted farmers. Lot of paddy, sugarcane areas especially in Shimoga taluk were converted into arecanut gardens, when this was the trend people other than – traditional growers were also started investing in arecanut plantations.

Later when prices started falling down the growers stopped investment on new arecanut plantations.

Such price correlation with crop area and plantation is found in all agricultural commodities, whenever prices increase for any commodity farmers shift to that crop.

Co-operative marketing societies play an important role in the marketing of arecanut in bulk and assist their members in selling their produce whenever they wish. These societies provide facilities like provision of credit facilities, storage facilities etc.

There are three important co-operative marketing societies functioning in the Shimoga district are,

1. **Central Areca and cocoa marketing co-operative society Limited (CAMPCO)**
2. **Maland Areca marketing co-operative society Limited (MAMCOS)**
3. **Arecanut Processing and Sales Co-operative Society Limited (APSCOS)**
CAMPCO is a joint venture effort of the state governments of Karnataka and Kerala and was established in 1973. The CAMPCO was started by the state government of Kerala and Karnataka and it is popularly known as CAMPCO.

The few main objectives of the CAMPCO are,

1. To procure arecanut from member growers and if necessary from other growers on agency basis or on outright purchase basis.
2. To arrange for their sale of arecanut to the best advantage of its members.
3. To provide credit facilities.
4. To export the produce
5. To promote scientific research and manufacture of semi-finished, finished produce of arecanut, MAMCOS.

It is one of the oldest marketing society of the sample district started in 1939. The head office is situated in Shimoga.

The main objectives of the MAMCOS are,

1) To provide good market for the arecanut grower members.
2) To provide credit facilities, storage facilities, fertilisers etc to its members.
3) To export arecanut out of state.

Apart from these facilities it provides useful literature about arecanut.

1. Cultivation, processing to its members.
2. Provides implements for the purpose of spraying chemicals.
4. It organises seminars workshops and on arecanut production and development.

**APSCOS, Sagar**

It is also one of the reputed and oldest society established during 1973 in study area at Sagar with Hosanagar, Sagar and Sorab taluk growers as its members.

APSCOS also is having many objectives.

1. On marketinng, processing, grading of arecanut just like CAMPCO.

**Agricultural Produce Marketing Committee (APMC)**

Regulated APMC also started by the Government at Shimoga in the APMC yard. Thus the establishment of the co-operative marketing societies became a boon to arecanut cultivators in the study area.

It is very interested to note that the prices of arecanut donot always fall within the economic principles. In principle the price moves forward or backward with the change in supply or demand. More surprisingly, there are instances in areca trade the price has risen or fallen even though the supply is more or less constant. However this sort of wild variation in prices of arecanut has become almost regular feature in the market. This has widely affected the small and medium farmers categories who entirely depend upon the areca income for their livelihood.

The white variety of arecanut which got from ripe arecanut after sundrying for 40-45 days is the common most variety.

Major market for Red is Shimoga. Sagar market is for Red and White.
The growers will do primary grading at their level but the traders will do further grading of the arecanut based on quality, colour, size and demand of the market. Red variety of areca is mainly used for preparation of gutkha, panmasala and scented supari and few quantity is consumed by direct chewing.

The sales procedure and proceedings in APMC is highlighted in the marketing chapter. The price behaviour of arecanut and its reason for price fluctuation delt is the marketing chapter.

The price spread effect in the local market from growers to consumers in the study area is worked out.

In Sagar market the price spread effect is less from grower to consumer because the wholesales, retailers quote less profit margin as compared to Shimoga market.

With regards to imports during 1950 arecanut production in the country was not sufficient to meet the international requirements. This reflected in the import of areca in huge quantities to India.

In 1994-95, India started importing arecanut due to increase in domestic consumption. However compared to the total Indian production of arecanut import is negligible as per the DGCIS statistics about 29,227 tonnes, Rs.850 million of arecanut was imported during the year 2000-01.

When prices of arecanut suddenly picked up in 1999-2000. The prices became unaffordable to the Indian consumers mainly for the price of value added products. As a result clandestine import started because, imported arecanut is inferior to Indian quality and it was very cheap and mainly used for manufacturing Gutkha.
To protect the interest of domestic industry Government of India took major initiatives by raising duty on arecanut from 35% to 100%. Thus the traders were using unofficial ways for import.

The imported arecanut from Indonesia, Malaysia, Mayanmar, arrives at Kolkota port for exports to Nepal. From Nepal this arecanut is transported to Nepal by road and it is again brought to Kolkota market or Siliguri market through Dhalbari border.

The estimated imports from Nepal border to India in the year 2000-01 is around 14,500 tonnes, This arecanut is moved to Kolkota, Uttarapradesh, Bihar for other parts of the country for gutka manufacturing.

It has been observed that the quality of imported arecanut is inferior and tasteless. Hence it was mainly used by gutkha and panmasala manufacturers, and also some of the traders mix the imported arecanut with chali or white variety of the domestic arecanut.

In this regard Government has to take stringent action against the clandestine imports from other countries, if not it effects the prospects of domestic arecanut in India.

In the marketing with respect to the exports of the country, the bulk of production of arecanut in India is consumed within the country. However, small quantity of arecanut is exported abroad, as per the DGCIS statistics export is ranging between 100 to 800 tonnes over a period of fifty years. During 2000-01 India exported 639 tonnes (62.9 million) of arecanut mainly to UAE, UK, Maldives, Canada, Singapore, Bangaldesh, USA and to other countries.
During the survey conducted by DGCIS it has been observed that arecanut is exported to Bhutan and Bangladesh from fuentsholing town a border town of West Bengal and Assam considering this estimated export of arecanut from India during 2000-01 is around 4000 tonnes.

In the marketing chapter proper conclusions and suggestions were given to facilitate the marketing and safeguard the interest of all the farmers category of the study area.

**Conclusions**

On the basis of the results of the present study the following conclusions are drawn.

1. Arecanut is highly remunerative crop in the entire study area and in both the taluks and this was the reason behind rapid area expansion of areca cultivation of both the taluks, despite the high establishment cost in the first stage of the areca garden.

2. The results of the study indicates that the investment on arecanut cultivation is economically feasible and financially sound irrespective of category of farmers in the study area.

   However the results of the investment evaluation (NPV, IRR, B:C Ratio, pay-back period) reveals that, if any priority to be assigned in the development of areca gardens the first priority goes to large farmers category followed by medium and small farmers category.

3. The size of land holding is a vital element in determining the management capacity of the farmer.
Large farmers are more economical in working and conductive to greater efficiency because all the technical advantages is open to large farmers are not open to small and medium farmers.

Large farmers enjoy economics of cultivation, yield and returns, management and marketing. In turn these economies will help in reducing cost of the farm and increases the efficiency.

Economics of cultivation will be reaped by large farmers on account of,

1. Use of upto date human and machine labour.
2. Advantages of skilled and unskilled labourers in areca cultivation.
4. Proper utilisation of by products.
5. Usage of more effective utilisation of available resource of their farm yield.

Hence the investment on large gardens are more profitable.

4. As arecanut is a perennial crop, it starts bearing economic yield from, sixth year onwards and the farmers has to make heavy investment in the first stage. Banana is grown as an intercrop basically to give shade to the young areca sapling. Banana suckers will be removed when areca palm attains four years of age. Banana gives an additional income in the gestation period it will help the farmer to meet some part of the expenses made on the investment, and also provides employment generation for the rural folk.
Likewise, mixed cropping grown in the second stage in Sagar and Shimoga taluks. Pepper is cultivated in Sagar taluk while cocoa is cultivated in Shimoga taluk as mixed crop respectively.

Mixed crop brings additional income to farmers. The income received from the returns of mixed crop will subsidise the cost of cultivation of areca garden during second stage. The income varies for different farmers category in the study area. Hence we recommend to grow intercrop and mixed crop in areca gardens to get some economic relief (benefit) to the farmers.

5. Areca nut is a commercial crop and arecanut cultivation is highly capital intensive at the same time it is high employment oriented also. It provides direct employment to large number of rural folk as well as indirect employment to many who are engaged in its processing, marketing and trading activities.

It provides more than five crores of mandays of employment annually in its cultivation. It provides basic necessities for the persons who are involved in areca cultivation and marketing.

The areca gardens provides work throughout the year since it involves various agricultural operations like land levelling, fencing, for pit preparation, nursery rising, planting of areca seedlings, intercrop, and mixed crop cultivation, de-weeding, mulching, manuring, in irrigation infrastructure, in plant protection activity, harvesting, watch and ward, transportation, marketing upto the consumer level.

Areca nut cultivation provides employment for both skilled and unskilled labourers. The large farmers category provides highest mandays of employment followed by medium and small farmers category.
6. Arecanut cultivation in the entire study area and in both the taluks helped in boosting the farmers economy and also enhanced the social and economic position of the farmers.

7. In the study area, system of irrigation mark the progress of people. Water management is important in agriculture. The success of agriculture depends mainly on how timely and adequately the water is used, in the requirement of areca cultivation.

The conservation of water and its judicious and economic use is very important. As areca is a perennial crop the farmers adopt more scientific techniques and intensive cultivation and enables the farmers to use best quality of irrigation methods at the right time and to reap bigger margins of profit.

Loss of water occurs in conveyance distribution system, non-uniformity in the spread of water over the field, percolation below the root zone and surface run-off is common in the canal system. Hence sprinkler system of irrigation is advantageous, and it is superior over the conventional irrigation system and it is helpful in getting more yield.

In the study area large farmers installed sprinkler irrigation system though it requires more investment.

The inputs like human labour, farm yard manure, green leaves, chemical fertilizers, plant protection chemicals are used efficiently by large farmers category in the study area and they are getting good returns and they are economically benefited.

Hence we recommend to small and medium farmers to use all the above inputs in a proper and efficient manner to get good yield and in turn to get remunerative returns.
Suggestions

In Karnataka use of arecanut and its cultivation constitute a distinct agricultural practice and it is also one of the important commercial crop compared to other economic crops. Areca palm received adequate attention by large farmers of study area as far as possible in the following aspects, so as to get good economic yield. These following aspects is also applicable for small and medium categories of farmers to follow to get good and remunerative returns.

Arecanut is cultivated in varieties of soils and climatic conditions but the yield and economic bearing of arecanut is governed by the following points.

i. Climate

i) Altitude is very important since at a higher altitude the winter temperature is too extreme for the crop it adversely effect on yield of areca and its returns and the quality of fruit is not good.

At a higher altitude it effects the germination of seed of arecanut as well as the dry Kernel i.e. chali.

It grows well below 850 meters of sea level because the germination of nut and the weight of the Kernel is good.

ii. Temperature

The palm florishes within the temperature range of 14°C to 36°C. Extremes of temperature are not good for the healthy growth of the palm. Because it causes heavy damage to the foliage and even the death of the areca palm.
iii) Rainfall

The areca palm flourishes in tracts of rainfall especially in Malnad but not so well in maidan parts. It grows but the yield is less. It grows well in traditional areas as it is suitable for areca cultivation. It is suitable to local soil and climatic conditions. In traditional areas hence we recommend small and medium farmers of non-traditional belt to consider this factor before investing on areca plantations.

2) Nursery

Areca nut is exclusively seed propagated perennial crop. It is essential that adequate care is to be taken in selection and rising of areca seedlings.

1. Selection of mother palm.
2. Selection of Seednuts.
3. Selection of proper techniques and germinating and rising seedlings.
4. Selection of seedlings.

Selection of mother palm

The characters of the mother palm is age at which the first bearing starts and regular bearing habit, with larger number of leaves and shorter internode and high fruit set are the criteria for the selection of mother palm.

Seednut selection

Nuts to be selected from fully ripe nuts from the middle portion of the middle branch.
Selection of seedlings

12 to 18 months of old seedlings is used for transplanting.

3. Establishment of the garden

1. Selection of the site and layout

Areca nut essentially a garden land crop and thrives best in humid areas protected well against hot sun burn and heavy wind. The palm does not withstand either drought or water stagnation. The site selected should therefore have adequate irrigation facility during the dry period.

The soil should be well drained and must have drainage facilities.

Areca palm is very delicate and cannot withstand with the extremes of temperature and exposure to direct sun. So it is essential that the site selected for rising areca garden should have protection either by way of hillocks or tall evergreen trees around the garden.

This is the reason that the traditional gardens are located in valley of hillslopes which are protected by forest trees growing all round. It is a typical site of malnad tract of Karnataka this should be noted well by non-traditional areca farmers.

2. Spacing

Spacing depends primarily on the depth and fertility of the soil. It reflects on the yield of the areca palm.

3. Depth of Planting
Depth of planting depends upon the sub-soil moisture and height of water table. Areca palm does not withstand water stagnation, hence drainages in the fields to be provided and deep planting is preferred. Deeper planting provides a firm anchorage to the roots and also provides a larger volume of the space for the spread of roots.

Year after year fresh nodes exposed above the pit, it has to be covered up in the course of annual operations of the manuring and intercultivation.

4. Season of planting

The planting of seedlings in the permanent sites is done best in May-June or September-October.

5. Drainage

Perfect drainage system and protection from suncorch is very important. It is essential to provide one drainage channel for every two rows of palms to drain the excess water.

At the beginning of the monsoon each year these drains are to be cleaned to have an easy flow for the stagnant or seepage water.

6. Shading

Young seedlings to be protected from the direct exposure of sun by providing shade of either arecanut or coconut leaves or by rising a shade crop of banana during the early years, it also helps the farmers to get some income in the gestation period.
4. Garden Management

Cultural operations followed by the cultivators in an elaborate and programmed system done in twice a year for the operations like digging, spread of farm yard manure, de weeding, mulching the interspaces of areca garden with green or dry leaves, it prevents the water evaporation from the ground recently dug protects rains and forms humus and manure to the soil and it suppress the weed growth.

Manuring

Green leaves, farm yard manure to be applied in large doses annually. Along with cattle manure, green leaves use of tank silt or earth from the paddy fields together with farm yard manure to be used. In malnad soppina betta is maintained.

Application of chemical fertilizers in split doses is also important.

Irrigation

The areca palm is very sensitive to drought. The methods of irrigation is plays a important role in cultivation of areca gardens. In recent years sprinkler irrigation is in practice by large farmers.

Drip or trickle irrigation is gaining importance.

Harvesting

The stage of harvesting depends upon the type of produce to be prepared for the consuming markets.

One type prepared out of immature green nuts. other from ripe nuts.
Majority at which the fruit is harvested and the season of harvest affect the quality of the processed nut considerably.

All these above points are invariably followed by large farmers in the study area in getting good yield and substantial returns hence we recommend the above factors to be followed by small and medium farmers category to get good and remunerative returns, which will enhance the socio-economic status of the small and medium farmers and in turn price fluctuations.

In the study area, the small, medium and large categories, out of their respective yields are traditionally preparing 50% of Grade 1, 34% of Grade 2 and remaining 16 % of Grade 3. Here we suggest to prepare more percentage of grade 1 in their respective yields so as to fetch income in terms of returns.

The large farmers are in better position in getting yield and returns and it should not be confined to large farmers category only at the same time the small and medium category of farmers can reap the substantial benefit by implementing the above cultivation practices intensively and meticulously.

**Recommendations**

In the light of various difficulties and constraints faced by arecanut growers including the CAMPCO Ltd. regarding, Fall in the arecanut price and other issues related to arecanut, following salient features or recommendation are mentioned below.

As on today arecanut is mainly used for masticatory purpose. It is commonly used with lime and betel leaf for chewing. It is also consumed as processed arecanut in the form of Gutkha, panmasala and panparag, which are hazardous to health.
The reported medicinal values of arecanut and other alternative uses need to be explored profitably for the sustenance of arecanut farmers in future. It is quite essential to develop technologies for value added products through products development in terms of pharmaceutical, industrial and cosmetic purpose.

Keeping in view of the liberalisation of trade, removal of quantitative restrictions (QRs) in the WTO regime the prevailing arecanut price is which lower (55 to 78%) in the international market than the domestic price and the possibility of import of arecanut cannot be ruled out even after increasing the levy duty from 35% to 100% to safeguard the interests of farmers.

However, there is an urgent need to increase the productivity of the crop by doubling the yield and reducing the unit cost of production in order to be competitive in the world market.

With this background the following recommendations given below, which need to be implemented scrupulously.

1. Seednuts and seedlings are to be distributed from govt. nurseries/ICAR institutions / Central State Forum Nurseries.

2. Proper steps to be taken by the state Govts. to create awareness among the farmers about possible impact of the indiscriminate expansion of area over a period of time and the need to have sustainable income.

3. For the increase of productivity of the existing plantations, which are young or old drip irrigation may be instituted. It is gaining momentum nowadays.
4. Cropping system should the profitability of arecanut +cocoa, areca + pepper on areca, areca with pepper, clove and nutmeg which need to be popularized to get sustainable income from mixed cropping instead of monocropping.

Farmers who are adopting such cropping systems get higher income and additional employment potential. This needs popularisation through demonstration and agricultural universities has to intervene in this respect.

5. There is an urgent need to design suitable harvesting devices and appropriate small dryers and grading machines which will go a long way for reducing the difficulty in harvesting, cost of harvest and this will also helps to go for on farming process. For this research and development organisations like ICAR, has to design suitable appropriate devices.

6. Technical and financial assistance for the entrepreneurs to encourage and promote alternate uses of arecanut by-products from arecanut stem, leaf sheath formaking disposable plates, cups, caps, umbrellas, photoframes etc.

7. Since the price fluctuation in arecanut is unpredictable and violent, there is need to work out a strategy for providing price support in order to safeguard the traditional arecanut growers to get sustainable income.

Areca marketing seems to be complicated system. Large number of intermediaries are involved besides a few co-operative organisations like CAMPCO and other co-operative societies in other states. The CAMPCO network only procure 10% of production.
8. One of the high risk to the farmers is lack of storage facilities either at CAMPCO or in any other co-operative societies, hence subsidy may be given for constructing airted, humidity controlled godowns at different places. This pattern of assistance is available with NHB, which may be extended to the co-operative societies in corporate sectors.

9. As CAMPCO is a well organised society in the marketing of arecanut and having vast experience in marketing arecanut they should expand their activities in other states as it is helpful to the areca farmer.

10. The CAMPCO being an apex body, it is necessary that CAMPCO should take up a detailed survey on industrial, medicinal uses of arecanut.

11. The import duty on arecanut was increased from 35 to 100% to safeguard the interest of the farmers by the Govt of India. However, instances are reported that arecanut is brought as a dry fruit. Arecanut should not be covered under dry fruit category. Appropriate action may be instituted so that the unscrupulous import should not take place.


   Important aspect of Arecanut and its alternative uses are listed below, it may boost the farmers economy and it will open up a new way in marketing and makes the areca cultivation sustainable.

   Apart from the use of Arecanut as a masticatory and with the introduction of by products got from modern ways of living the various parts of the areca palm can be made use of for different purpose.
1. From Nuts:

   The by products from nuts can be used for tanning leather.

1. In leather industry.
2. As a writing ink
3. As an adhesive in plywood manufacture.
4. As a textile dye.
5. In purification of sugar juice.
6. As a safe food colouring agent etc.

2. From Husk.

   - From fibre, for making thick board, flufficushions and non-woven fabrics.
   - For preparing hard boards and plastics.
   - Pulping and paperboards.
   - Wrapping papers can be prepared from areca pulp and bamboo.

3. From Leaf sheath.

   - For making paper boards for packing purpose
   - Through away cups and plates.
   - Ply boards.
   - For tea chests for long-distance transport, it cutdowns the use of softwood timber for this purpose.
   - Used as picture monunts, can be used as decorative panels of wooden almirahs and teapoys.
- Used as a cheap substitute for leather in house chappies and as a cheap summer wear chappals.

- Used in briefcases, bags, spectacle cases, tea and coffee trays, office file boards and flaps, and in the manufacture of match boxes and can be used for packing glass wear and fragile articles by converting sheaths into packing wool.

- Test is on in the use of thermal and electrical insulations.

4. From Arecanut stem and leaf.

Areca stem can be used as a building material.

Due to its hardness and golden yellow colour the timber can be used in stationary articles like rulers, shelves, waste paper baskets, the sharpened stem used for husking coconuts,

- Nails made of areca stem widely used in furniture industry.

- From leaves are good source of organic manure.

The future of arecanut and arecanut base industry depends on the extent to which an economically feasible alternative use for the different constituents of the areca palm could be developed early.

In the field of arecanut marketing co-operative institutions such as CAMPCO have played an important decisive role in recent years in the states of Karnataka and Kerala.

The technology for the utilisation of different parts of areca palm etc if developed it would not be difficult to start small scale industry at the village level in turn it gives employment generation in cultivation and by-product aspects. Though arecanut production and its related activities are reckoned as a major industry, it is a fact that
no efforts at any time have been made for popularising use of this commodity.

In view of the numerous uses for which arecanut has been put to, it is to be assumed that it will have an impact in future also, possibly through developing a suitable alternative technology for its utilisation.

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