CHAPTER – II

REVIEW OF LITERATURE AND METHODOLOGY

2.1 General

To develop clarity and comprehension in any study, it is necessary to review the various concepts, research methodologies and analytical tools used by researchers earlier in their studies. Such an attempt would help the researcher to have a better and precise understanding of the perspectives of the research problem and would also facilitate the researcher to modify and improve the present analytical framework in the right direction. The findings of the earlier studies would guide the researcher in setting the hypothesis and objectives and to compare the findings. This chapter briefly reviews the concepts, research methodologies, analytical tools and findings of the past studies which are relevant to the present study.

The review is presented under the following headings for better perception and clarity. Studies relate to:

2.2 Production of Banana

2.3 Cost and return structure of Banana.

2.4 Marketing of Banana.

2.5 Problems of Banana Producers in production and marketing

2.6 Banana Energy.
2.2 Studies related to Production of Banana

Earlier studies relating to the productivity of banana cultivation of different varieties of banana in various places, importance of banana, uses of the by-products, factors influencing banana production and measures adopted for increasing banana production are as follows:

Sangili (1980)\(^1\) found that there is inverse relation between the area under banana and paddy cultivation in Anandanallur Block, Madurai. Another fact pointed out by this study is that banana is a substitute crop for paddy fields and hence people cultivate more banana. He also proved that there is a negative correlation between the cost of production and the net profit of banana. He also pointed out that profitability of banana is higher for owners or cultivators than for tenant cultivators.

Hayeer (1990)\(^2\) in his study ‘Fruit growing in India’ studied about the areas where banana is grown throughout the country and also in foreign countries. He estimated that the kathali variety is cultivated in half of the banana cultivable areas in Tamil Nadu, Assam and Travancore. Kathali is a popular variety even today. He has noted that Tamil Nadu has long dry areas for the cultivation of banana. Having a long dry season through cold winters and hot wind in summer affects banana cultivation in the northern parts of India.

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Pandiyarajan et al., (1994)\(^3\) shows how the edible banana is given the name “Musa Paradisica”. The prominent varieties suitable for export to Central America, South America and Europe are Rasthali, Red Banana and Ney Poovan.

Emile Frison et al., (1998)\(^4\) in their article remarked that bananas and plantains are extremely important crops throughout the developing countries of the tropics. They are not only a staple food crop for millions of people, but they also provide an essential source of income through local and international trade. The plant is versatile and, as well as being an important food source, also provides fibre, starch and alcohol. Different types of bananas are important in different regions, but everywhere, banana and plantain producers face growing hardships, as a result of increasing pest and disease pressures, more specifically, the rapid global spread of black sigatoka disease, to which many important cultivars are susceptible. Relatively limited resources are being directed towards banana improvement. So a considerable investment in this area is still required. It is therefore essential that researchers, donors, and indeed the general public are made aware of the global importance of this crop, in order to ensure that a level of resources commensurate with its importance are directed towards its improvement in the future.


Chadha (1999)\(^5\) stated that among fruits banana accounted for the highest production and they contributed 31 per cent of the total food production. There had been a phenomenal increase in the production and productivity of banana which rose from 4.0 million tonnes in 1967 to 10.4 million tonnes in 1994. However, there were many problems which require to be addressed through systematic research.

Tamilarasan (1987)\(^6\) found that banana was cultivated in wet lands, dry lands and garden lands of Tamil Nadu, while cultivation in dry lands and garden lands was popular in Tiruchirapalli District because of the availability of both irrigation and drainage facilities.

Bandyopadhyay (1987)\(^7\) examined the extent of Banana Cultivation during the period of 1970-71 to 1983-84 in the selected states of Maharashtra, Karnataka, Tamil Nadu and Kerala in the southern Peninsula of India. The compound growth rate in area, Production and yield of banana in the state of Maharashtra worked out to 1.975 per cent (Significant at 5% level), 2.18 per cent (Significant at 1% level) and 0.237 per cent per annum respectively. The corresponding figures for Karnataka are 0.75 per cent, 6.92 per cent (Significant at 1%) and 6.376 per cent (Significant at 1%) and for Tamil Nadu are 0.664 percent, 2.343 per cent

(Significant at 1%) and 1.7 per cent per annum (Significant at 5%) respectively. The corresponding figures for Kerala are 0.19 per cent, -1.292 per cent and -1.5 per cent per annum respectively.

Patil et al., (1987)\(^8\) examined the trends and growth rates in area, production and productivity of banana Crop. They found that the area under banana cultivation increased from 6,600 hectares to 34,400 hectares and production also increased sharply by almost 68.9 per cent. Famers are responsible for banana prices.

Nagarajan (1993)\(^9\) pointed out that unlike other varieties; Nendran is a multi-purpose fruit, when unripe, the fruits are used for making ‘Chips’. Production of Chips is an agro-based industry with Nendran as raw material. ‘Chips’ are also used for export purposes. Nendran can be consumed raw after steaming or roasting on fire when ripe or half ripe. From Nendran flesh a special powder is made and this is used for making tablets which are said to cure stomach ulcer.

Gupta et al., (2001)\(^10\) in their study indicated that, banana is a traditional plant cultivated widely for mankind. After harvesting of the fruit, the various other parts of the plant (by products) are not effectively utilised. It has been estimated that a residual biomass (Pseudo stem and leaves) of 13 to 20 tonnes dry

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matter per hectare is available. They suggested that feeding of whole banana plants (stem and leaves) will meet the maintenance requirement of cattle. Patel (2004) concluded that banana leaves can be incorporated in the diet of kids. However, at present they are thrown out as waste on roadsides, or allowed to rot away in the fields or sometimes burnt in the field. In order to throw light on the efficacy of banana by-products to serve as a potential source of roughage to ruminants, a study was undertaken to evaluate the various by-products of banana as a source of feed to ruminants through studying the effect of the by-products of banana plant on rumen fermentation pattern.

According to Nagarajan (2002)\textsuperscript{11}, the study of Nendran banana in Trichy District in the context of prevailing drought, compared to other varieties, Nendran variety appears to be a safe bet, as it is not affected by serious pests and diseases, which calls for plant protection involving a huge expenditure.

Gopalakrishna Maduka (2004)\textsuperscript{12} described that. India is the world’s largest producer of Banana with a production of 10.8 million tonnes (2002-2003). Area under the crop went up from 0.2 million hectares in the early 70\textsuperscript{°} to 0.49 million hectares in 2002. Production during the same period went up from 3.0 million tonnes to 16.81 million tonnes. Tamil Nadu and Maharastra are in the top of the

list of banana producing states in India followed by Karnataka, Andra Pradesh, Madhya Pradesh, Orissa and West Bengal. In 1999-2000, Tamil Nadu ranks first in production with an area of 0.92 lakh hectares and production of 4.86 million tonnes. Maharashtra produced banana in an area of 0.72 lakh hectares with an estimated production of 4.33 million tonnes. In Karnataka it is grown in an area of 0.60 lakh hectares with a production of 2.01 million tonnes and productivity of 3.3010 kg/ hectare.

Mohamed Jaffar and Namasivayam (2004)\textsuperscript{13} remarked that the average net profit per acre on banana cultivation was high in the case of medium size growers and medium to large size growers and low in the case of small size growers. Country capitalizes the opportunity in increasing the production of banana and productivity of banana can also be enhanced with scientific production technique.

Joel Mpawenimana (2005)\textsuperscript{14} in his study analysed the socio-economic factors influencing the production of bananas in Kanama District in Rwanda. After estimating the relationship between the output of bananas and various socio-economic factors, the findings showed that various socio-economic factors have to be reviewed in order to improve the production of bananas in the country. The results described that acreage (land), physical capital, fertilizer and price, have positive relationship with the banana output. These are the factors on which the


government should give emphasis in order to increase the production of bananas. There are other factors such as education has shown a positive coefficient, but explained an insignificant relationship to the banana output. One of the reasons is that educated people run away from rural areas to towns. Labour was another factor which has shown a negative effect. However based on the above findings, he concluded that land, physical capital, fertilizer, and price are the important socio-economic factors that have effect on the production of bananas in Rwanda.

Manojkumar et al., (2006)\(^{15}\) concluded that the majority of the farmers cultivating banana had agriculture as their main source of income. The reason stated for non-enrolment in insurance was not lack of awareness or high premium rate but cumbersome administrative procedures and financial difficulty to pay premium at the pre-gestation stages of cultivation. Even the farmers who had adequate financial resources were reluctant to pay premium in bulk, out of their own sources. Linking of a credit facility with crop insurance programme is found to be an inevitable condition for its success. The crop insurance scheme shall be made viable by spreading the risk horizontally by enrolling all the farmers in a locality in the scheme. The scheme should be attractive, credit-linked, and should have support facilities like a reinsurance package. Majority of farmers are not willing to leave banana cultivation in future even if it involves high risk. So a package that covers a longer period (for example a three-year package) with a

premium that considers the cost of cultivation for the period as a whole has to be thought of. This will help to bring down premium rates, by saving on cost of land preparation, especially in reclaimed lands.

Raghavendra Naduvinamani (2007)\textsuperscript{16} in his study suggested that India has been a predominantly agrarian economy since time immemorial. The development efforts over the last four decades have doubtlessly strengthened our industrial base. However, agriculture continues to be the mainstay of our economy even today. This study has been undertaken to know the economics of red banana production under contract farming in Karnataka. The primary data was collected to study the resource use efficiency, detailed information on input used and output sold and problems faced by the contract farmers for 35 farmers for the year 2004-2005.

In the study area, fruit crops constituted 22.57 per cent of the gross cropped area (64.75 hectares) and among fruit crops, Red banana crop occupied the area of 42.89 hectares which constituted 14.95 per cent of the gross cropped area. It was estimated that, the total cost of Red banana production per hectare was `97,976.25. The average total variable cost incurred in Red banana contract farming was `86,760.40. The benefit-cost ratio for Red banana cultivation under contract farming was 3.28. Resource use efficiency in Red banana, the coefficient

of multiple determination ($R^2$) was 0.95, thus a high proportion of variation in the gross return was explained by the variables included in the model.

Debabandya Mohapatra et al., (2010) in their paper remarked that banana is one of the most appreciated fruit all over the world because of its multipurpose use as food. Lack of suitable post harvest management practices may lead to a huge economic loss for the banana producing regions. Different post- harvest management practices are in use to enhance its shelf life by delaying the ripening, reducing respiration rate, and controlling the disease causing organisms, during transport and storage. An integrated approach can ensure product safety and quality that reaches the consumer, residing far away from the production area. In this article different pre-storage treatments viz. pre-cooling, chemical and biological treatment for disinfection, modified atmospheric packaging, chemical treatment, irradiation, and coating for enhancement of shelf life is discussed in brief.

According to Nagarajan(1994) Banana plant has the special nature of second propagation as second cropping. The second cropping give yield quicker than the first cropping and reduces the cost of cultivation. It reduces the cost of digging ditches, manuring, watering, sucker treatment, transporting and hoeing. During the second cropping, the suker absorbs the nutrients from the mother plant for a certain period. One agriculturist raises three crops of poovan over a period of

thirty one months, which include one main crop of 12 months and two ratons of roughly nine months each.

Ranga Prabhu (2011)\textsuperscript{19} earned about ₹3,00,000 from banana (G-9 variety) from cultivation in three acres in 9-10 months using only natural manures. A lawyer turned organic farmer, he claims that natural inputs work best and can result in a good yield.

The above studies explained the various aspects of banana production.

\subsection*{2.3 Studies related to Cost and Return Structure of Banana}

The studies conducted by the earlier researchers to analyse the cost and return structure of banana, tools used for analysing cost and return structure of banana cost of cultivation and yield of banana for different types of farmers and different varieties of banana are given below.

Peter (1974)\textsuperscript{20} studied the input-output ratios of banana plantation in Kanyakumari District of Tamil Nadu. Cobb-Douglas production function had been used. The study illustrates that a shifting of resources from the total per day units of labour to total expenditure incurred for manuring is necessary to maximize the gross income at the existing level of expenditure. There is a highly significant positive response in the gross income to the positive changes in the expenses on manure.


Arputharaj and Kesavan Nair (1986)\textsuperscript{21} concluded that on an average, an amount of `36,252 per hectare had been incurred towards cost of cultivation of plantain. The highest item of expenditure was human labour forming about 23 percentage of the total cultivation expenses. The average output per hectare was 14,991 kg. of plantain bunches, valued at `56,205. The benefit cost ratios at cost A1, A2, Band C worked out to 2.16, 2.10, 1.84 and 1.64 respectively.

Thomas and Gupta (1987)\textsuperscript{22} have explained that the main items of expenditure in working out the cost of cultivation of banana per hectare in Kottayam District of Kerala were the expenditures on manures and fertilizers and on labour. An encouraging point noted in their study is the significant contribution of family labour which absorbs about 30 per cent of the total labour cost in small size holdings.

Latha Bastine and Radha Krishnan (1988)\textsuperscript{23} reveal that the cost of cultivation per hectare was `36,249. The returns worked out to `45,068 and the net income was `8,819. The main items of expenditure are the cost of both family and hired labour and manure per hectare of plantain cultivation. The study showed that the contribution of family labour was 30.50 percentage of the total


expenditure for labour. The contribution of family labour showed a decreasing
trend as the size of holding increased.

Semban (1991)\(^{24}\) in his study has used Cobb–Dauglas production function
to assess the efficiency of inputs and the yield of banana which was influenced by
the size of land, sucker and supporting poles. Land and supporting poles have
shown diminishing marginal returns to their application. The return to scale of
production of banana is the operation of diminishing return to scale, that is one per
cent in the yield of Banana. There is more scope for further application of land
and supporting poles and there is a reduction in the use of suckers in the
cultivation of banana in the study block.

Nirmala (1992)\(^{25}\) observed that labourers were prepared for most of the
farm activities. The small farmers incurred more expenses on labour employments
compared to large farmers. The input-output ratio per acre in terms of operational
cost to total cost was less for small farms than for large farms. The small farmers
incurred high cost of cultivation and obtained larger quantity of output per acre
than the large farmers.

Hiremath et al., (1994)\(^{26}\) in their study applied Cobb-Douglas type of
production function to assess the resource use efficiency in lime orchards. The

\(^{24}\) Semban, T. “Economics of Banana Cultivation in Tiruchirapalli District”, Unpublished Ph.D.
\(^{25}\) Nirmala, “Economic Analysis of Rice Cultivation”, (New Delhi: Concept Publishing Company,
\(^{26}\) Hiremath, G.M., Sastry, K.N., Hiremath, G.K.R., Narawadi, U.G., and Sundaraswamy, B.,
“Resource Use Efficiency in Lime Orchards”, Agricultural Banker, April-June, 1994,
pp.14-17.
regression coefficient for land was 0.71 in medium and 1.57 in large orchards that were statistically significant at one per cent level. The regression co-efficient of land for small orchards was 0.31 but non-significant. The regression coefficient of labour was non-significant in small and large orchards whereas in medium orchards it was 0.66 and significant at five percent level. There was no scope for increasing production of lime by increasing plant protection chemicals in small sized group and by increasing farmyard manure in large sized group.

Olekar et al., (1996)\(^{27}\) found that the variables included in Cobb-Douglas production function were able to explain the variations in yield of sunflower to the extent of 91 per cent and 86 per cent for small and large farms respectively. The output elasticity of human labour and farmyard manure were found to be significant indicating that there was scope to increase sun flower production further by the increased use of these inputs.

Kumara Gurubaran (1997)\(^{28}\) analyzed the input and output structure of Banana varieties revealed that the farmers cultivating poovan obtained higher yield than Nadu Growers. The Average yield per acre worked out to 14.87 tonnes for poovan whereas it was 13.95 tonnes for the Nadu variety. The levels of variable inputs used per acre showed that all the inputs differed significantly between the farmers cultivating the two varieties of Banana.


According to Kannan, (2000)²⁹ two important reasons for a change in the cropping pattern in Kerala, that is dominate by cash crops are comparatively high wages without a corresponding increase in labour productivity on the one hand, and on the other, prices that are not determined by the Kerala Market. Farmers do not enjoy any significant price advantage. Thus, he has concluded that farmers have opted for shifting land out of rice into more remunerative and less labour absorbing cash crops such as coconut, rubber, banana and others.

Arulkodi (2003)³⁰ has analysed that the cost and return structure of the three banana varieties. She indicates that the yield per acre in both physical and monetary terms was higher for poovan followed by karpoo ravalli and nendran. Their respective Physical and monetary returns being 25 tonnes (‘52,810.81) for poovan, 20 tonnes (‘47,732.43) for Karpooravalli and 14.55 tonnes (‘43,200) for Nendran.

The above studies express the cost and return structure of banana cultivation and the tools used by the various researchers.

2.4 Studies related to Marketing of Banana

The past studies related to marketing of banana, marketing channels, method of transport, marketing system, marketing efficiency, process in marketing and suggestions to improve banana marketing have been presented here.

Aiyasamy et al., (1980)\textsuperscript{31} in their paper have disclosed that the present study was undertaken to analyze the production and marketing of ‘Poovan’ variety of banana in Tiruchirapalli region of Tamil Nadu. Sixty farmers spread over six selected villages constituted the sample for this study. Detailed information on the cultivation aspects of banana, costs of production, problems in production, marketing agencies, prices, marketing costs, pattern of disposal and constraints in marketing were collected through pre-tested schedules. Severity of diseases and of wind were reported as the major agro-biological factors. Among the economic and institutional factors inadequacy of credit and non availability was the major bottleneck, besides higher cost of bamboo poles, higher cost of fertilizers and inadequate marketing. Organization of banana marketing through co-operatives as well as through regulated markets would help to fetch better prices.

Chandrasekaran (1987)\textsuperscript{32} studied the marketing of banana in the Cumbam Valley in Theni district. He found that the soils in the Cumbam regions were predominantly red loamy in about 70 per cent of the area and red sand in over 23 per cent of the total area. Red loamy soil was mostly found in the Utthamapalayam Block. While red sandy soil was in abundance in the Chinnamanur Block. These soils were porous with good drainage facility and were admirably suited for cultivation of crops like banana.

Simmonds (1982)\textsuperscript{33} discussed the varieties and the methods of transport in different countries. He has given a good account of the economic characteristics of banana. The return is quick as it can be harvested in a year. It is quick to recover from the damage caused by wind. It demands more fertilizers and water. The labour requirements and income from banana vary with season. It is economical as the income from it is spread over a period of few months.

Akbar and Rahman (1991)\textsuperscript{34} found that the largest volume of banana was sold (63 percent) in the market place itself. They identified three different channels and worked out the price spread and the farmer’s share of the consumer’s rupee. They found that as the length of the marketing channel increased, the farmer’s share declined considerably and vice versa.

Jose M.Yorobe (1998)\textsuperscript{35} in his paper examines the banana marketing system in the Philippines in the context of its economic performance and market development prospects. The structure, organization and performance of domestic and export marketing and the formation and efficiency of pricing are investigated. Commodity flow, margin analysis and the evaluation of marketing efficiency are conducted at the small holder level.

The growth of banana productions and domestic consumption remained stable but percapita consumption has been declining due to a burgeoning export

demand including emerging markets in Asia, Europe and the Middle East. While the country enjoys dominance in Asian markets, it now faces increasing competition from Asian neighbours and a lack of dynamism due to area limitations.

The dominant participants in the banana marketing channel consist of assembler-shippers, wholesaler-retailers and retailers. Tests for spatial price efficiency indicate a low level of short-term market integration suggesting the low sensitivity of prices in local markets from shocks transmitted from urban markets. Price adjustments were also not instantaneous giving a window of opportunity for profitable arbitrage. A survey of 50 smallholder banana farmers and 27 traders in a major banana-producing province in the Philippines was conducted to look into the commodity flow, marketing margins and cost and efficiency of marketing bananas. The results showed that Assemblers-Shippers (AS), Assemblers-Shippers –Wholesalers - Retailers (ASWR), wholesalers and retailers possessed the greatest opportunity for profitability. Their dominance in pricing, incorrect counting and poor grading already suggest the possible exercise of market power. The low quality of infrastructure and post-harvest facilities inappropriate handling and storage and lack of market information add more to marketing costs. Overall, the results indicate a low level of efficiency in the marketing system.
Uma et al., (1998) in their paper viewed that in India, banana marketing is a multi-stage process which includes accumulation, transportation, grading, distribution etc. For the improvement and development of the marketing structure, a co-ordinated approach aimed at removing all the weak links in the marketing chain is essential. A package of improved marketing services in the form of regulated co-operative markets, facilities for grading, weighing, storing, transporting, handling and finance provision is to be made available to ensure the producer a fair return from his production effort and a better share in the price paid by the consumer by fixing an appropriate support price and procurement price. Market research programmes should be oriented to the developing of an orderly and efficient marketing system. Though the National Horticulture Board (NHB) has developed a very good marketing intelligence to disseminate marketing information regarding horticultural produce to the interested parties, commodity intelligence bulletins exclusively for banana need to be published.

Now, India is entering an era of surplus banana production. Thus, it is a crucial time for developing a systematic banana marketing channel and extending its range to foreign countries by improving the shelf life period and storage and export facilities. In India, the National Research Centre on Banana, Trichy, has been showing keen interest in testing the zero energy chamber storage for banana for increasing shelf life at production sites. Developing new banana varieties with

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prolonged shelf life period and export qualities etc. are the areas of primary interest. In the present situation of the country, even after attaining self sufficiency and surplus production of banana, India is not able to compete in the international market for banana export due to the presence of bottlenecks in marketing channels and gaps in production with good export quality. The responsibility for rectifying all these problems lie with scientists, government and economists working on marketing channels and post harvest technology of banana.

Gajanana (2002) in his article concluded that the producers of banana var. poovan are found to use two main channels for marketing their produce i.e., one, selling in the local market either through Pre Harest Contractors or Commission Agents (Channel I); two, selling to the agents of the wholesalers in the distant markets like Bangalore, Mumbai and Chennai (Channel II). The post harvest loss in channel I was found to be 19 per cent compared to 21 per cent in Channel II. The main reason for the higher loss in channel II was transit loss due to long distance transportation. This suggests that there is a need to improve packing for long distance transportation through boxes and other containers as at present the naked bunches are loaded in the trucks one over the other which results in bruises and pressing of fruits.

Further, in order to make the best use of the utilizable waste banana fruits, it is suggested to establish processing units of banana in the production area as it

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was found feasible. Though the cost of marketing and the post-harvest loss are slightly higher in the distant Bangalore regulated market, the price realized was found to far outweigh these and this suggests that the producers could organize themselves as a group and transport their banana to the distant markets to take advantage of the higher price and income.

The study shows that in the regulated market (Bangalore), a commission of five per cent and a cess of one per cent is collected from the buyers (traders) in the market contrary to a commission of 10 per cent charged from sellers (farmers) in the unregulated market (Trichy). Besides, the average price of `65 per bunch was received in the regulated market Bangalore as against only `51 per bunch in the unregulated market, Trichy. Therefore, there is an urgent need to convert all unregulated markets like Trichi into regulated markets for the benefit of farmers throughout the country.

Kathirvel and Chandrasekaran (2008)\textsuperscript{38} in their study concluded that, the banana cultivation is higher in Karur district. But they fetch only lower price. If a co-operative marketing society is established in this district, it will be beneficial for banana producers as it undertakes the procurement, processing and other marketing functions for the benefit of the members.

Alka Srivastava and Janaki Chundi (2000)\textsuperscript{39} pointed out that the village economy as a whole cannot be developed without effective and efficient rural marketing which involves a two way marketing process comprising of marketing of products which flow to rural areas and also the products which flow to urban areas from the rural areas. Since India’s majority of population live in rural areas and agriculture is their chief means of livelihood, greater emphasis is given to innovations in efficient marketing of agricultural products, which will ensure remunerative price for their produce and also supply of the same to the consumers at reasonable price.

Asok (2004)\textsuperscript{40} in his study on, “Liberalization and Globalisation: Issues in Agricultural Marketing”, made an attempt to bring into focus the need for a long-term prospective in the filed of agricultural market keeping in mind the agricultural production, consumption requirements and global changes. The existing system has to be revitalized to take up the thrown up by the forces of globalization and give a proper direction to all sections of the agricultural marketing system, so that integration does not have a negative fallout on the economy.


Stephen Mutuku Nzioka (2009)\textsuperscript{41} in his article disclosed that approximately 80\% of Kenya’s population lives in rural areas and derives its livelihood largely from agriculture. Agriculture makes up about 26\% of Kenya’s gross domestic product, and banana production occupies 2\% of Kenya’s arable land. Bananas are grown both as a source of food and household income to millions of rural Kenyans; however, production has been declining in the last two decades. The objective of the study was to examine banana production and marketing in Kiambu East District, with the aim of improving the levels of banana production by small-scale farmers and making recommendations to improve marketing efficiency. A structured questionnaire was given to farmers in three Divisions of Kiambu East District: Githunguri, Municipality and Kiambaa. A frontier production function was established, and results indicated that farmers operated at about 60 per cent of the optimum production level because of technical inefficiency, resulting in low levels of production by individual farmers.

If farmers received training on how to manage their traditional bananas and organized into marketing groups, they could improve their bargaining power and increase household income to as much as 3 times the current level. Farmers therefore should form production and marketing groups to grow and market their bananas collectively. Farmers also need to be given management training and financial assistance to grow their yielding varieties of bananas (e.g., Tissue

Culture Bananas). In addition farmers need to be trained on indigenous post-harvest technology to realize increased household incomes.

Duraisingh et al., (2008)\textsuperscript{42} in their study suggested that, fair price markets may be started in Nazareth area to sell out the marketable surplus. The government should publish the actual ruling price list of the different commodities and also suggested that the government should arrange adequate and cheap means of transport facilities in their study area.

Rama Rao et al., (2008)\textsuperscript{43} found that about 53 per cent of farmers sold their produce in the regulated markets and 33 per cent sold in unregulated markets such as local traders and commission agents, about 13 per cent of the farmers did not sell their produce at all. It was observed that farmers would be paid immediately for their produce when sold in a regulated market. On the other hand, they had to wait for at least fifteen days if they sold in the unregulated markets. The study reveals that the existence of a wide price spread indicates that the farmers’ income can be enhanced considerably, if the marketing. Channels are shortened, so that the farmers get a higher share of what the consumers pay.

Thus the above studies provide a vivid picture of the following namely marketing of banana, marketing channels, transportation of banana and suggestions to improve banana marketing conditions.

2.5 Studies related to Problems of Banana Producers in Production and Marketing

The previous studies related to problems of farmers in production and marketing of banana are given below.

Kathirvel (2008)\textsuperscript{44} analyzed the economic factors limiting to banana production with the help of Garrett Ranking Technique. He pointed out that credit inadequacy was the major problem (Rank 1) in the production of banana. High Fertilizer cost was the next important problem (Rank 2). The small size of farm holdings, the lack of technical guidance was the least important problems.

Muthupandi (2009)\textsuperscript{45} analysed the production problems of banana growers by using Garret Ranking Technique. Severity of wind which was the major problem with a mean score of 61.64. Severity of disease is the next important problem with a mean score of 58.81. The third important problem faced by the growers was severity of rain which had a mean score of 45.18. Soil condition was the fourth problem which has a mean score of 35.63.


Geetha and Meena (2010) have adopted factor analysis to find out the problems faced by the farmers in the production of banana. They found that financial, environmental, farming, natural and personal risk and spoilage factors were the important problem factors in the production of banana.

Jaffer Mohamed (2002) analysed the marketing problems of banana growers by using Garrett Ranking Technique. The percentage of the individual ranks was converted into scores using the Garrett Table and thereby the mean score and the rank were assigned to the problems encountered by the growers. The fluctuation in prices of banana was the major problem with a mean score of 73.86. Inadequate finance was the next important problem faced by the grower with a mean score of 62.12.

The above studies point out the problems faced by the banana cultivators in production and marketing of banana.

2.6 Banana Energy related Studies

Kombairaju (1989) analysed the energy consumption pattern in crop production of Naickenpalayam village of Perianaickenpalayam Block, Coimbatore District, in 1989. The findings of this study showed that among the various irrigated crops the energy intensity was the highest for paddy (1056.01

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\[\text{Kombairaju, S., “Energy Use Planning in Crop Production at Micro Level: A Programming Approach”, Ph.D., Thesis submitted to the Department of Agricultural Economics Tamil Nadu, Agricultural University, Coimbatore, 1989, pp.70-76.}\]
Kwh/month) and the lowest for topioca (248.10 kwh/month). The total energy requirement of banana has been estimated at the highest as 8966.52 kwh/ha as against 4752.06 kwh/ha for paddy. The study showed that there was scope for improvement in farm income which depends on energy efficient and cost saving technologies.

To sum up banana cultivation satisfies economic, domestic, social and cultural needs of the people. Banana products constitute one of the major items of export. It contributes to the Gross Domestic Product (GDP) of the country, earns foreign exchange, provides employment and income in the farm sector and it is augmented for its medicinal importance. It is a positive indication of banana cultivation.

The above studies related to production cost and return, marketing and problems faced by the banana producers in production and marketing of banana are explained clearly. In spite of all these problems faced by the banana cultivators, banana cultivation improves the economic and social life of the farmers and the society.

2.7 Concepts

The important concepts used in this study are defined in this chapter.

Agriculture

The term “Agriculture” is derived from the Latin words “Agri” and “Culture” “Agri” means soil or field. “Culture” means tilling. So Agriculture
means tilling the soil. The object of tilling the soil is to raise crops and plants for the use of mankind.

**Agricultural Wages**

Wages are prices paid for the services of labour. The ability of the workers to buy goods depends on the quantum of wages they get. The level of wages depends on the output of labour and the price of products.

**Agricultural Labourer**

According to Agricultural Labour Enquiry Committee, “Agricultural labourers are those who are engaged in the cultivation of crops getting wages for the work rendered”. Agricultural labour is a person who works on another person’s land for wages. Most of the agricultural labourers are either landless people or those who are engaged in the Agricultural work for earning their livelihood. They are basically unskilled and unorganized.

**Banana (Musasp)**

Banana is essentially a hot climate plant and its original home is said to be the warm regions of South East Asia. Edible bananas are of two kinds. The cooking banana known as plantain which can be considered as a starchy vegetable and the fruit banana.
Plantain

Plantain is a quick growing plant, which attains a height of about ten to twenty feet. It yields very delicious tropical fruits, which are highly nutritious and easily digested. The unripe fruit is astringent, while the ripe fruit is laxative. The roots, rhizomes and flowers have medicinal value. There are several varieties of this plant.

Sucker

The plantlet which emerges from the tuber of the mother plant is called sucker in banana. Many suckers will emerge from the mother tree. The vigorously growing one or two suckers are left for further multiplication of banana. Sucker is the main planting material for banana.

Consumer

“Consumer”49 has been termed as ‘Black Box’ a mysterious one which can never be looked into and can only be broadly understood by grasping the outputs that come out as a result of many marketing stimuli along with the influence of certain exogeneous variables such as culture, time and income.

Producers

Producers - farmers want the marketing system to purchase their produce without loss of time and provide the maximum share in the consumer’s rupee. They want the maximum possible price for their surplus produce from the system.

Similarly, they want the system to supply them the inputs at the lowest possible price for their surplus produce from the system.

**Commission Agents**

A commission agent is one who negotiates price for the sale of goods he handles. But he doesn’t bear title to the goods he handles. He acts as a mediator, collects the value, deducts his commission and remits the balance to the farmers whom he transacts.

**Price Spread**

“Price spread”[^50] refers to the distribution of price paid by the consumer among the various intermediaries and producers.

**Crop Loan**

Crop loan is defined as the loan amount offered by the co-operative society to meet the expenses incurred in connection with the cultivation of crops like cotton, sugarcane, paddy, banana, tapioca, coconut and rubber. The duration of the loan is ten months.

**Cultivator**

A person is termed as cultivator if he or she is engaged in cultivation by himself or by supervision or direction in one’s capacity as the owner or leasee of

land held from Government or as a tenant of land held from private persons or institutions for payment of money, kind of share.

**Farmer**

The farmer has the full control over the choice of farm practices depending upon the prices and the degree of the knowledge over the farm activity. Therefore his thinking and basic notions play a vital role on the increase in production per acre. Those who are engaged in cultivation as their main occupation are said to be farmers. A farmer is a person who cultivates banana and markets them through various channels of distribution or directly to consumers.

**Marginal Farmers**

Marginal farmers denote those sample farmers holding from 2.5 to 5 acres of land.

**Small Farmers**

Marginal farmers denote those sample farmers holding land between one to five acres.

**Grading**

After harvesting but before packing there comes one more important operation, which is known as Grading. It is an act of Separating the fruits into different lots according to their size, colour and stage of ripeness.
Harvesting

Harvesting is the first important operation in the process of marketing. This includes selection of a suitable method for harvesting which may protect the fruits from injury and also a proper assessment of the maturity of fruits to be packed.

Packaging

The object of packaging of banana is to protect the contents during storage, transportation and distribution against deterioration which may be physical, chemical or biological.

Horticulture

‘Horticulture’\textsuperscript{51} is the crop science which deals with the production, utilization and improvement of fruits, vegetables, ornamental plants, spices and plantation crops including medicinal and aromatic plants.

Intercropping

In the banana fields vegetables like yams cucumber and green leaves are grown as intercrop for the first three months.

Market

A place (if so mentioned) and also a situation in which transactions can be take place between buyers and sellers.

Marketing Middlemen and Traders

Marketing middlemen and traders are interested in a marketing system. Which provides them a steady and increasing income from the purchase and sale of agricultural commodities.

This objective of market middlemen may be achieved by purchasing the agricultural products from the farmers at low prices and selling them to consumers at high prices.

Marketing System

Marketing system is a chain of various functions performed by the market functionaries in order to transfer produces from producers to ultimate consumers.

Channels

The path taken by the product from producers to the ultimate consumers.\(^{52}\)

Marketing Cost

Marketing cost consists of all items of expenditure incurred in transferring banana from the producers to the consumers.\(^{53}\)

Marketing Structure

All the agencies involved either vertically or horizontally in selling and buying products.

\(^{52}\) Kulkarni, K.L., Agricultural Marketing in India, Bombay Co-operative Book Dept. 1964, p.41.
**Commission Agents**

Commission agents are one who negotiates price for the sale of goods he handles. But he does not bear title to the goods he handles. He acts as a mediator collected the value, deducts his commission and remits the balance to the farmers for whom the transacts.

**Broker**

A broker is an individual or party that arranges transactions between a buyer and a seller, and gets a commission when the deal is executed. A broker who also acts as a seller or as a buyer becomes a principal party to the deal.

**Village Traders**

Village traders act as a connecting link between the producers and the commission agents / wholesale merchants.

**Producers’ Surplus of Agricultural Commodities**

This is the quantity which is actually made available to the non-producing population of the country. The arrangements for marketing and the expansion of markets have to be made. Only for the surplus quantity available with the farmers and not for the total production. The rate at which agricultural production expands determines the face of agricultural development and the growth in the marketable surplus determines the face of economic development.
**Producer’s Surplus**

The marketable surplus is that quantity of the produce which can be made available to the non-farm population of the country. The marketable surplus is the residual left with the producer-farmer after meeting his requirements for family consumption, farm needs, for seeds and feed for cattle, payment to labour in kind, payment to artisans, carpenter, blacksmith, potter and mechanic payment to land-lord as rent, and social and religious payment in kind. This may be expressed as follows.

\[
MS = P - C
\]

- **MS**: marketable surplus
- **P**: Total production
- **C**: Total requirements.

Family consumption, farm needs, payment to labour artisans, land lord and payment for social and religious work.

**Marketed Surplus**

Marketed surplus is the quantity of the produce which the producer, farmer actually sells in the market irrespective of his requirement for family consumption, farm needs and other payments. The marketed surplus may be more or less or equal to the marketable surplus.

Bansil writes that there is only one term marketable surplus. This may be defined subjectively or objectively. Subjectively, the term marketable surplus refers to theoretical surplus available for sale with the producer-farmer after he has
met his genuine consumption requirements and the requirements of his family, the payment of wages in kind, his feed and seed requirements and his social and religious payments. Objectively the marketable surplus is the total quantity of arrivals in the market out of the new crop.\textsuperscript{54}

**Marketing Efficiency**

Marketing efficiency is the ratio of market output (satisfaction or marketable surplus) to marketing input (marketing cost). An increase in this ratio represents improved efficiency and a decrease denotes reduced efficiency. A reduction in the cost for the same level of satisfaction or an increase in the satisfaction at a given cost results in the improvement in efficiency.

**Marketing Margin**

Marketing margin is the share or margin received by the intermediaries for the services rendered by them.

**Hours of Work**

Hours of work constitute the normal working hours for specific agricultural operations fixed according to the tradition in the area concerned.

**Wages**

Wages are the reward for labour. They are given a place of very great significance by the workers, the employers and the government. To a worker

wages represents income, to the businessman represents cost and to the government they represent potential taxes.

**Net Income**

Net income is the difference between gross income and total cost.

**Net Profit**

Net profit is a surplus above the cost of production i.e. the residue after deducting as contractual income to the other factor services.

**Household**

A household is a group of persons who live together and share a common kitchen. A single person is treated as a household provided he or she maintains a kitchen.

**Debt**

Debt is one which a person owes some amount of money to another person.

**2.8 Methodology**

The aim of the present study is to make an attempt to analyse the various factors concerned with the cultivation of banana such as the production of banana, marketing of banana, cost and return of banana cultivation, problems of banana producers and suggests appropriate measures to improve the production of banana in Kalkulam Taluk of Kanyakumari District, TamilNadu. It is essentially a fact finding approach related largely to the present and arriving at a generalization of the status of banana producers by undertaking a study based on the cross-section
of the banana cultivators in the taluk. This is an empirical research mainly based on survey method. The present study adopts positive methods to describe the present status and normative method to prescribe for future improvements in the status of banana producers households in the area of study.

2.8.1 Study Area

Kanyakumari District comprises of four taluks, out of which the Kalkulam taluk is selected for this study. In the Kalkulam taluk there are three blocks namely, Kurunthancode, Thuckalay and Thiruvattar. All the three blocks were taken for the study. The farmers in Kalkulam taluk found that Banana cultivation is more profitable. The area under banana cultivation is increasing. Banana is an annual crop and it is mainly grown for the market. It is considered as a poor man’s commercial crop, because according to the availability of capital, the scale of operation is adjustable.

In the marketing of banana in Kalkulam taluk the middlemen enjoy the benefits because of the inability and illiteracy of the poor farmers. There is no regulated market specially meant for banana.

2.8.2 Sampling Design

Multi-stage stratified random sampling technique has been adopted for the study taking Kanyakumari District as the universe, the block as the stratum, the village as the primary unit and banana cultivators as the ultimate unit.

Kanyakumari District comprises of nine blocks. Banana is mainly cultivated in Kurunthancode, Thuckalay and Thiruvattar blocks of Kalkulam taluk.
Hence the selection of sample villages was restricted to these three blocks. A list of area under banana cultivation in 2009-10 for all the villages of the three blocks was prepared from the records of the Joint Director of Agriculture, Nagercoil, Kanyakumari District. Five villages in each block which account for the highest area under banana cultivation in the descending order of magnitude were selected as the study unit for primary data collection.

A list of banana cultivators in the selected villages was obtained from the records of the Joint Director of Agriculture, Nagercoil, Kanyakumari District. The percentage random sampling technique has been adopted to select 208 samples from Kurunthancode, 200 samples from Thuckalay and 34 samples from Thiruvattar 15 villages from the three blocks mentioned above. Thus, a total of 442 banana cultivators (2%) were selected for statistical investigation. The village-wise list of sample farmers is presented in Table 2.1.
**Table: 2.1 - Name of Block and Proportionate Sample Selected Farmers**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Block Name</th>
<th>Total Farmers (Banana)</th>
<th>Sample Farmers (Banana)</th>
<th>Overall Selected Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Small Farmers</td>
<td>Marginal Farmers</td>
<td>Small Farmers</td>
</tr>
<tr>
<td>1.</td>
<td>Villukury</td>
<td>14</td>
<td>3,204</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Puliyoorkurichi</td>
<td>12</td>
<td>2,195</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>Kurunthancode</td>
<td>11</td>
<td>2,110</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>Aloor</td>
<td>6</td>
<td>1,602</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>Lakshmipuram</td>
<td>7</td>
<td>1,216</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>50</strong></td>
<td><strong>10,327</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Thuckalay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Valvachagostam</td>
<td>35</td>
<td>2,424</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Kothanalloor</td>
<td>30</td>
<td>2,160</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Thirivithancode</td>
<td>32</td>
<td>2,031</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Thuckalay</td>
<td>25</td>
<td>1,953</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>Eraniel</td>
<td>23</td>
<td>1,280</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>145</strong></td>
<td><strong>9,848</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Thiruvattar</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Surulacode</td>
<td>550</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>2.</td>
<td>Attoor</td>
<td>340</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Thiruvattar</td>
<td>245</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Mecode</td>
<td>280</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Viyanoor</td>
<td>251</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1,666</strong></td>
<td><strong>32</strong></td>
<td><strong>33</strong></td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td><strong>1,861</strong></td>
<td><strong>20,207</strong></td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>


100 banana traders were also taken for this study among them 50 samples from Marthandam banana market and another 50 samples from Thuckalay. The
data collected were carefully processed, edited and tabulated for analytical purposes.

2.7.3 Sources of Data

This study is based on both primary and secondary data. The primary data of the banana cultivator level were collected from a sample of 442 cultivators drawn from the three blocks of the Kalkulam taluk. The questionnaire was so designed as to overcome bias to the possible extent with various checks. The required primary data were collected from the selected cultivators with the help of an enquiry schedule, through the personal interview method. Care was taken to avoid bias and several cross checks were applied to ensure accuracy of data.

The secondary data were made available from the Directorate of Economics and Statistics, Chennai, ‘G’ Returns, Pasli, District statistical office, Horticulture office, season and crop Reports, various journals, books and websites.

2.7.4 Period of Study

Taking into consideration the purpose and data requirements of the study, the period of study was restricted to one good agricultural year 2009-2010 with normal rainfall, which is sufficient for undertaking an in-depth study of the research problem. The investigation was carried out during the period May 2010 to July 2011.
2.7.5 Tools used for the Study

The researcher prepared interview schedule consisting of various questions relating to the profile of the farmers, banana production, marketing and problems of cultivators in production and marketing. Profile of traders and marketing problems of traders and also consulted with subject experts to fulfill the objectives of the study. Interview method was used to supplement the information wherever necessary. The purpose behind interview is both to fill the gaps in the information provided by the respondents and also to get additional information which normally people do not give in writing. During personal interactions, it is easy to get required information from such banana cultivators. The interviews were conducted only with banana cultivators and traders.

2.7.6 Statistical Techniques Used

After the fieldwork, the data were carefully scrutinised and edited in order to ensure accuracy, consistency, and completeness. Statistical techniques used are: percentage and Trend Analysis, Average Annual Growth Rate, Multiple Linear Regression, Production Function Analysis, Cost Benefit Analysis, Garrett Ranking Technique, Factor Analysis, Kaiser Meyar Olkin (KMO) and Bartlett’s Test of Sephericity, Lorenz Curve, Gini Concentration Technique and other diagrams and graphs.
**Trend Model Forecasting**

In order to analyse the trend in area, production and productivity of banana various trend analysis is used. Trend models, otherwise called deterministic models often catch the fluctuations occurring in business and economic variables. Most frequently used trend models are linear, quadratic, logarithmic and exponential. The trend models employed in this study are presented below.

1. **Linear Trend Model** \[ Y = a + b \ T + u_t \]
2. **Quadratic Trend Model** \[ Y = a + b +c \ T^2 + u_t \]
3. **Logarithmic Model** \[ \log Y = a + b \log T + u \]
4. **Cubic Trend Model** \[ Y = a + bT +c \ T^2 + d \ T^3 + u_t \]
5. **Exponential Trend Model** \[ Y = a + b \ e^{ct} + u_t \]

Where, \( T \) = Time variable  
\( a, b, c, d \) = coefficients of the regression model to be estimated  
\( u_t \) = value of error variable at time ‘T’

**Average Annual Growth Rate (AAGR)**

The average annual growth rate shows the average percentage change of the base year to current year.

The formula used for this computation is:

\[
AAGR = \frac{1}{n} \sum_{t=2}^{n} \left( \frac{Y_t - Y_{t-1}}{Y_{t-1}} \right) \times 100
\]
Where $Y_t$ and $Y_{t-1}$ are values for current year and base year respectively and $n$ is the number of years of the time series.\textsuperscript{55}

**Multiple Linear Regression Model**

In order to identify the determinants of production function, the following form of multiple linear regression model of Cobb-Dougles type is used.

$$Y = \alpha_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 + U$$

Where $Y = \text{Annual gross return}$

$x_1 = \text{Varieties of banana}$

$x_2 = \text{Age of the plant}$

$x_3 = \text{Capital invested (in ₹)}$

$x_4 = \text{Land in acres}$

$x_5 = \text{Farming experience}$

$U = \text{Disturbance term}$

**Estimation of Cost Function**

In order to identify the cost function of banana production, the following form of simple regression model was fitted by the method of least squares.

$$C = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + b_7 x_7 + b_8 x_8 + u$$

Where $C = \text{Total cost}$

$x_1 = \text{Wages for Labourers in ₹}$

\[ x_2 = \text{Fertilizer cost in '} \]
\[ x_3 = \text{Sucker cost in '} \]
\[ x_4 = \text{Irrigation cost in '} \]
\[ x_5 = \text{Plantation cost in '} \]
\[ x_6 = \text{propping cost in '} \]
\[ x_7 = \text{Rent} \]
\[ x_8 = \text{Other Incidental Charges} \]

**Garrett Ranking Technique**

Garrett ranking technique was used to rank the problems. The ranks were assigned and points were given in the following order.

1 – Rank = 5 points
2 – Rank = 4 points
3 – Rank = 3 points
4 – Rank = 2 points
5 – Rank = 1 point

After assigning points to various ranks, the Garrett mean score was calculated by using the following formula.

\[
\text{Present Position} = \frac{100(R_{ij} - 0.5)}{N_j}
\]

where,

\[ R_{ij} = \text{Rank given for the } i^{\text{th}} \text{ reason by } j^{\text{th}} \text{ respondents} \]
\[ N_j = \text{Number of factors ranked by } j^{\text{th}} \text{ respondents} \]
**Gini Concentration Ratio**

In order to find out the correct estimation Gini concentration ratio’s was calculated.

The Gini coefficient is stated as

\[ G = 1 - \sum p_i (Z_i + Z_{i-1}) \]

where

\[ P_i = \text{cumulative percentage of person} \]

\[ Z_i = \text{cumulative percentage of income} \]

**2.8 An Overview**

Out of a number of studies relating to banana production, cost and return analysis and marketing, many have pointed out the inadequacy of finance and climate change as the reason for the low productivity. The review of the previous studies brings to light many concepts and factors related to and required in the estimation of production function analysis. However, the studies indicate that production and marketing of banana are given importance and the other aspect of the research which is equally important, that is, the cost and return analysis has not been adequately undertaken. This research tries to focus on this aspect.