STUDIES ON THE ECONOMICS OF PRODUCTION OF *Nendran* Banana

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C O N T E N T S

INTRODUCTION

CHAPTER I

INTRODUCTION

Production of Nendran banana, the subject matter of this study is a very remunerative supplementary avocation to hundreds of poor agricultural labourers in Tellicherry Community Development Block area and in other parts of Kerala. Green patches of Nendran crop, beautifying the paddy field throughout the year is a very common sight in Malabar. Unlike in other parts of the country, the production of this variety of banana is taken up by landless agricultural labourers and small farmers mainly on temporarily leased lands, and as the enterprise is very costly, the unit area of cultivation is extremely small.

Sham Singh et al (1963) have observed that Nendran belongs to the group of the world famous cooking plantains, represented by Nana Nendran, Attu Nendran and Myndoli of Kerala and Rajeli of Bombay. These are all tall varieties ranging from 9 feet to 12 feet in height. Nendran is the only variety of banana which receives intensive cultivation in Kerala. Of the many types found in Nendran variety 'Tiruvodan' is cultivated in Tellicherry Block, the area under study.

No separate estimate of the acreage under the Nendran crop is found to have been made. In the 'Report on the marketing of Banana in India' 1945, it has been stated that the area under Nendran was 10 per cent of the total area of 1,36,455 acres under banana in the then Madras Province and it was largely grown in Malabar. In the farm bulletin entitled, 'The Banana in India' (1957) published by the Indian Council of

Agricultural Research, the area under Nendran has been estimated as 4,000 acres in Malabar and 1,000 acres in South Kanara. According to a report of the Department of Statistics, Kerala, the total area under all kinds of banana was 1,05,545 acres and the production of Nendran and other kinds of banana in 1961-62 in the Kerala State was 55,443 tons and 25,69,00 tons respectively. On this basis the present area under Nendran in the Kerala State may be roughly estimated as 9,000 to 10,000 acres.

Nendran is unrivalled among bananas. The Nendran banana according to Gopalan Nair (1962) has the biggest sized edible fruit in Musa family. An ever popular fruit of Kerala, Nendran has a premium in the market. The fruits as an item of food find entry from the lowest hut to the royal palace. This popular fruit is used both for dessert and culinary purposes. Many a dainty dish is prepared out of the Nendran fruit. Mention is found to have been made in some references to Nendran that the fruit is eaten only after cooking. But no such restriction is found in Kerala. The ripe fruit is consumed as such by children and adults, though to make the fruit tastier, often they are steam boiled. Unripe fruit is used like potato for various culinary purposes. The raw pulps, cut into thin wafers and fried in coconut oil, make the wellknown "banana chips" that keep well for two or three months and are in great demand and are exported from Calicut to distant places like Baghdad and Basra. The ripe fruits sliced lengthwise and fried in ghee is yet another very tasty preparation. Ripe fruits are also used in the preparation of 'Prathaman'

(a preparation like payasam) and salads. Many other kinds of sweets can also be prepared out of ripe Nendran fruits and preserved for a considerable length of time.

The banana flour made from fully matured unripe Nendran is an ideal baby food. Gandhi (1957) pointed out that banana flour is rich in carbohydrates and minerals and is more easily digested than any other cereal starch. A famous preserved ~~preserved~~ product known as, 'banana fig' is also prepared out of all varieties of Nendran.

The uses of Nendran fruit mentioned above are only a few out of many to which it is put to, in its native state of Kerala.

According to Cheriyan Jacob, the fruit contains three times more calcium than Rasthali. Food produced in Kerala being deficient in calcium, the availability of a fruit which contains this mineral in abundance is a blessing.

Practically there is no part of Nendran plant which is of no use to man. The rhizome of the suckers cooked alone or with tapioca, fish etc., is a food of the poor people. A very tasty pickle called locally as 'Kanda achar' is also prepared out of the rhizome of the plant. The flower and flower stock are also edible and make good side dishes for rice. Fibre extracted from leaf sheaths of Nendran plants after harvest of the bunches is a very good substitute for coir and other ropes. To prevent the wastage of this useful material, with the financial assistance and supervision of the Khadi Commission, a 'Banana Fibre Extracting Centre' has been organised

in the village of Kodiyeri which is an important centre for Nendran production in Tellicherry block. This centre, apart from finding good use for this waste material, provided employment for 27 women. There is good scope for opening a few more centres in the block area at places where the production of banana is of considerable significance.

As a field crop, Nendran is more paying to the grower than most of the other fruit crops and cereals. Nendran yields 7,000 to 8,000 kg. of edible matter per acre of land which is many times more than the average yield of rice or any other food crop.

The expansion and efficiency of production of this unique crop even at the cost of reducing the area under rice is of paramount importance to produce more valuable food for the people, to provide more employment to the under-employed agricultural labourers and to ensure them a better return. The need for increased production of Nendran now assumes a greater significance after the formation of the Banana and Fruit Development Corporatio for Southern States at Madras in view of the possibility of gaining foreign exchange by export of banana to foreign countries like Russia, Japan, Italy and Arabian countries.

High cost of production, the inability of the growers to meet the capital requirements and ignorance about the efficient use of resources are the formidable factors that stand in the way of expansion and efficiency in production of Nendran. Comparatively a very large amount of resources goes into the production of Nendran. These resources are used according to the

traditional practices and convention. Therefore an investigation to throw light on the volume of cost involved in the production, the pattern of resource use, its productivity and the optimum resource use pattern that would maximise returns may be of immense use to invite the attention of the authorities concerned to formulate programmes for financial assistance by way of loans etc., and to provide guide lines for the economic and efficient use of resources to the growers. These were the reasons which promoted the present study.

The investigation on the subject therefore involved a careful study of the existing pattern of resources use, and production techniques and analysing the level of efficiency of the resources used and the economy of the enterprise.

The specific objective of the study may be enumerated as follows:

1. To estimate the per acre cost and per tonne cost of Nendran production and return therefrom.

2. To estimate the capital requirement of an average grower.

3. To assess the total family income received by an average grower and the wages accrued per man day unit of family labour contributed in Nendran production.

4. To evaluate the resource use efficiency in production.

REVIEW OF PAST WORK DONE

CHAPTER II

REVIEW OF PAST WORK DONE

Cox (1920) stated "cost of production is more frequently used in the sense of expense of production i.e., money cost. This means that it has cost the farmer so many dollars to produce a bale of cotton, or a calf. Cost of production used in this sense includes every expense of whatever nature, whether overhead or operating expenses, necessary to obtain the products. It includes all such items as interest on capital invested, depreciation, labour costs both hired and that of the manager and his family, cost of seed, fertilizer etc.," Hopkins and Taylor (1935) pointed out "there are three principal methods of obtaining data needed in efforts to determine production costs. These are by 'Estimation' by 'Surveys' and by 'Actual records kept in farms'. According to Hopkins, Armstrong and Mitchell (1932) the chief reasons for making a study of producing crops are to discover the most improved methods of reducing the cost and to learn what crops give the most profitable returns. Patil (1933) observed that the chief merit of farm costing in India would lie in bringing out facts, regarding the incomes in different crop zones, which are little known and the material and their analysis would suggest adjustments in farm management and in effecting economies in the cost of production.

The study of cost and return and factor-product relationship in farming is therefore of paramount importance down from the primary producer to the ultimate consumer in a country. But the number of cost studies is not large enough and does not cover

all fields especially in India and thus is inadequate to throw light on various problems in agricultural production. Patil (1933) pointed out "Agricultural cost accounting is a new development in Agricultural Economics and even America and Europe can present very few complete studies in this new field. One no doubt finds considerable information regarding costs and receipts of crops in most countries including India, but the information though important in its own way is not of much statistical value to an economist or a farm manager. The information on costs and receipts of crops, as is found in agricultural textbooks is of the nature of approximation rather than cost", and this gives a correct picture of the progress of cost accounting studies until recently. But some useful studies in cost accounting and resource efficiency have been conducted in recent years in foreign countries and also to a smaller extent in India which throw light on many specific problems in farm management.

There is no clear evidence to decide exactly in which country, the cost accounting studies originated on a scientific basis. Isolated investigations on costs with different purposes had been conducted in the European countries since the second half of the 19th century. United States of America was the pioneer in the field of scientific farm management (Tandon and Dhondyal 1962a). The economic depression in the last two decades of the 19th century made it necessary to study ways and means for the reduction of cost of production of farm products and this was the starting point to conduct enquiries into the cost of different farm products either by means of special investigations or in connection with research, bearing upon the technique of production. Hopkins and

Taylor (1935) reported that during the depression of the early 1890's, a number of estimates of costs were made to demonstrate that farm prices were too low and something should be done about them. The Federal Government either through the agency of special committees or as a part of research investigations initiated enquiries into the cost of production of different farm products. These investigations with the object of making more accurate examination of the structure in the production of agricultural commodities became more numerous in the later part of the 19th century in the United States of America. These early enquiries were mostly made on the basis of questionnaires sent out by official correspondents. Though these early works had many defects, they paved the way for the introduction of a more scientific consideration of production cost problems, as a branch of the more comprehensive subject of farm management.

The introduction of 'Route Method' by Hays in 1902 under which the same official visited daily a series of farms so as to make on the spot enquiries needed for ascertaining the cost of production was an important contribution in the systematic treatment of the studies of production costs. As this method involved prohibitive cost in undertaking large scale studies, other methods of farm management analysis had to be resorted to. Warren in 1903 introduced 'Farm Survey Method' in cost accounting. Tandon and Dhondyal (1962) stated that his report 'A Farm Management Study of Tompkins county, Newyork' published in 1911 was a landmark in the history of farm Management.

By 1907-1908, the rising prices of farm products in the United States of America led to a new pressure on the agricultural experiment stations and on the Department of Agriculture to study cost of productions in order to discover cheaper methods of farm production. Hopkins and Taylor (1935) observed that the recognition given to cost of production figures by price fixing boards and the feeling of need for such figures by producers provided the main stimulus to cost studies for the next 8 or 10 years.

The reorganisation of the office of the Farm Management in 1919 under A.C.Taylor was followed by an upsurge in cost accounting studies and the peak was reached during the years 1919-23 (Problems of Farm cost, in Indian Agriculture', Ind. Soc. Agri. Eco.) Bennet (1928) stated that there were six States conducting cost investigations by means of 'Route method' in 1920. By 1924, there were 'Routes' in operation in 14 States. In 1926-27, 23 States were operating 35 of these 'Routes'. A rough count by Bennet of the classified lists of projects carried on by Agricultural Experiment Stations showed 82 such projects in 1920, 87 in 1921, 96 in 1924-25 and 190 in 1925-26. According to Hopkins and Taylor (1935) the remarkable increase in cost studies in 1925-26 was due to an increase in funds made available for research purposes under the Pornell Act.

In course of time many modifications were made in the method of Farm cost studies in the United States. The initial emphasis on finding the cost on money values was shifted towards the determination of the physical factors of cost encountered

in farm management operations and which entered into the making of crop and live-stock products. In later studies better management practices received more attention as did questions of efficiency within individual enterprises. Since then many developments and refinements have been effected in cost studies and their number and importance increased. As observed in 'Problems of Farm cost in Indian Agriculture' (1953), cost studies occupy a prominent place in agricultural development and account for about 1/5th of the total number of enquiries and studies conducted in the United States.

Cost studies have been used in America for wide and varying purposes. Hopkins and Taylor (1935) stated "five of the most prominent uses are: as basis of price guarantees, as basis for tariff rates in railway rate bearings, as means of arousing interest in farmers' discussions and as farm efficiency factors". The value and utility of farm cost data to the farmers in America is indicated by the fact that several 'Farm management Services Associations" have been organised in the States where the members pay a fee in support of a fieldman and for the summarisation of their yearly records by experimental station analysts.

As a weapon for the organised study of the economics of farm management, the system of cost accounting is one of recent origin in England though its importance was stressed as early as 1858 by Prof. John Coleman and in 1891 by Dr. Firsain. The most important development in the field occurred in 1913 when the Agricultural Economics Research Institute was established at Oxford with C.S.Orwin as Director. The analytical method of cost accounting advocated by Orwin was first laid down in his book

entitled "The Determinations of Farming cost' published in 1917. The work done at Oxford and the system advocated by Orwin attracted a considerable amount of attention. The importance of this work was further enhanced by the fact that the results of these studies were used as basic data for taking decisions on fixing maximum and guaranteed prices for corn. Soon after the First World War an 'Agricultural Costing Committee' was set up in 1918 and its 'findings were published in 1921. The next development in cost accounting in England took place during the years 1922 to 1926 when as part of the Research and Advisory Service of the Scheme of Agricultural Education in England and Wales, agricultural economics officers were attached to various colleges and university centres to advise farmers on management problems and in many cases their activities were devoted to the extension of costing work. J.S.King (1927) embodied his views on the whole question of cost accounting in his book "Cost Accounting Applied to Agriculture as an Aid to Productive Farming". The method Dr.King instituted involves the entire abandonment of the unit cost principle. After the early research into costs, the further contributions in this sphere in England have been in the adaptation of the original principles to specific purposes.

In Germany attention was paid to farm accounting even in the 9th century. The agricultural depression and the fiscal legislation in the period after the First World War gave stimulus to cost investigation and the various agricultural organisations in Germany actively encouraged accountancy as it was considered the most effective way of helping the farmers in their struggle against their difficulties of farm business.

By 1942 there were about 300 Farm Accountancy Offices in Germany controlling the results obtained on more than 40,000 farmers.

In Switzerland the Secretariate of Swiss Peasants published the first result of farm accountancy at Brougg in 1901. The usefulness of this study in solving the technical problems and questions of agrarian farm policy gave inducement to other countries like Denmark, Sweden, Norway, Finland, Rumania, Bulgaria, Hungary, Scotland etc., to take up such studies in these countries also. All these countries in later years did much valuable and pioneering work in the study of farm costing which has now become an integral part of their farm organisations (Problems of Farm cost in Indian Agriculture).

While the Western Countries had far advanced in the study of cost accounting in agriculture no substantial scientific study was taken up in this field until very recently in India and the literature on this subject is very scanty (Patil 1933). The first institution to initiate studies on farm accounts was the Punjab Board of Economic Enquiry in 1923-24 (Tandon and Dhondyal 1962). Figures of cost, receipts and profits on farming prior to this are generally found in the reports of the Departments of Agriculture and the Government Experimental and Demonstration farms established since 1905-1906 in various States and in Land Revenue Settlement records (Shirname 1952). The ryotwari land settlement of Madras was based on the estimation of net produce from the land and the Madras Land settlement records, abound in, estimates of costs, receipts and profits of agriculture even for the period before 1860. This information though important in its own way, is not of much statistical value

to an economist or farm manager.

The Punjab Board of Economic Enquiry since 1923-24 has been supplying standard performance to selected farmers for maintaining records of accounts and has been publishing the results of the study every year to provide information on cost of production of major crops, cultivation expenses and returns holding wise, intensity of cropping, employment of family labour, maintenance cost of bullocks and the like (Tandon and Dhondyal).

Costing of cultivators' farming business was attempted for the first time in Bombay in 1925-27. In connection with the study of harvesting cost of sugarcane and the labour employed therein in the Deccan Sugarcane tracts, Patil tried the questionnaire system to collect data. This method was not successful and he had to fall back upon enquiries on the spot. Patil (1933) pointed out that under Indian conditions personal enquiry on the spot only yields satisfactory results. From the year 1925 to 1928 studies in the cost of production of important crops in the Deccan were undertaken by Patil, with a view to ascertain the net profits or losses and to suggest economies, while prices of farm produce were falling after the First World War boom. In these studies the route method was tried and found useful. According to Patil monthly visits recommended by American investigators did not supply accurate information, as no accounts or notes of any kind were kept by the average Indian farmer and therefore it was found necessary to visit farms under study twice a week.

Patil with the assistance of ten qualified investigators took up during 1928 - 1930 an exhaustive farm cost study in fourteen farms in six districts of the South West Part of the then Bombay Presidency with a view to find out suitable income measures and formulating 'modus operandi' for farm cost study. This probably was the first attempt in India in which opportunity costs i.e., costs not directly incurred) were calculated and allocated in consonance with cost accounting principles avoiding arbitrary assumptions. The income measures used in this work were the 'Family Labour Income' and the 'Farm Business Income'. These concepts were of great importance as they provided information to judge the economic position of the farmer and for suggesting adjustments in crops and cropping plans.

The First All India study of costs and returns on farmers holdings was conducted by the Indian Council of Agricultural Research during 1933-36. The study was limited to the cost of production of sugarcane and cotton and other important crops in the principal sugarcane and cotton growing tracts in India. The data and the findings of this study were published under the title 'Report on the cost of Production of Crops in Principal Sugarcane and Cotton Tracts in India, 1938'. Inspite of the meticulous care taken in the enquiry and the voluminous data made available, the results arrived at suffered from confusion and inaccuracies of heterogeneity and they did not furnish information on costs even in relation to the sizes of holdings. Bose (1954) raised certain doubts as to the dependability of the results.

In subsequent years, attempts were made by various institutions and agencies to throw light on many aspects of

farm costing. The studies conducted by the Gokhale Institute of Politics and Economics, Bombay, the Vishwa Bharathi University, Calcutta, the Indian Council of Agricultural Research and the Directorate of Economics and Statistics, Government of India were of very great importance in the field of production cost studies.

Bose (1936 - Viswabharathi) in his study on 'Marketing of Rice at Bholpur' investigated the cost of production of paddy. A 'Farm Business Survey' was conducted in Wai Taluk, a typical sample of the Deccan famine tract by Gadgil and Gadgil in 1937-39 (Gokhale Institute), with the objective of finding out whether the survey method of 'Farm Business Studies' was applicable to Indian conditions and if so, what adoptations would be necessary in the peculiar circumstances of the country. Bhatacharjee (Vishwa Bharati) in 1947 conducted studies on cost of production related to the size of farms in West Bengal. The Indian Central Jute Committee has been conducting inquiries into the economics of Jute cultivation since 1948-49 in Bengal, Assam, Bihar and Orissa. The annual reports of the Committee give an account of the cost of production of jute and net income from it.

During World War II, with the gradual introduction of controlled economy in the country, the problem of calculating the cost of production of crops came to the forefront as part of agricultural policy.

In 1948 the Departments of Economics and Statistics of the Government of Uttar Pradesh initiated an enquiry to collect data on cost of cultivation of some important crops in certain

selected villages of the State (Pande 1952). A very significant study from the methodological point of view was the 'Pilot Enquiry' carried out into the cost of production of cotton, Jowar and Groundnut in Akola district in Madhya Pradesh by the Indian Council of Agricultural Research during 1953-54, in collaboration with the Indian Central Cotton and Oilseeds Committees. The main objective of this enquiry was to make available technical data for guidance in the efficient planning of large scale sample surveys to determine the cost of cultivation of different crops (Panse 1953). The collection of data was based upon the cost accounting method. It was concluded from this work that of the two types of sample units, the operational holding, and the field; the operational holding can be preferred for future enquiries. From this enquiry it was also possible to suggest guide lines in the matter of the size of sample required in such studies for attaining a reasonable degree of precision.

In order to initiate 'Farm Management Research' on the necessary broad basis, the Directorate of Economics and Statistics and Research programmes Committee of the Planning Commission' sponsored the first series of studies in the 'Economics of Farm Management' in 1954-55 in six typical regions of the country namely Bombay, Madras, Uttar Pradesh, Madhya Pradesh, West Bengal and Punjab. The studies were started in Bombay, Madras, Punjab Uttar Pradesh and West Bengal in 1954-55 and were continued till 1956-57. In Madhya Pradesh the studies were started only in 1955-56 (Poduval 1960). Two main objectives of the study were to compare the merits of 'Cost Accounting' and 'Survey' methods and to provide 'Input-output relations in the farms, which would

be useful to study the relative efficiency of the various factor combinations in the regions under study. The factor-product relationship in these studies has been worked out by employing multiple regression analysis. In some of these studies the famous Cob-Douglas production function has also been made use of.

Farm cost studies are now generally considered as the decision making phase of farm business. Farm cost studies are increasingly gaining importance and are now being approached at the national level to help the farmers in increasing their net income and standard of living and thereby elevate the prosperity of the nation as a whole.

Studies on Production Cost of Banana

Literature on cost accounting of banana on the basis of comprehensive study is very scanty and it is especially so in the case of Nendran variety of banana which is taken up in this study. However estimation of Costs and returns in the production of banana has been done by some authors on the basis of details obtained from certain Government farms and also from certain regions where banana is extensively cultivated.

Burns and Dani (1930) worked out from a mass of records of two plantations in the Ganeshkund Botanical Garden, cost of cultivation and return from banana crop. They found that the net profit from one acre of banana cultivation per year was Rs.265.

Holms 1930 worked out the actual total cost of producting an exportable bunch averaging all grades in the Canaries as 2s. 3d. Patil (1933) studied the cost and returns of banana

cultivation in Wadgaon village, in the then Bombay Province by the cost accounting method.

Nayar N.P. (1941) estimated the cost of cultivation and return of 'Nendran' in Malabar area and found that there was a net profit of Rs. 225 per acre. Jacob (1942) found that in Travancore State the gross income per acre of Nendran was about Rs. 350 and deducting Rs. 150 against the cost of cultivation, lease of land etc., there was a net income of Rs. 200 inspite of the high cost of cultivation and heavy manuring.

Dhareshwar (1942) stated that there were 80 to 150 fruits per bunch worth Rs. 6 to 8 per thousand under Deccan conditions and if all plants bore one buncha year, the income per acre would be more than Rs. 1000/- and if not all bore, the income would be Rs. 600/- to Rs. 800/- per acre with expenses amounting to half as much.

Naik (1949) pointed out that net profits of Rs. 537 to Rs. 1000/- per acre of banana had been reported in Madras. Jacob (1952) gave figures showing net profit in different districts of the same state varying from Rs. 200 to Rs. 500 at prewar prices, which would amount to much more in purchasing power than at present. Nayar T.G. (1954) estimated Rs. 300 to Rs. 759 per acre from perennial plantations.

Roy (1950) gave figures showing the expenses for the first and second years of banana cultivation in Bihar as Rs. 505 and Rs. 367 respectively with incomes of Rs. 711 and Rs. 1655 per acre.

Nayar T.G. (1962) estimated the cost of cultivation,

receipt and net profit per acre of Nendran banana in parts of the West Coast as Rs. 810, Rs. 1450 and Rs. 640 respectively.

Problems in costing:

Many problems are encountered in deciding the elements of cost of production and their evaluation in agriculture. It is difficult to evolve an indisputable formula for apportionment of cost to elements of production even in foreign countries where agriculture is developed on business lines. Hopkins and Taylor (1935) explained the problems in their work entitled 'Cost of Production in Agriculture'. The problems of calculating the cost of production is further complicated in Indian agriculture because of the peculiar characteristics of the agricultural structure and farming methods as adopted by Indian cultivators under subsistence farming and diverse systems of ownership and land tenures. Shirname (1952) observed that calculation of the cost of production of any farm enterprise inevitably includes a number of estimates and adoption of arbitrary procedures in the apportionment of costs. Driver (1952) pointed out "it is by no means uncommon for even the latest books on farm accounting based on research of more than quarter of a century to tell us that absolute accuracy in evaluation of things like most types of farm property etc., is impossible and it is useless even to achieve it".

The problems confronted in the present study are apportionment of costs to (1) family labour (2) manures produced in the farm (3) land (4) seed produced in the farm and (5) Interest on working capital etc.,

Singh (1952) remarked that for practical purposes, the family labour can be evaluated at the rates prevalent in the locality for regularly paid labourers. Agrawal (1952) recommended that in the interest of simplicity in accounting procedure, family labour might be charged at the permanent hired man's wage. Pande (1952) held the same view and also stressed to show, the part of family labour in the cost of cultivation separately also. Patil (1953) calculated the family labour income instead of imputing any cost to it by deducting rent of owned land and interest on working capital from 'farm income'. The Imperial (now Indian) Council of Agricultural Research (1933-36) adopted the wages of permanent labourers and in regions where such labourers were not available the rate of casual labourers in computing cost of family labour. In the pilot enquiry carried out in 1953-54 in the Akola district all human labour, family as well as hired, employed on different operations in the field was evaluated at prevailing rates of wages for casual labour.

In the evaluation of manures produced in the farm Shirname (1952) was of the opinion that the only possible and workable way of valuing them under Indian conditions was on the basis of farm price with which the farmers were more familiar. According to him all purchased manures must be charged at cost. In the cost studies conducted in the principal sugarcane and cotton tracts in India during 1933-36 by the Indian Council of Agricultural Research, such manures were evaluated at their sale value at the nearest place where they could be sold, less cost of transport to such places. Pande (1952) also supported

this procedure of evaluation of manures produced in the farm. In the apportionment of cost of manures and fertilizers, Patil (1933) followed the following procedure. The whole cost of concentrated manure was debited to the crop to which it was applied, as no residual effect of concentrated manure was taken into account. As regards farm yard manure the full value of the manure was charged to the crop (like rice) in the heavy rainfall tract. In the case of sugarcane and lucerne (under perennial irrigation) 70 per cent of the value was charged to the crop and 30 per cent to the succeeding crop. This view was also supported in 1952 by Shirname, Pande and Agarwal. However Agarwal in 1960 observed that in order to maintain simplicity in procedure the residual effect might not be considered and the entire cost of manure might be charged to the crop to which it was applied.

In the matter of apportionment of land rent, Patil (1933) charged the actual cash paid in the case of crops grown on leased lands and the current rate in the community in the case of crops grown on owned lands. Shirname (1952) observed that in calculating the cost of production it would be desirable to charge the normal rate of rent as cost.

The Imperial (now Indian) Council of Agricultural Research calculated the value of seed produced in the farm at the prevailing market prices. Patil also used the same mode of apportionment of cost to seed in his studies. Prevailing market rate was also taken to compute cost of seed in the pilot survey (1953-54). But Pande (1952) was of opinion that it would

be better to evaluate the farm produced seed at the cost of producing it. Agarwal observed in the case of seed, the market price basis appears to be more convenient as seed forms only a small percentage of the total produce much of which is either sold or consumed at home and which is evaluated on the basis of actual market prices received.

Patil observed "considering farming as a business it is fair to include interest on operating capital in the cost". In his studies, expenditure on seed, manure and outside labour (except the labour on harvest) was lumped and interest was charged on it for six months at the rate of 12 per cent. Singh (1958) opined that interest on investment should be as an element of cost. Shirname also held the view that calculating cost of production of a particular crop, it wou be essential to consider interest as an element of cost.

As regards the rate of interest to be charged, Pande was of opinion that the rate should be fixed after taking in account the local conditions obtaining during the period of enquiry. Another view is that in the case of operating capit the rate of interest charged may be the same as that of the rate charged by the Cooperative Societies on the loans advanc to the farmers.

Resource - Product Relationship

The study of cost of production alone does not suffice t give an idea of the relationship that exists between the resource used and products received. Heady (1964) pointed out that a knowledge of this relationship provides the tools by means of

the problems of production or resource use can be analysed. This gives the key for the efficient use of resources to maximise production and profit. To derive the functional relationship between variable inputs and produce a mathematical concept called 'Production Function' is employed. To quote Heady again 'Production Function' refers to the relationship between the input of factor services and the output of product; product output is a function of or is 'dependent on' the input of resource services. A production function can be expressed as an algebraic equation of the form $y = f(x)$ which means that y is a function of x' (where x and y represent input and output respectively. Stigler (1947) defined the Production Function as the relationship between the input of production services per unit of time and output of products per unit of time.

The history of the development of the Production Functions dates back to the middle of the 19th century. Justus Von Leebig's, 'Law of the minimum' was the first attempt to define the fundamental relationship between fertilizer or nutrient inputs and crop yields (Heady and Dillon 1961). Baule suggested that Von Liebig's law of minimum supposed that plants took up nutrients only in a given ratio and the yield would vary directly with the quantity of nutrient available in smallest supply. Bondroff and Plessing interpreted in his law as represented by the algebraic form $y = ax$, where y is yield response, x is the quantity of the nutrient and 'a' is the constant or Coefficient defining the transformation ratio.

The first attempt to define the algebraic nature of the

fertilizer crop production function was that of Mitscherlich in 1909. The equation proposed by him was a non-linear production function relating nutrient input and crop output. Later Mitscherlich made some changes in the form of the function and made it into an exponential one.

Working independently and without the knowledge of this development Spillman proposed an exponential yield equation similar to that of Mitscherlich. It was in the form of $y = M-AR^x$, where 'M' is the maximum total yield obtainable by increasing the nutrient input x, 'A' is a constant defining the maximum response (the sum of marginal yields) attainable from use of x and 'R' is the coefficient defining the ratio by which marginal productivity of 'X' declines. He developed this equation after examining results from fertilizer experiments on tobacco in North Caroline.

Since then different forms of algebraic equations were derived by various workers. The algebraic equation drawn up by Cobb and Douglas in 1928 is now very widely used to fit up production functions in studies of output response on input in agriculture. Actually the function was first applied by Cobb and Douglass to the data on American manufacturing industries over the period 1899-1922. The function is employed in the form of $y = ax_1^{b_1} x_2^{b_2} \ldots\ldots x_n^{b_n}$ where 'y' represents product, 'x_1' factors, 'b_1' elasticities of production and 'a' constant.

One of the first major attempts by agricultural scientists to fit production function to farm data, was published by Tolley,

Black and Ezekiel. Kamiyo of Tokyo University was another pioneer in this line. He analysed data from a 1939 survey of paddy farms in the Tokoku and Seinan districts of Japan. He fitted an equation to these data in the form of the function drawn up by Cobb and Douglass.

The first empirical estimates of production functions for agricultural firms in the United States was worked out by Heady for a 1939 random sample of 738 Iowa farms. The form of the function employed in this study was also that of the Cobb-Douglass type.

Since then a considerable number of studies on input-output relationship using production function in agriculture has been conducted in foreign countries and their results used to increase efficiency in production. A start has been made in India also in recent years.

Sukatme (1941) fitted a production function to study the economics of manuring on rice. Panse et al (1951) fitted a similar function to study the response of manurial trials on cotton in Peninsular India.

In recent years more studies on these lines have been conducted, sponsored by institutions and also on the initiation of individuals. Factor-product relationships in crop production have been estimated by fitting production functions equations by Agrawal, Singh et al, Zacharias, Mathur and Khundanpur and Driver and Desai in the 'Studies in the Economics of Farm Management' undertaken by the Directorate of Economics and

Statistics, in six typical regions of the country. Shastri (1958), Kahlan and Saxena (1958), Suryanarayana (1958), Kannan (1960), and Krishna Raj (1964) also fitted up production functions to estimate the functional relationship between input and output in Agriculture.

The present study is also an attempt in this line.

MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

The study under discussion is based on the cultivation of Nendran banana in the year 1963-64 in Tellicherry Community Development Block area. Tellicherry block is one of the two blocks in Tellicherry Taluk and is situated around Tellicherry Municipality. The area of the block is 48.19 square miles.

Small strips of Nendran banana crop are wide spread and well distributed throughout the wet land areas in the block. For reasons of compactness common soil-climatic conditions and uniformity in cultural practices, the block area formed a fairly homogenous region for the study.

The survey method of investigation was employed for collection of data in this study. A preliminary survey was first taken up in Tellicherry Taluk to study the cultivation practices of Nendran production and the socio-economic condition of the growers. This preliminary survey showed the homogenecity of the area and was helpful in selecting Tellicherry block for the study and also developing the hypothesis which formed the basis for this study.

The sampling technique adopted in the survey was stratified one stage random sampling with Tellicherry block as the universe, the villages in the block as strata and the individual Nendran growers, as the ultimate units.

A list of growers and area under Nendran cultivation in

Table 1

Distribution of the sample of growers in the ten villages

S.No.	Names of villages	Area under Nendran banana in acres.	Number of growers selected
1.	Kodiyeri	69.02	29
2.	Eruvatty	52.83	23
3.	Kadirur	50.22	21
4.	Eranjoli	37.39	15
5.	Kottayam	35.57	15
6.	Pathiriyad	12.60	6
7.	Chokli	8.42	4
8.	Peringathore	7.09	3
9.	Pinarayi	5.35	2
10.	Dharmadham	2.29	2
	Total	280.78	120


TELLICHERRY BLOCK
N
PATHIRIYAD
KOTTAYAM
ERUVATTY
PINARAYI
DHARMADHAM
ERANJOLI
KADIRUR
TELLICHERRY
MUNICIPALITY
KODIYERI
MAHI AREA
CHOKLI
PERINGATHORE
--- VILLAGE BOUNDRY
— ROAD
— RAIL
AREA = 48.19 Sq miles

each village in the block was first prepared with the help of the Gramasevaks working in the villages, as this information was not available, in the records of the Revenue and Statistical Departments. To get a fairly precise estimation of the various aspects of Nendran cultivation in the area it was decided to select 120 holdings spread over in all the 10 villages in the block. The number of growers selected in each village for the study was with probability proportional to the area under Nendran in the village. However, a minimum of two growers per village was fixed so as to ensure adequate representation of varying cultivation practices. As the cultivation units were small and in all cases less than one acre and seven cents it was decided not to group the selected holdings into size groups. Selection of the requisite number of growers from each village was made using random numbers after listing the growers serially according to the extent of the area cultivated by each of them.

The number of Nendran growers randomly selected for study from different villages are given in Table 1.

The 120 growers selected for study had cultivated a total area of 28.08 acres during the year 1963-64. The area surveyed thus works out to a 10 per cent sample of the total area of 280.78 acres under Nendran banana in the block area.

Collection of data

On the basis of the hypothesis developed a questionnaire covering all aspects of Nendran cultivation was formulated to gather information from each selected grower. The selected Nendran growers were contacted personally during the year 1964.

The important aspects of cultivation practices touched upon in the questionnaire were as follows:

1. Size and characteristics of the land, under cultivation
2. Terms of lease and amount of rent paid.
3. Kinds, amount and rates of wages of labour employed in cultivation.
4. Availability and sufficiency of capital and the sources and condition of credit.
5. Kinds, quality and quantity of seed, manure and fertilizer used in cultivation and their efficiency in production.
6. All items of expenses on cultivation and materials used.
7. Crop yield and receipts.

In short when the cultivators were interviewed, information was elicited on all phases of production of Nendran and also on any external factors, directly or indirectly affecting the efficiency of production. The data thus obtained were filled up in the schedule then and there.

On the completion of the investigation the data collected were tabulated, processed and statistically analysed. The unit and per acre cost of production of Nendran are computed taking into account of all items of cost in production. Secondly the main resources used in production have been grouped into three broad classes namely Land, labour and Manure and Fertilizers and their productivity estimated through multiple regression analysis. Seed has not been included as a separate item of resources in the regression analysis as it was used proportional

to the land. Other items of resources used in Mendran production are more or less exogenous with regard to yield and hence they have also not been considered in regression analysis.

Method of Analysis

Though, no size group was considered while taking the samples of holdings, after the data were collected the farms were classified into two size groups, one comprising all farms upto 25 cents in area and the other above 25 cents in area, as a measure of further stratification. The consideration for fixing up the above two sizes was that an area of 25 cents and below can be normally managed with family labour and an area exceeding 25 cents would require labour hired from outside. But the analysis of variance showed that no significant differences existed between size groups (Appendix 1) So the entire sample of holdings in each village was considered as one homogenous group.

To estimate the factor-product relationship and to indicate the productivity of the resources used in the production of the crop a 'Production function' was fitted. The marginal productivity of each resource has also been estimated so that the exact contribution each makes at the margin can be seen.

The production function employed in this study is of the Cobb-Douglas type. This function is linear in terms of logarithms and can be written in the following general form.

$$y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} \ldots\ldots x_n^{b_n}$$

or $\log y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 \ldots\ldots + b_n \log x_n$

where

y denotes output;

x_i denotes input factors (i = 1,2,3,4 .....n)

a denotes a constant; and

b_i denotes the partial regression coefficients
(i = 1,2,3 .....n)

In the production function fitted for this study, land, labour and cost of manure and fertilizer are taken as the independent variables (x_1, x_2 and x_3 respectively) and output as the dependent variate (Y).

The partial regression coefficient (b_i) indicats the elasticities of production of the input items x_1, x_2, x_3.....x_n.

Summing up the elasticities, the returns to scale is determined. Elasticities totalling to less than unity, unity and more than unity denote, decreasing, constant and increasing returns to scale respectively.

When the input-output curve is to be estimated for a single variable resource, for instance land, the short run production function takes the form of $y = f(x_1, x_2, x_3 ....x_n)$ where x_1 (land) is varied and all other resources are fixed in quantity.

Average physical productivity

The average physical product of each resource is estimated by dividing the mean product output by each mean factor input. The resultant average includes the product returns of all resources at unit of that factor. The average products are

General Description of the Area studied

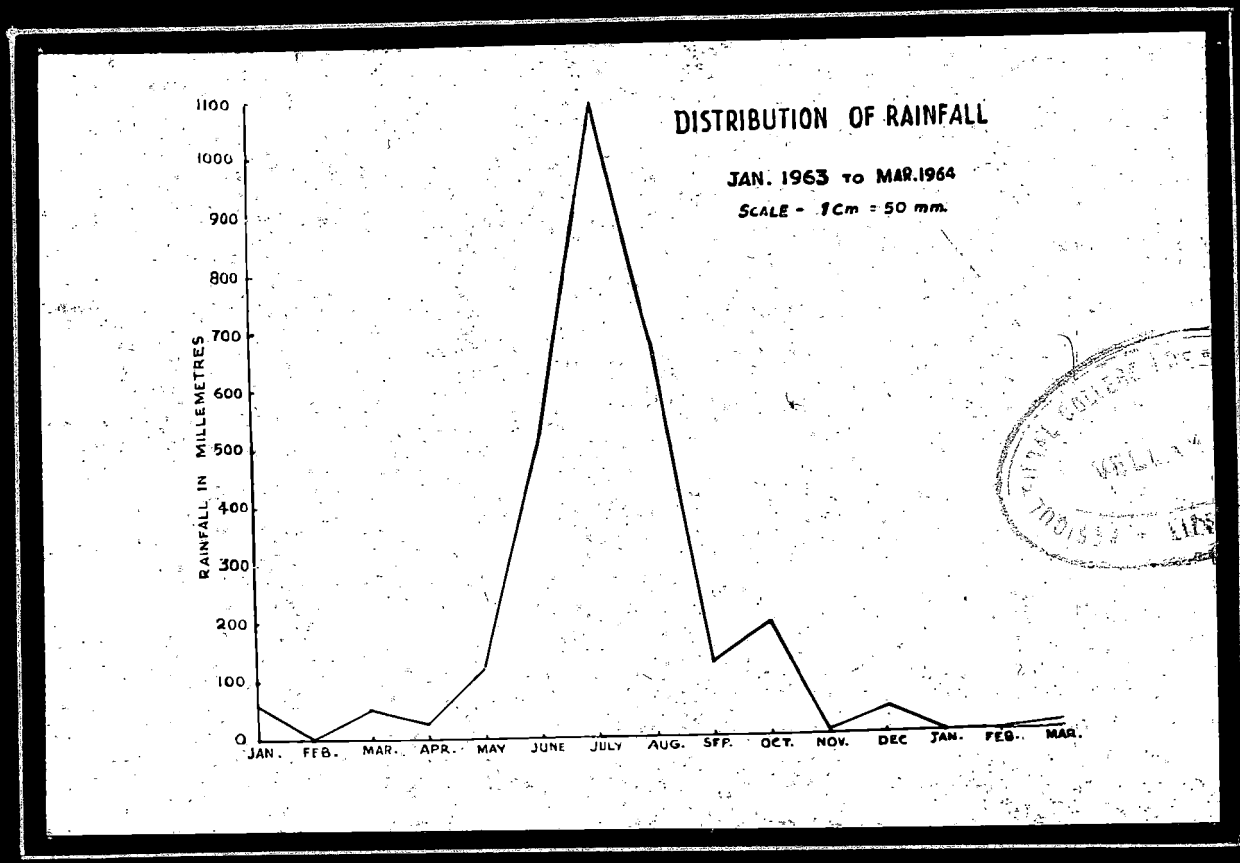
A. Location and Physical features: Tellicherry Community Development Block where the study has been conducted is the Western most of the two blocks in Tellicherry, the southernmost taluk of Cannanore, the northern most district of Kerala State. The taluk is bounded by Western ghats on the East, Arabian Sea on the west and by two rivers namely Dharmadhampuzha and Mahipuzha on the north and south respectively. The area of the study thus consists of a narrow strip of lower land along the coast of the Arabian sea. It is an undulating plain. The upper grounds planted with coconut and arecanut palms, mangoes and jack fruit trees, pepper-vines and banana are locally known as parambas. The bottoms of the valleys are levelled into paddy flats. The paddy flats lie in isolated blocks of 50 to 300 acres. Unbroken stretches are absent. Intermixed with paddy, Nendran banana is cultivated in scattered patches in the paddy flats.

B. Climate and Rainfall

The climate of this coastal plain is hot and excessively damp. Vegetation thrives and grows with rank luxuriance. The area is exposed to the full force of the South west monsoon and its rainfall is copious and ordinarily unfailing. The normal annual rainfall is usually about 3000 MM. The year can be divided into four distinct periods according to the weather and rainfall of the area. During the period from January to March, dry weather prevails with little or no rainfall. April and May are the hottest months of the year. Occasional rainfall is also usual during this period. Thunderstorms begin at the end of

March. By the end of May, their great violence proclaims the approach of the South West monsoon. It ordinarily sets in about the first week of June and with occasional breaks the rains continue to the end of September. Nearly three fourths of the total rainfall of the year is received in these four months. The principal wet and dry crops of the area are adjusted to this season and like many other crops, the major growing period of banana is during this part of the year. In October the retreating monsoon continues to give fairly general rain. In the last quarter of the year, the North East monsoon takes its turn. The rainfall during this period is characterised by continuous light showers upto the middle of November and thereafter the period of breaks between rains is extended. The monsoon generally ends with a few heavy showers. The rainfall during the North East monsoon is also especially important to banana cultivation as it supplies continuous moisture to the crop if it is even and saves the growers from the trouble of irrigating the crop during that period. By the end of December the dry weather is firmly established and lasts till the end of March.

The following abstract of the rainfall statistics for 70 years ending 1939, reproduced from the Statistical Atlas of Malabar gives a picture of the annual rainfall and its distribution in the area.


DISTRIBUTION OF RAINFALL
JAN. 1963 TO MAR.1964
SCALE - 1Cm = 50 mm.
RAINFALL IN MILLEMETRES
1100
1000
900
800
700
600
500
400
300
200
100
0
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEP. OCT. NOV. DEC JAN. FEB. MAR.

	Dry weather (Jan - March)	Hot weather (April-May)	South West monsoon (Jun-Sept)	North East monsoon (Oct-Dec)	Annual Total (average)
In inches	1.30	12.58	96.79	17.03	127.70
In mm.	33.02	319.532	2458.466	432.562	3243.58

The annual rainfall at Tellicherry during the year 1963-64 was 2879 mm. A graph showing the monthwise distribution of the rainfall from January 1963 to March 1964 is provided on the left hand side.

C. Soil

More than 95 per cent of the land area is covered with loamy soil. The loamy soil is a well balanced mixture of clay and river sand and is lateritic in origin. The clay content of the soil is derived from the wash of the laterite hills in the upper regions of the tract and is impregnated with iron and potash. The soil as a whole is poor in organic matter.

The soil is fairly deep in paddy flats and easily worked. It is porous and quickly drained. These qualities of the soil make it ideally suitable for Kendran cultivation. The soil very well responds to good cultivation and heavy manuring. Due to the poor natural condition of the soil it is not possible to get any return from the soil without proper care and attention.

The moisture retentivity of the soil is very poor and hence even a few days after a heavy rain watering is required for healthy growth of tender types of plants like banana.

D. Source of Irrigation: There is no major source of irrigation in Tellicherry block area and no crop other than summer vegetables and Nendran banana is grown under irrigation. The water table in the area is high especially in the first few months following the rainy season. Ponds dug out in the paddy fields are used for irrigating these crops by pot watering. But the ponds dry up during the hot months of the summer season. Lack of irrigation facilities is one of the limiting factors in the expansion of banana cultivation.

A vented dam was constructed to the rivulet, Kunduchira flowing in between the villages of Kodiyeri and Kadirur during the First Five Year Plan. Though it is not useful for the purpose of direct irrigation, when the vented dam is shut in the summer months because of the high level of water in the rivulet, the water table in these two villages on the sides of the rivulet rise close to the soil surface and help in retaining moisture in the soil and maintaining the water level in the irrigation pond. Because of this facility cultivation of more and more area under irrigated banana and vegetables is attempted in these two villages. These two villages are the most important centres of production of Nendran banana in the whole of the Cannanore district and have attained a high level of production efficiency. Proximity of Tellicherry town serving as a ready and good market is yet another reason for these villages to develop cultivation of banana and vegetables.

FIRST MANURING

AFTER COMPLETION OF MANURING
(Drainage channels are also seen)

PLANTS PROPPED UP WITH STAKES OF BAMBOOS

Cultivation practices of the Nendran crop

Well drained and rich deep soils in high level paddy fields are selected for cultivation of Nendran banana. In lands selected for Nendran cultivation, drainage channels of 2 feet to 3 feet depth and 2 feet width are dug leaving space in between to plant 2 or 3 rows of plants with spacing of 8 feet on both sides.

Nendran unlike other varieties of banana is not ratooned. Fresh planting is done every year. There is no particular season for planting of Nendran. Fruits are available in the market throughout the year. Where facilities for irrigation is lacking and the growers cannot afford to take up irrigation, the time of planting is adjusted to avail the full benefit of the rain during the major growing period of the plant.

Suckers are planted in the centre of circular pits of about 1 foot radius or in small holes scooped out just sufficient to hold a sucker. When planting is done in pits, some quantity of bulky manure is applied at the time of planting. About 700 plants cover an acre.

Regular manuring of the plants is commenced after about 45 days of planting when the young plant puts forth 3 or 4 leaves. Manure is applied in basins formed by removing earth from the base of each plant to a depth of four to five inches and to a radius of about 1 to 1 1/2 foot. The supply of manure to Nendran crop is done in 4 or 5 stages. In the earlier applications

A FULLY MATURED BUNCH

HEAP OF BUNCHES AT THE WHOLESALE MARKET

FOR SALE AT THE RETAIL SHOP

more bulky manures like wood ash, cattle manure, goat manure, green leaf and small quantities of fertilizers are given and in the later applications bulky manure is less and fertilizer is more. Wood ash is applied in very large quantities through out the life period of the plant even after the plants are bearing bunches. The interspace is dug up two or three times with mammatti. After the manuring is completed shallow basins are formed around the plants for irrigating them.

The plants begin to bear bunches 7 to 9 months after planting. At the time of emergence of the bunches, the plants are propped up with stakes of bamboos or wooden posts. The developing fruits are covered loose, with plaited coconut leaves fitted around the bunch to protect it from the scorching sun and damage by birds. The bunches will be ready for harvest 90 to 100 days after flowering. Thus the life period of the crop is 10 to 12 months.

RESULTS

CHAPTER IV

RESULTS

Cultivation of Nendran banana is mainly taken up by landless agricultural labourers and small farmers as a subsidiary occupation. Out of the 120 cultivators investigated, 4 only owned lands on which Nendran was grown. The remaining 116 held land either on the basis of temporary lease or permanent lease. The number of temporary lease~~r or permanent lease. The number of temporary~~ lease holders was 88 and permanent lease holders was 28. From the sample studied it may be inferred that 73.4 per cent of the Nendran banana cultivators was landless agricultural labourers, 23.3 per cent was small farmers and only 3.3 per cent was owner cultivators in the region.

The landless labourers acquired land for the purpose of this cultivation from owners or permanent lessees on condition that the same will be returned after cultivating for a fixed number of years or whenever the land was required by them, fixing a rent on the basis of the number of plants that could be grown on the land according to a standard spacing and at the prevailing rate of rent. The agreement is merely oral and on mutual trust and no written document is invariably executed. The permanent lessees got the land from the owners on an agreement called Kozhu Chorthu (Varupattam) for paddy cultivation and they enjoy permanent occupancy right on the land paying rent annually as laid down in the agreement deed executed.

Size of holding : The area put under the crop by each

Table 8

Area under Nendran banana and the average extent of area per grower in each village.

S.No.	Names of villages	Area under Nendran		No. of growers	Average area per grower in cents
		Ac.	cents		
1.	Kodiyeri	69	02	251	27.80
2.	Eruvatty	52	83	386	13.69
3.	Kadirur	50	22	262	19.17
4.	Eranjoli	37	39	192	19.47
5.	Kottayam	35	57	189	18.82
6.	Pathiriyad	12	60	74	17.03
7.	Chokli	8	42	48	17.54
8.	Peringathore	7	09	82	8.64
9.	Pinarayi	5	35	18	27.72
10.	Dharmadham	2	30	10	22.90
11.	Tellicherry Block	280	78	1512	18.57

Table 3

Number and Percentage of growers in different size groups in each village

S.No.	Names of villages	No. of growers having area			
		10 cents and below	Between 10 cents and 25 cents	Between 25 cents and 50 cents	above 50 cents
1.	Kodiyeri	32 (12.6%)	99 (39.4%)	97 (38.6%)	23 (9.2%)
2.	Eruvatty	217 (56.2%)	126 (32.6%)	40 (10.4%)	3 (0.8%)
3.	Kadirur	80 (30.6%)	103 (39.3%)	64 (24.4%)	15 (5.7%)
4.	Eranjoli	52 (27.1%)	84 (43.8%)	45 (23.4%)	11 (5.7%)
5.	Kottayam	78 (41.3%)	67 (35.4%)	38 (20.1%)	6 (3.2%)
6.	Pathiriyad	29 (39.2%)	37 (50.0%)	7 (25.5%)	1 (1.3%)
7.	Chockli	19 (39.6%)	20 (41.7%)	8 (16.6%)	1 (2.1%)
8.	Peringathore	58 (70.8%)	22 (26.8%)	1 (1.2%)	1 (1.2)
9.	Pinayari	0	14 (77.8)	3 (16.7%)	1 (5.5%)
10.	Tharuadhan	0	8 (80.0%)	2 (20.0%)	0
11.	Block Total	565 (37.4%)	580 (38.3%)	305 (20.2%)	62 (4.1%)

cultivator was very small. In the whole of Tellicherry Block the total area occupied by the crop during the year 1963-64 was only 280.76 acres, but the number of persons engaged in its cultivation was as large as 1512. The largest area cultivated by a single grower in the whole region was only 1.07 acres. The average size of the area per grower was 18.57 cents. The total area, the number of cultivators and the average size of the area per grower in each village are given in Table 2.

In Table 3, the frequency distribution of growers in different size groups and their percentage to total are shown.

The vast majority of the growers fell into the size groups of 10 cents and below and between 10 and 25 cents. Out of the total of 1512 growers, 565 growers were in the former and 580 in the latter size groups. In other words, 75.7 per cent of the total growers was having only an area of 25 cents and less each under Nendran cultivation. Three hundred and five growers or 20.2 per cent was cultivating an area between 25 cents and 50 cents per head. The number of growers in the size group of 50 cents per head and above was only 62. Out of this only four was having an area of 1 acre and above under cultivation. The proportion of the smaller cultivators to the total was still larger in some of the villages. In the villages of Peringathore, Pathiriyad and Eruvatty, the percentages of growers having an area of 25 cents and less each were as large as 97.5, 89.2 and 88.8 respectively.

Though all of the growers admitted that the production of

Table 4

Market value of land in different villages

No.	Names of villages	Average market value of land per acre	No.	Names of villages	Average market value of land per acre
1.	Modiyeri	6,500	6.	Pathiriyad	4,000
2.	Eruvatty	3,750	7.	Chokli	3,750
3.	Kadirur	4,500	8.	Peringathore	3,500
4.	Eranjoli	5,000	9.	Pinarayi	4,000
5.	Kottayam	4,000	10.	Dharmadham	4,500

Table 5

Average rate of rent paid per acre of land in the villages

No.	Name of villages	Average rate of rent per acre Rs.	No.	Name of villages	Average rate of rent per acre Rs
1.	Kodiyeri	121.97	6.	Pathiriyad	166.00
2.	Eruvatty	161.94	7.	Chockli	140.00
3.	Kadirur	104.47	8.	Peringathore	146.15
4.	Eranjoli	148.83	9.	Pinarayi	116.66
5.	Kottayam	156.87	10.	Dharmadham	153.12
Block Average		137.62			

Nendran banana was a remunerative enterprise, 63 out of the 120 cultivators investigated could not extend the area under Nendran for want of working capital. Thirty one growers were not able to cope up with the additional labour required for irrigating the crop during summer months. The remaining 26 could not get suitable land for extending the area under Nendran.

Land: Variable cost or working capital played an important role in Nendran cultivation and exerted a great influence especially on the extent and intensity of cultivation. But 'fixed' or 'overhead cost' on land, buildings, equipment, livestock etc., did not have much significance on the cultivation due to the fact that Nendran cultivation was mainly taken up on leased lands and no implement other than mammatty and billhooks was used in the cultivation. However the cost of land was exerting some influence on the rate of rent. The market value of land suitable for Nendran cultivation in different villages during the time of investigation ranged from Rs. 3000 to Rs. 6500 per acre. The average market value of land prevalent in each village is shown in Table 4.

As 116 out of 120 growers investigated were producing Nendran on leased lands, costing of the land is done in terms of rent actually paid by them. In the case of four owner cultivators, the rate of rent prevalent in the area for such land is taken for computation. Average rental value paid in each village was as shown in Table No.5.

The average rate of rent paid per acre in the block was Rs. 137.62. But in different villages it ranged from

Rs. 104 to 166. The reason for the difference in the rate of rent was due to the difference in the nature of lease rather than the fertility status of the soil.

Labour: Labour constitutes one of the major input factors in Nendran production. But no bullock labour or power driven implement is employed in the cultivation of this crop in Tellicherry block area. The entire work is carried out by human labour. The human labour engaged in the cultivation included both family labour and casual labour. The system of engaging regular or permanent labour for agricultural work is not in vogue in the region.

Employment of women both family and casual is comparatively less in Nendran cultivation. Women labour is only employed for such works like transportation of manure, props, seeds, fruit bunches etc., and for breaking clods in the field.

The working time in the region for casual labourers both men and women was 7.30 A.M. to 12.30 P.M. which amounts to five hours of work per day. But mostly the work in the banana field is done during off hours by family labour. So the computation of labour units has been done based on the work hours.

The wages paid to casual labourers were more or less the same in all the villages. The rates of wages were also not fluctuating for general works in different seasons or for different operations in the same season. It was noted that when once the wages rose, the same rate prevailed until there was another rise in wages due to the general rise in wage levels. The wages prevalent during the period of study was Rs. 2 for men

Table 6

Labour employed per acre for different operations - villagewise

	Preparatory cultivation.		Planting		Manuring		Inter cultivation		Irrigation		Propping etc.,		Total		Total in man day units	Total cost Rs. P
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women		
1.Kodiyeri	14.8	-	5.2	3.9	34.3	23.8	23.2	-	155.3	-	23.8	4.6	256.6	32.3	268.8	537 6
2.Eruvatty	39.3	5.4	9.3	-	30.7	19.7	23.1	-	93.9	-	25.4	4.9	221.7	30.0	233.0	466 0
3.Kadirur	16.5	-	5.6	3.5	30.9	19.6	22.3	-	134.2	-	23.9	5.9	233.4	29.0	244.3	488 6
4.Eranjoli	59.1	14.9	5.2	1.8	30.6	15.1	22.6	-	105.9	-	24.7	7.2	248.1	37.7	262.2	524.4
5.Kottayam	33.1	7.6	8.7	3.5	28.7	23.3	23.9	-	76.5	-	25.4	7.2	196.3	41.6	211.9	423 8
6.Pathiriyad	46.0	-	5.7	0.3	29.3	18.0	19.3	-	84.7	-	22.3	5.3	207.3	23.6	216.2	432. 8
7.Chockli	52.0	12.0	8.7	0.6	37.4	10.0	31.3	-	94.6	-	26.6	5.4	250.6	28.0	261.1	522.4
8.Peringathore	65.4	27.0	13.4	-	32.7	19.2	17.4	-	153.8	-	26.9	1.9 5.4	309.6	48.1	327.6	655 2
9.Pinarayi	60.0	13.3	8.0	-	22.7	18.1	18.7	-	126.7	-	17.4	-	253.4	31.4	265.2	530.4
10.Dharmadham	80.8	10.0	7.5	-	27.5	12.5	17.5	-	137.5	-	20.0	7.5	270.0	30.0	281.2	562.4
Block average	30.8	4.5	6.6	2.6	31.4	20.4	22.8	-	120.2	-	24.3	5.3	273.3	32.9	248.1	496.4
Block Av. in man day unit	32.5		7.5		39.0		22.8		120.2		26.1		248.1			
Block Av.in %	13.1%		3.1%		15.7%				48.4%		10.5%		100%			

and Rs. 0.75 for women per work day. Payment of wages as a rule was in cash.

Scarcity for casual labour was experienced in the area especially when labourers were engaged in paddy fields and coconut gardens. The scarcity of agricultural labour is found to be increasing every year as the young educated generation is generally having an aversion to agricultural work and seek employment outside the agricultural sector.

In order to ensure uniformity in compilation, all the labour employed was standardised to a common unit termed "man equivalent" taken to be identical with an adult worker, earning normal wages. The ratio of wages paid to man and woman was 3:8. Hence in respect of woman labour employed in cultivation, conversion has been applied at the rate of 8 women as equivalent to 3 men. The labour employed for the various operations upto the stage of harvest is tabulated villagewise and is presented in Table 6. For calculating cost of labour, family labour has been evaluated at the rates paid to casual labourers.

On an average in the block area the labour of 237.3 men and 32.9 women or in otherwords 248.2 man day units were required to produce one acre of Nendran crop. The average labour requirements in different villages ranged from 211.9 man day units to 327.6. Nendran production in Peringathore village involved the maximum and Kottayam village the minimum labour per acre. In the villages of Kodiyeri, Kadirur, Eranjoli and Eruvatty, important in the matter of per acre output and total

Table 7

The porportion of family and casual labour employed in the production of Nendran one acre for different operations in man day units

Preparatory cultivation		Planting		Manuring		Intercul-tivation		Irrigation		Propping etc		Total	
F.L.	C.L.	F.L.	C.L.	F.L.	C.L.	F.L.	C.L.	F.L.	C.L.	F.L	C.L	F.L	C.L.
20.4	12.1	6.0	1.5	27.2	11.8	17.2	5.6	118.7	1.5	22.4	3.7	211.9	36.2
(62.8)	(37.2)	(80)	(20)	(69.7)	(30.3)	(75.4)	(24.6)	(98.8)	(1.2)	(85.8)	(14.2)	(8554)	(14.6)

The figures in the bracket indicates percentage.

F.L. = Family Labour

C.L. = Casual Labour

Table 8

The proportion of family and casual labour employed in production of Mendran in the villages

No.	Names of villages	Labour employed in man day units			Percentages	
		Family	casual	Total	Family	casual
1.	Kodiyeri	206.3	59.5	268.8	77.9%	22.1%
2.	Eruvatty	212.1	20.9	233.0	91.1%	8.9%
3.	Kadirur	234.8	9.5	244.3	96.1%	3.9%
4.	Eranjoli	219.9	42.3	262.2	83.9%	16.1%
5.	Kottayam	195.0	16.9	211.9	92.0%	8.0%
6.	Pathiriyad	180.4	35.8	216.2	83.4%	16.6%
7.	Chokli	151.5	109.6	261.1	58.1%	41.9%
8.	Peringathore	295.5	32.1	327.6	90.2%	9.8%
9.	Pinarayi	203.2	62.0	265.2	86.6%	23.4%
10.	Dharmadham	265.3	15.9	281.2	94.3%	5.7%
11.	Block average	212.0	36.2	248.1	85.4%	14.6%

extent of area under the crop, the labour requirements per acre of the crop was 268.8, 244.3, 262.2 and 253 man day units respectively.

Amongst the villages, it was in Kodiyeri that the largest amount of labour was employed on irrigation and manuring. The labour employed for irrigation and manuring in the village was 155.3 man day units and 43.2 man day units respectively.

The lion's share of the labour requirements in Nendran production was contributed by family labour. The family labour contributed for different operations in banana cultivation on a per acre basis is calculated and presented in Table 7.

The total amount of family labour and casual labour employed villagewise and their respective percentages are given in Table 8.

Among the villages Chokli employed the largest amount of casual labour 41.9 per cent and Kadirur employed the least 3.9 per cent.

Seed materials: Nendran like all other kinds of banana is propagated from its underground bulbous stem, botanically called rhizomes. Most of the Nendran cultivators in the region obtained planting materials from their previous crops. Ninty-eight out of one hundred and twenty or 81.7 per cent of the growers investigated used suckers they had produced themselves. The rest, purchased suckers from other growers, as they were either new entrants in Nendran cultivation, or their suckers could not be kept upto the time of planting or the suckers were diseased or the growers liked a change of the

Table 9

Details about seed materials used.

No	Names of villages	Total No.of growers investigated	No. of growers using suckers		No. of growers making selection of		
			Produced by them	Purchased	Sword suckers	Healthy suckers	No selection
1.	Kodiyeri	29	24	5	27	2	-
2.	Eruvatty	33	19	4	18	4	1
3.	Kadirur	21	17	4	19	2	-
4.	Eranjoli	15	12	3	14	1	-
5.	Kottayam	15	13	2	12	2	1
6.	Pathiriyad	6	4	2	4	1	1
7.	Chokli	4	4	-	3	1	-
8.	Peringathore	3	2	1	2	-	1
9.	Pinarayi	2	2	-	2	-	-
10.	Dharmadham	2	1	1	2	-	-
Total		120	98	22	103	13	4
Percentage			81.7	18.3	85.8	10.8	3.4

Table 10

No. of suckers planted per acre and its cost

No.	Names of villages	No. of suckers planted per acre	Cost	No.	Names of villages	No. of suckers planted per acre	Cost
1.	Kodiyeri	7033	70.30	6.	Pathiriyad	698	69.80
2.	Eruvatty	704	70.40	7.	Chokli	700	70.00
3.	Kadirur	701	70.10	8.	Peringathore	735	73.50
4.	Eranjoli	702	70.20	9.	Pinarayi	700	70.00
5.	Kottayam	700	70.00	10.	Dharmadham	700	70.00
	Block average	703	70.00				

old stock.

Most of the growers made selection of the seed materials, according to the criteria which each thought would be helpful in increasing the yield. The type of seed materials used by growers is shown in Table 9.

One hundred and three growers out of 120 or 85.8 per cent preferred sword suckers with medium sized and round shaped rhizomes. Thirteen growers or 10.8 per cent were satisfied with the general healthy appearance of the suckers. Four growers or 3.4 per cent of the total growers investigated were indifferent in the matter of the selection of suckers.

The spacing given between plants was found to be almost uniform and it was more or less 8' x 8' in all the villages. Hence the number of plants in each plot was proportional to the area. On an average the number of plants per acre was found to be 702 and the cost was Rs. 70.20.

Manures and Fertilizers: The bulky manures commonly used in the production of Nendran were cattle and goat manures, wood ash, green leaf manure and small quantities of compost, paddy straw etc., Among the concentrated manures banana mixture was commonly used. Muriate of potash, Ammonium sulphate, Urea, lime etc., were also used in limited quantities.

Manuring to Nendran plants was done in three or four and in some cases even in five doses. Some farmers applied wood ash, cattle or goat manure, straw wastes etc., in various combinations at the time of planting. But regular applications

Table 11

Details of the Number of growers using and producing cattle manure, green manure and compost

No.	Names of villages	Total number of growers	Number of growers applied cattle manure	Number of growers pro-duced cattle manure	No. of growers applied leaf manure	No. of growers pro-duced	Number of growers applied compost	Number of growers pro-duced
1.	Kodiyeri	29	29	17	18	10	4	4
2.	Eruvatty	23	1	1	19	3	3	3
3.	Kadirur	21	21	8	9	5	1	1
4.	Eranjoli	15	4	2	14	3	7	7
5.	Kottayam	15	-	-	12	-	2	2
6.	Puthiriyad	6	-	-	5	-	3	3
7.	Chockli	4	-	-	4	-	1	1
8.	Peringathore	3	-	-	3	-	-	-
9.	Pinarayi	2	1	1	1	-	-	-
10.	Dharmadham	2	2	2	2	-	1	1
11.	Block average	120	59	33	87	21	20	20

of manures were started only 1 1/2 to 2 months after planting. For every application of manures shallow basins were formed around the plants and the manures were uniformly spread in the basins and covered with a thin layer of soil. The first one or two applications of manure was done at intervals of six to eight weeks. But the later doses were applied at shorter intervals. The previous applications contained more of bulky manures and less of chemical fertilizers. Similarly the later applications contained comparatively more of chemical fertilizers and less of bulky manures. The manuring was usually completed before the growing period of the plant was over. However the growers applied at short intervals handful of wood ash at the base of the plant even after it came to flowering. These doses of wood ash were believed to result in better development of the fruits.

The kind and quantity of bulky manures applied depended upon the availability and the idea held about the efficacy of each type of manure by individual growers. The number of growers using cattle manure, green manure and the number of growers who produce them are shown in Table 11.

On an average in the block area only 49 per cent of the banana growers used cattle manure out of which 46 per cent purchased it from outside. Seventy two per cent of the growers applied green manure to the Nendran crop. But only 24 per cent produced green manure *in situ*. The green manure grown *in situ* was black gram. Two of the cultivators also raised sesbania. Only 17 per cent of the growers manufactured and used compost

Table 12

Quantity of manures and fertilizer applied to one acre of Nendran crop - Villagewise

No.	Names of villages	Quantity of manures and fertilizers used per acre			
		Farm Yard manure Kg	Wood ash Kg	Green manure compost, Waste straw etc., Kg	Fertilizers Kg.
1.	Kodiyeri	2151	2654	1192	787
2.	Eruvatty	70	2783	5088	536
3.	Kadirur	1812	3194	398	754
4.	Eranjoli	168	2553	2807	556
5.	Kottayam	-	2142	2432	408
6.	Pathiriyad	-	3063	3795	496
7.	Chokli	-	4200	3900	673
8.	Peringathore	231	5225	1203	119
9.	Pinarayi	700	2560	2120	329
10.	Dharmadham	625	2563	1188	365
11.	Block average	1037	2766	1882	625

manure and even out of the compost manure manufactured only a small portion was applied to the Nendran crop and the major portion was used for paddy and other crops.

All the growers used wood ash and chemical fertilizers. The quantities of different manures used on a per acre basis in Nendran production in various villages is shown in Table 12.

The maximum quantities of farm yard manure and fertilizers were applied in Kodiyeri and Kadirur, being 2151 kg and 1812 kg of farm yard manure and 787 kg. and 754 kg. of fertilizers respectively per acre in each of these two villages whereas green manure application was greater in villages like Chokli, Pathiriyad and Kuruvatty being 3900 kg., 3795 kg., and 3088 kg. respectively. The application of wood ash was uniformly in high doses in all the villages. On an average in the block area, 1037 kg. of farm yard manure, 2766 kg. of wood ash, 1882 kg. of green manure and other manures and 625 kg. of fertilizers were applied per acre of Nendran crop.

Table 13 gives an estimate of the total quantity of major nutrients i.e., Nitrogen, Phosphorus and potash available in the various manures and fertilizers applied to one acre of Nendran crop in different villages. The manures in column No. 5 and fertilizers in column No. 6 in Table 12 are taken as green manure and banana mixture for conversion into nutrients as other manures and fertilizers were negligible.

The quantities of nutrients contained in wood ash and green manure have been estimated by taking the percentage content of the nutrients in these manures as given in 'A Note Book of

Table 13

Nutrient contents of manures and fertilizers applied to one acre of Nendran crop in different villages

No.	Names of villages	Nutrient contents of manures and fertilizers applied to one acre of Nendran crop		
		Nitrogen N	Phosphoric Acid P_2O_5	Potassium oxide K_2O
1.	Kodiyeri	77.52	115.19	257.44
2.	Eruvatty	58.60	92.93	238.29
3.	Vadirur	69.56	119.81	280.95
4.	Eranjoli	59.11	90.60	226.21
5.	Kottayam	44.80	71.06	162.92
6.	Pathiriyad	58.66	94.93	252.35
7.	Chokli	73.34	128.30	329.17
8.	Peringathore	16.46	90.20	326.50
9.	Pinarayi	39.72	70.19	186.24
10.	Dharmadham	37.64	75.32	198.46
Block average		63.66	101.46	245.03

Table 16

Cost of manures and fertilisers applied to one acre of Nendran Crop.

S.No.	Names of Villages	Cost incurred per acre on Farm Yard Manure Rs.	Wood Ash Rs.	Green manure Rs.	Fertilisers Rs.	Total	Percentages of cost incurred on Farm Yard Manure	Wood ash	Green manure	Fertilisers
1.	Kodryeri	86	265	55	324	730	11.7	36.3	7.5	44.5
2.	Erruvatty	3	278	168	223	672	0.4	41.3	25.0	33.3
3.	Kadirur	73	319	15	316	723	10.0	44.2	2.1	43.7
4.	Eranyoli	6	25 5	125	247	633	1.0	40.2	19.7	39.1
5.	Kottayam	-	214	130	168	512	-	41.8	25.3	32.9
6.	Pathiriyad	-	307	184	203	694	-	44.2	26.5	29.3
7.	Chockli	-	420	124	271	815	-	52.6	15.2	33.2
8.	Peringathore	6	523	213	50	792	0.7	66.1	26.9	6.3
9.	Pinarayi	28	236	116	140	520	5.4	45.3	22.3	27.0
10.	Dharmadam	25	258	73	158	514	4.9	50.3	14.1	30.7
11.	Block average	41	277	93	261	672	6.1	41.2	13.8	38.9

Agricultural Facts and Figures" p. 128 and 132. The nutrient content of farm yard manure has been estimated by taking the percentage contents of the nutrients as given in 'Agricultural Officers Guide Book, Kerala (1963) Page 53 that of the 'banana mixture' has been done, according to the nutrient content of the mixture used by the growers in the area.

As it may be seen from Table 13 that a large quantity of the major nutrients Nitrogen, Phosphorus and Potash were going into the production of Nendran banana in the area. In the block area on an average, 248 kg. of potash, 101.6 kg. of phosphorus and 65.6 kg. of nitrogen were applied per acre of Nendran crop.

Cost of Manures and Fertilizers

The total expenditure incurred on manures and fertilizers and the relative share of each in the total cost is worked out in Table 14.

The maximum expenditure on single item of manure was incurred on wood ash in all the villages except in Kodiyeri. In Kodiyeri also the expenditure on wood ash was high. In Peringathore village 5225 kg. of wood ash costing Rs. 523 was applied to one acre of Nendran crop. In Chokli village also the expenditure on wood ash was as large as Rs. 420. In the villages of Kadirur, Pathiriyad, Eruvatty and Kodiyeri, the expenditure on wood ash was Rs. 319, Rs. 307, Rs. 278 and Rs. 265 respectively. The minimum expenditure on wood ash was incurred in Pinarayi village, being Rs. 236 per acre. The second highest item of expenditure in manures and fertilizers

was on fertilizer in all the villages except Peringathore. The maximum expenditure on fertilizer was incurred in Kodiyeri village being Rs. 324. The cost of fertilizer applied in Kadirur village per acre was Rs. 316, in Chokli Rs. 271 and in Eranjoli Rs. 247. The minimum expenditure on fertilizer was incurred in Peringathore village. The expenditure on farm yard manure was comparatively low in all the villages. Peringathore incurred an expenditure of Rs. 213 on green manure. In Pathiriyad, Eruvatty, Kottayam, Eranjoli and Chokli also the expenditure on green manure was considerable. On an average in the block area Rs. 672 was spent on manures and fertilizers for one acre of Nendran crop. Out of this Rs. 277 was spent on wood ash, Rs. 261 on fertiliser, Rs. 93 and Rs. 41 respectively on green manure and other manures and on farm yard manure. The percentages of cost on different items were 41.2 per cent on wood ash, 38.9 per cent on fertilizers, 13.8 per cent on green manure and other miscellaneous items and 6.1 per cent on farm yard manure.

Taking labour cost of Rs. 78 (Table 6) also into consideration the total cost on the single item of 'Manures and Manuring' on an average at the block level amounted to Rs. 750/-

Propping: Tellicherry block being a coastal region is subjected to heavy monsoon winds. Hence proper propping of the plants as they come to flowering is an essential operation to save them from the hazards of strong winds. Cost of the posts and coir used for propping and the labour charges for erecting and fixing the same are two items of expenditure incurred on propping. Cost of labour on this account has already been considered along with other items of labour charges.

Table 15

Cost of propping material for one acre of Nendran crop

S. No.	Names of villages	Value of propping material Rs.	S No.	Names of villages	Value of propping material Rs.
1.	Kodiyeri	176.00	6.	Pathiriyad	165.00
2.	Eruvetty	163.00	7.	Chokli	184.00
3.	Kadirur	166.00	8.	Peringathore	152.00
4.	Eranjoli	175.00	9.	Pinarayi	165.00
5.	Kottayam	155.00	10.	Dharmadam	191.00
Block average		168.00			

The materials generally used for propping of Nendran plants were bamboo and wooden posts. The props can be used for 2 or 3 year Accordingly, the proportion of cost on the basis of the number of years, they are used in each case, has been apportioned to the year under study. The expenditure incurred on propping on a per acre basis in various villages is given in Table 15.

There was no wide variations in the expenditure on propping materials in different villages. On an average in the block area the expenditure on propping materials was Rs. 169. Taking labour charges for erecting and fixing the prope also into consideration, the total cost on this item in one acre of Nendran crop amounted to Rs. 221.

Harvesting and Method of disposal of produce: Only very few growers harvested their crop themselves. The practice popular with the growers in the area under study was to sell the harvesting right of standing crops. This mode of disposal is locally called 'Pattam Kodukkal'. The practice of selling the right of harvest of the produce is widely prevalent in the case of coconuts also which is the major crop in the area.

Ninety five out of the 120 growers investigated, disposed of the produce before harvest. The 25 growers who harvested the crop on an average had incurred an expenditure of Rs. 21.60 to harvest the produce in one acre. The cost of harvest however has not been included in the final calculation for arriving at the per acre and unit cost of production as the popular practice obtaining amongst Nendran growers and in the major Nendran growing villages was to sell the produce before harvest. For assessing the income from the produce the selling rate of the right of harvest of the

bunches then prevalent in the villages have been imputed in the afore mentioned 25 cases also for the sake of uniformity. However at the end of this chapter when returns from the crop are considered, the additional income that could have been obtained,had the produce been harvested and marketed, has been brought out from the data available in the case of the above 25 growers.

The bunches on the standing plants were disposed of, by fixing prices either on the basis of a bunch or on units of 100 fruits. In the majority of cases in the area the prices were fixed on the basis of a bunch. As pointed out in the 'Report on the Marketing of Bananas in India' (1945) p. 23, the contractors move from place to place in the beginning of the season and purchase the standing crops. The contractors undertake to harvest, cart and book the banana fruits to different destinations. They also sell the fruits to merchants and consumers in the nearby markets. Tea-shop owners also buy the standing crop on the above basis. The contractors in many cases also advance loans to the growers on condition that the produce would be sold to them. Thirty one out of 120 growers investigated had obtained credit from the contractors. In some cases, the standing crop was sold when the bunches were very tender, for want of money for meeting the urgent financial commitments of the growers. In such transactions the growers suffered a heavy loss as the quality of the bunches was not taken into consideration when the price was fixed.

Even after the sale was effected it was the responsibility of the growers for the proper upkeep of the crop by giving regular

irrigation, protecting the plants from wind and watching against theft. The contractors would harvest and take standard bunches only into consideration for payment. According to the agreement, if any damage was suffered even due to natural reasons, the contractors were free from any loss. Another great loss to which the growers were subjected due to this method of disposal of the produce was that invariably some deductions from the rates agreed upon would be made at the time of the final settlement of the accounts, on the plea that loss had been incurred by the contractor in the business. Eighty seven out of 95 growers who disposed of the standing crop, complained about this illegal deduction during the investigation. It was revealed by the enquiry that the deductions ranged from 12 paise to 37 paise per bunch. On an average, an average grower lost about Rs. 30 on this account during the year under study. The investigation also revealed that the growers were forced to adopt this mode of disposal of their produce for the following reasons. The banana bunches in a plantation came to harvest at different times. Hence the growers were not able to get the income from their crop in a lumpsum to meet their previous commitments. Secondly the growers to meet their credit requirements were forced to sell their produce early before it came to maturity. Thirdly, as only a few number of bunches would be ready for harvest at a time, the transport of the produce in small lots would be expensive and troublesome to the grower who had neither the means nor the time for the same. Fourthly many of them had prior understanding to sell the produce to the contractors as a set off to the advances they had received. Twenty nine growers disposed of the standing crop to realize

were not having institutional agencies for credit, that hardship for obtaining the same was felt. The predominant purpose of credit was found to be for the purchase of fertilizers and manures. The major if not the whole component of the credit requirement of all the 97 growers was for the same. This is evident from the large amount required for this purpose in the cost of production. Forty five growers required credit for the purchase of props and 24 for meeting expenditure connected with other operations in addition to the purchase of manures and fertilizers.

The number of growers depending on various agencies for credit is furnished in Table 17.

In Kodiyeri and Kadirur villages a major portion of the credit requirements was met by Co-operative Societies. In other villages the chief source of credit was private persons Nicholson as long back as 1895, pointed out that ryots as a class were the greatest lending classes in rural parts of the Madras Presidency. This fact remained unchanged in spite of great changes. Merchants or contractors were also important as agents of credit. In the block as a whole 35 per cent of the credit requiring growers borrowed from Co-operatives, 28 per cent from private persons and merchants and 9 per cent from private banks by mortgaging ornaments.

There was no standard rate of interest for the money advanced by the merchants and private persons. The merchants and contractors advanced credit on condition that the produce would be sold to them. Such credit bore no interest apparently. But in the settlement of the price of the produce, low prices

Table 17

Details of different agencies who advanced credit-villagewise

No.	Name of villages	Number of growers who got credit from: Co-operatives	Merchants & contractors.	Banks by mortgaging ornaments	Private persons
1.	Kodiyeri	14+6* = 20 (68%)	2+6* = 8 (26%)	1 (3%)	2 (6%)
2.	Eruvatty	1 (8%)	7 (33%)	3 (14%)	10 (48%)
3.	Kadirur	11+5* = 16 (64%)	4+5* = 9 (36%)	-	-
4.	Eranjoli	1 (10%)	1 (10%)	2* (20%)	4+2* = 6 (60%)
5.	Kottayam	-	3 (23.1%)	2 (15.3%)	8 (61.6%)
6.	Pathiriyad)	-	1 (20%)	1* (20%)	2+1* = 3 (60%)
7.	Chockli	-	-	-	2 (100%)
8.	Peringathoro	-	-	-	1 (100%)
9.	Pinarayi	1 (33%)	1+1* = 2 (67.0%)	-	-
10.	Dharmadham	-	-	1 (100%)	-
Block average		27+12* = 39 (35%)	19+12* = 31 (28%)	7+3-10 (9%)	30+8* = 38 (28%)

* This sign denotes that the same persons obtained credit from other agencies also.

Figures in bracket show percentages.

money earlier and as already mentioned 33 growers sold the produce to the contractors because of their prior commitment for the advance received, out of the 120 growers investigated.

Credit: The larger investment required on resources and the greater time lag involved in the production of Nendran necessitated a large volume of working capital in the undertaking. The fact that such an enterprise is taken up by poor agricultural labourers who did not have any command over capital, made it necessary on the part of the growers to rely largely on borrowed money.

Purchase of manures and fertilizers and posts for propping and in some cases digging drainage channels were the items of expenditure for which credit facilities were mainly required by the banana growers. The agencies that generally advanced credit to banana cultivators were merchants, contractors, private persons and cooperative societies. In some cases credit was also obtained from private banks by mortgaging ornaments. The number of growers requiring credit for different operations and the number of growers who were able to secure their full credit requirements are shown in Table 16.

Out of the total of 120 growers investigated 97 or 81 per cent of the growers required credit for meeting production costs. Though all these growers were able to get credit from one source or other only 45 growers or 46 per cent of the credit requiring growers could secure their full requirements of credit. Fifty two growers or 54 per cent could only get a portion of their requirements. It was in villages like Eruvatty, Kottayam, Pathiriyad, Peringathore etc., which were in the interior and

Table 16

Details of credit requirement of the growers

S.No.	Name of Villages	No.of growers not requiring credit	No.of growers requiring credit	No.of growers requiring credit for purchase of			No.of growers who get the full credit required	No.of growers who could not get full credit required
				Manures	Props	Misc.		
1.	Kodiyeri	4	25	25	12	6	14	11
2.	Eruvatty	2	21	21	4	5	7	14
3.	Kadirur	1	20	20	13	4	14	6
4.	Eranjoli	7	8	8	4	1	3	5
5.	Kotteyam	2	13	13	8	5	5	8
6.	Pathiriyad	2	4	4	2	2	1	3
7.	Chockli	2	1	1	-	-	1	1
8.	Peringathore	2	1	1	-	-	-	1
9.	Pinarayi	-	2	2	1	1	-	2
10.	Dharmadham	1	1	1	1	-	-	1
11.	Block total	23	97	97	45	24	45	52

Table 23

Details of Net return received from the Bendrem crop

S.No.	Names of Villages	Gross return per acre	Cost of production per acre	Net return per acre	Net return per average area cultivated (19 cents)	Net return from each rupee employed in production
		Rs.	Rs.	Rs.	Rs.	Rs. P
1.	Kadiyri	3213.00	1691.00	1522.00	289.00	0.90
2.	Eruvatty	2877.00	1583.00	1294.00	246.00	0.82
3.	Kadirur	3212.00	1606.00	1606.00	305.00	1.00
4.	Eralrjoli	2674.00	1602.00	1072.00	203.00	0.67
5.	Kottayam	2556.00	1360.00	1196.00	227.00	0.88
6.	Kathiriyad	2313.00	1576.00	737.00	140.00	0.47
7.	Cheekli	2766.00	1789.00	977.00	166.00	0.55
8.	Meringathore	2396.00	1880.00	516.00	98.00	0.27
9.	Pinerayi	2163.00	1449.00	714.00	136.00	0.49
10.	Dharmadhar	2078.00	1539.00	539.00	102.00	0.35
11.	Block average	2906.00	1598.00	1308.00	244.00	0.82

to produce one tonne of Nendran fruit.

The cost of production per average area of crop, grown by a cultivator is worked out in Table 21.

From Table 21, it may be noted that an average cultivator having an area of 19 cents under the crop should have a command over a working capital of Rs. 282 in Chokli, 241 in Kodiyeri and slightly less in other villages. In the block area as a whole a working capital of Rs. 223.00 was required for an average grower to embark on the production of Nendran.

Returns from the Enterprise:

Having considered the cost of production of Nendran banana in all its aspects, to get a complete picture of the economics of Nendran production, the returns from the enterprise is considered next. Return per acre, net return per acre, net return per average cultivator and net return per each rupee employed in Nendran production, and Family labour income and remuneration for man day unit of family labour at the level of an average unit area of cultivation are estimated in the following pages.

In Table 22, the total per acre return from Nendran fruit and suckers are furnished.

In the matter of yield and total income Kodiyeri village excelled all other villages, the total income being Rs. 3213-00 per acre. Kadirur village closely followed, Kodiyeri in total income. The lowest total income was received in Dharmadham being Rs. 2078-00.

Table 22

Details of yield of fruit and suckers and income from one acre of Nendran crop

Names of villages	Yield per acre Fruit kg.	Suckers	Value of Fruit Rs.	Suckers Rs.	Total income per acre Rs
1. Kodiyeri	7766	1233	3090-00	123-00	3213-00
2. Eruvetty	6782	1716	2703-00	172-00	2877-00
3. Kadirur	7711	1400	3072-00	140-00	3212-00
4. Eranjoli	6449	997	2474-00	100-00	2674-00
5. Pottayam	6035	1527	2503-00	153-00	2656-00
6. Pathiriyad	5383	1700	2143-00	170-00	2313-00
7. Chockli	6737	1733	2693-00	173-00	2766-00
8. Peringathore	5562	1808	2215-00	181-00	2396-00
9. Pinarayi	5184	1000	2063-00	100-00	2163-00
10. Dharmadham	4945	1100	1968-00	110-00	2078-00
11. Block average	6950	1383	2768-00	138-00	2906-00

Table 21

Cost of production per average area cultivated by a grower.

No.	Names of villages	Cost of production of banana per average area cultivated by a grower Rs.	Cost of family labour Rs.	Money cost incurred by average grower Rs.
1.	Kodiyeri	321.00	80.00	241.00
2.	Eruvatty	301.00	81.00	220.00
3.	Kadirur	305.00	89.00	216.00
4.	Eranjoli	304.00	83.00	221.00
5.	Kottayam	258.00	74.00	184.00
6.	Pathiriyad	299.00	69.00	230.00
7.	Chockli	340.00	58.00	282.00
8.	Peringathore	357.00	112.00	245.00
9.	Pinarayi	275.00	77.00	198.00
10.	Dharmadhom	292.00	101.00	191.00
11.	Block averege	304.00	81.00	223.00

of production of Nendran in all the villages except in Pinarayi and Dharmadham was the cost of manures and fertilizers followed by labour. On an average in the block area as a whole, a cost of Rs. 1690 was incurred for producing Nendran banana on one acre. Rupees Six hundred and Seventy two or 42 per cent of the expenditure was due to the cost of manures and fertilizers. Labour accounted for Rs. 496 or 31.1 per cent of the cost. Rupees One hundred sixty nine and Rs. seventy respectively were the expenditure incurred on the purchase of props and seed materials and they worked out to 10.6 per cent and 4.4 per cent of the total expenditure. Rent on land accounted for Rs. 135 or 8.4 per cent of the cost. The interest on working capital amounted to Rs. 56 or 3.4 per cent of the total expenditure. The percentage composition of each item of cost in the production of Nendran on one acre is also diagrammatically represented in pie diagram No.1.

The cost of production of Nendran per acre is broken up operationwise and is presented in Table 19.

The cost involved in producing one tonne of Nendran fruit is worked out in Table 20.

Nendran fruit was produced at the cheapest rate in Kadirur. The production cost of one tonne of Nendran fruit was Rs. 208. In Kodiyeri village also the fruit was produced at a comparatively cheap rate. Peringathore village incurred the maximum cost in the production of Nendran. The production cost was also comparatively high in Dharmadham and Pathiriyad villages. In the block area as a whole, on an average Rs. 250/- was incurred

TABLE 20

Unit cost of production of Nendran fruit

No.	Name of villages	Cost of cultivation per acre. Rs.	Quantity of fruit produced per acre kg.	Cost of production of one tonne of Nendran fruit Rs.
1.	Kodiyeri	1691.00	7766	218.00
2.	Eruvatty	1583.00	6782	233.00
3.	Kadirur	1606.00	7711	208.00
4.	Eranjoli	1602.00	6449	248.00
5.	Kottayam	1360.00	6035	225.00
6.	Pathiriyad	1576.00	5383	293.00
7.	Chockli	1769.00	6737	266.00
8.	Peringathore	1880.00	5562	338.00
9.	Pinarayi	1449.00	5184	281.00
10.	Dharmadham	1539.00	4945	311.00
11.	Block average	1598.00	6850	230.00

Table No.19

Cost of production of Nendran per acre - operationwise

S.No.	Names of villages	Total cost per acre Rs.	Preparatory cultivation Rs.	Seeds and sowing Rs	Manuring & manures Rs	Intercultivation Rs	Irrigation Rs.	Props and prpping Rs.	Rent of land and interest on working capital Rs.
1.	Kodiyeri	1691.00	30.00 (1.8)	84.00 (5)	816.00 (48.3)	46.00 (2.7)	311.00 (18.4)	227.00 (13.4)	177.00 (10.54)
2.	Eruvatty	1583	83.00 (5.2)	89.00 (5.6)	748.00 (47.3)	46.00 (2.9)	188.00 (11.9)	217.00 (13.7)	212.00 (13.4)
3.	Kadirur	1606	33.00 (2.1)	84.00 (5.2)	800.00 (49.8)	45.00 (2.8)	268.00 (16.7)	218.00 (13.6)	158.00 (9.8)
4.	Eranjoli	1602	128.00 (8.0)	82.00 (5.1)	706.00 (44.1)	45.00 (2.8)	212.00 (13.2)	229.00 (14.3)	200.00 (12.5)
5.	Kottayam	1360	72.00 (5.3)	90.00 (6.6)	587.00 (43.2)	48.00 (3.5)	153.00 (11.3)	211.00 (15.5)	199.0 (14.6)
6.	Pathiriyad	1576	92.00 (5.9)	82.00 (5.2)	765.00 (48.5)	39.00 (2.5)	169.00 (10.7)	214.00 (13.6)	215.00 (13.6)
7.	Chockli	1789	113.00 (6.3)	88.00 (4.9)	897.00 (50.0)	63.00 (3.5)	189.00 (10.6)	241.00 (13.5)	198.00 (11.1)
8.	Peringathore	1880	151.00 (8.0)	101.00 (5.4)	871.00 (46.3)	35.00 (1.9)	308.00 (16.4)	207.00 (11.0)	207.00 (11.0)
9.	Pinarayi	1449	130.00 (9.0)	86.00 (5.9)	578.00 (39.9)	37.00 (2.6)	254.00 (17.5)	200.00 (13.8)	164.00 (11.3)
10.	Dharmadham	1539	128.00 (8.3)	85.00 (5.5)	577.00 (37.5)	35.00 (2.3)	275.00 (17.9)	237.00 (15.4)	202.00 (13.1)
11.	Block average	1598	63.00 (3.9)	85.00 (5.3)	750.00 (46.9)	46.00 (2.9)	241.00 (15)	222.00 (13.9)	191.00 (12)

were quoted to which the debtor was bound to agree. When the growers refused to sell the produce to the creditor contractors at the low price offered by them there were instances of growers having had to pay interest at the rate of 15 per cent and more in the name of business profit. The growers were found to be reluctant to divulge information regarding the interest paid in the case of the credit obtained from private persons. However the rate of interest was not favourable to the growers.

Per acre cost of Production of Nendran:

All the components of cost in the production of Nendran bananas have been considered individually in the foregoing pages. Now different components of cost can be considered together as a complete whole.

From the data available, the per acre cost of production unit cost of production and cost of production for the average area put under Nendran per grower have been estimated. Firstly the per acre cost of production may be considered. The per acre cost of production itemwise and villagewise is furnished in Table 18.

The rate adopted in working out the interest on working capital in Table 18 is the same as the rate charged by cooperatives for short term agricultural loans in the area. The interest is charged for six months as the average period in which the total amount would have been held up in production would be the same period.

As already pointed out the most expensive item in the cost

PERCENTAGE COMPOSITION OF COST OF NENDRAN PRODUCTION

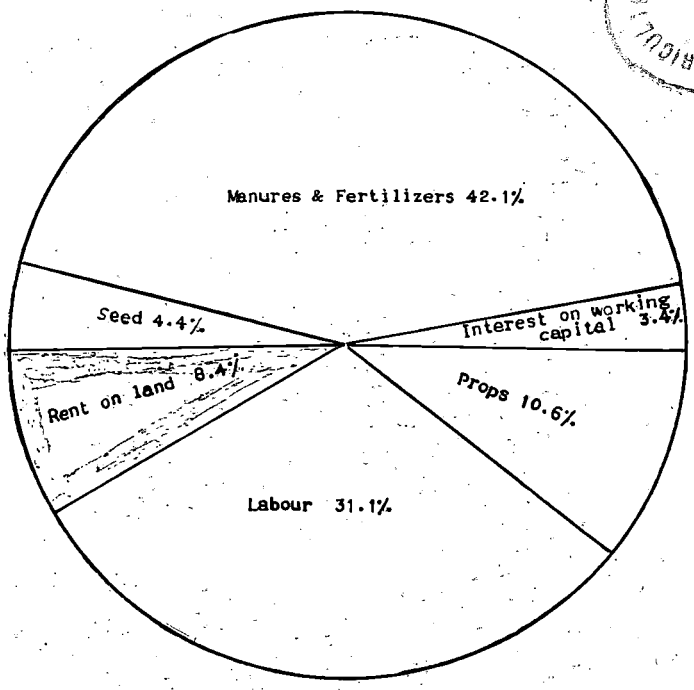


Table 18

Cost of production per acre and its components - villagewise

No.	Names of villages	Items of cost						Total
		Seed materials Rs	Manures and fertilizers Rs	Labour Rs	Crops and miscellaneous items Rs.	Interest on working capital @ 7½ % rate for 6 months.	land rent Rs	Rs.
1.	Kodiyeri	70.00 (4.1)	730.00 (43.2)	538.00 (31.8)	176.00 (10.4)	55.00 (3.3)	122.00 (7.2)	1691.00 (100)
2.	Aruvatty	70.00 (4.4)	672.00 (42.5	466.00 (29.4)	163.00 (10.3)	50.00 (3.2)	162.00 (10.2)	1583.00 (100)
3.	Kadirur	70.00 (4.4)	723.00 (45)	489.00 (30.5)	166.00 (10.3)	53.00 (3.3)	105.00 (6.5)	1606.00 (100)
4.	Eranjoli	70.00 (4.4)	633.00 (39.6)	524.00 (32.7)	175.00 (10.9)	51.00 (3.2)	149.00 (9.2)	1602 (100)
5.	Kottayam	70.00 (5.2)	512.00 (37.6)	424.00 (31.2)	155.00 (11.4)	42.00 (3.1)	157.00 (10.5)	1360.00 (100)
6.	Pathiriyad	70.00 (4.4)	694.00 (44)	432.00 (27.4)	165.00 (10.5)	49.00 (3.1)	166.00 (10.6)	1576.00 (100)
7.	Chockli	70.00 (3.9)	815.00 (45.6)	522.00 (29.2)	184.00 (10.3)	58.00 (3.2)	140.00 (7.8)	1789 (100)
8.	Peringathore	74.00 (3.9)	792.00 (42.1)	655.00 (34.9)	152.00 (8.1)	61.00 (3.2)	146.00 (7.8	1880 (100)
9.	Pinarayi	70.00 (4.8)	529.00 (35.9)	539.00 (36.6)	165.00 (11.4)	47.00 (3.2)	117.00 (8.1)	1449 (100)
10.	Dharmadham	70.00 (4.6)	514.00 (33.4)	562.00 (36.5)	151.00 (12.4)	49.00 (3.2)	153.00 (9)	1539 (100)
11.	Block average	70.00 (4.4)	672.00 (42.1)	496.00 (31.1)	169.00 (10.6)	56.00 (3.4)	135.00 (8.4)	1598 (100)

Note: Figures in the bracket are percentages

Table 27

Correlation matrix

	Y (Yield)	x_1 (Land)	x_2 (Labour)	x_3 (Manures & Fertilizers)
Y	1.000000	0.976320**	0.971327**	0.980604**
x_1		1.000000	0.973108**	0.997282**
x_2			1.000000	0.978697**
x_3				1.000000

Degrees of freedom in the estimation = 118.

been calculated by dividing the value of the gross produce per average holding after subtracting the cost due to labour services including the value of the unpaid family labour. The residual average product for labour and capital are furnished in Table 26 and the respective values of the same are Rs. 7.26 and 2.20.

Input-output ratio:

The relation of product to all resources used in production which is expressed as the input-output ratio is essential to find out whether if all resources have been paid at market prices, the production process would have resulted in a net loss or profit. The input output ratio is estimated by dividing the value of the product at market prices by the cost of all inputs also computed at market prices. If the resulting ratio is more than one, it indicates that the value of the product is greater than the value of resources used and therefore will result in profit. The input-output ratio in the case of Nendran production is very high being 1.82 and shows a high level of profit in the enterprise.

Production Function

The average productivity estimates made already give only a general idea of input-output relationships and profitability of factors which are of particular importance in production. But these estimates are not capable of giving an idea of the exact share contributed by each input factor by itself uninfluenced by other input factors in production and hence do not serve as an appropriate guide line to reallocate resources

estimate.

The gross average productivity for a particular factor input is estimated by finding out the quantum of product or output in physical or monetary unit per unit of factor input. As no share of the product is imputed to the factor inputs other than the one under consideration, the gross average productivity is of limited use in giving a clear picture of the resource efficiency (Heady 1952). The residual method gives a better measure of productivity estimate. In this method the productivity of the particular resource per unit is calculated only after subtracting from the value of the total product, the cost of the other input factors at market price.

Gross average productivity of labour and capital:

The computation of the gross average productivity of labour has been made by dividing the total value of product for acre by the total number of workers engaged in the production of the same. Similarly the gross average productivity of capital has also been worked out. The data are furnished in Table 26. The variable capital invested per worker is also worked out and shown in the same Table.

Residual average product for labour and capital;

The residual average product for labour has been computed by subtracting from the gross value of the product per average holding all the cost of production of non labour services in the farm. Similarly the residual average product per capital has

Table 26

Gross and Residual productivity of resources for arithematic mean of the sample estimated

Particulars	
No. of holdings surveyed	120
Average area in cents	19
Total value of the product in rupees	562.00
Total labour unit in man days	47.14
Value of labour unit including unpaid family labour	Rs. 94.28
Total value of non-labour capital service in rupees	Rs.209.72
Gross product per man day unit (Gross labour productivity) in rupees	Rs. 11.71
Residual product per workers in rupees	Rs. 7.26
Capital available per worker (Capital - labour ratio) in rupees	Rs. 4.41
Average capital productivity in rupees	Rs. 2.65
Average residual capital productivity in rupees	Rs. 2.20
Value of output per rupee worth of input	Rs. 1.82

The total average gross product per worker was Rs. 11.71

The gross average productivity per capital is Rs. 2.65

labour contributed by the family engaged in Nendran production are estimated in Table 24.

Production of Nendran in the area was securing a very good income to the grower families. An annual income ranging from Rs. 203 in Dharmadram to Rs. 394 in Kadirur was gained by an average grower family in different villages in the block area. The wages which accrued to a man day unit of family labour engaged in Nendran production in Kodiyeri village was as high as Rs. 9.23. The rates which accrued to a man day unit of family labour was Rs. 8.85 in Kadirur Rs. 8.14 in Kottayam and Rs. 8.07 in Eruvatty. Growers in Peringathore village got the lowest wage rate being Rs. 3.57 per man day unit. On an average in the block area one man day unit of family labour engaged in Nendran production earned Rs. 8.12.

Estimate of loss incurred by selling standing crop of Nendran.

As already pointed out only 25 out of 190 growers investigated were able to harvest and market their produce. It is generally believed that the growers are subjected to heavy loss due to disposing their produce before harvest. The magnitude of such loss is estimated in Table 25.

From Table 25, it may be noted that if it was possible for the grower to harvest and market the crop himself, he would have been able to get 5.14 per cent more of gross income than what he received in 1963-64. The gross income received by a grower cultivating an average area of 19 cents in the block area was Rs. 552. So an average cultivator could have added Rs. 28.4 more to his net return enhancing it from Rs. 249 to Rs. 277.40.

The various factors that were employed in the production of Nendran fruit and the proportion of the factor costs to the total cost has been estimated in the previous pages. This makes only an estimate of a production practice prevalent in a region. Each factor might or might not be contributing to the yield, but as items of costs they are important in the estimation of cost of production. But the estimation of the share, contributed by each factor, can only give an idea of the magnitude of the utility of each particular factor in production. This valuable information would be useful in regulating the use of production factors and can be derived from studies analysing the factor product relationship. Hence in the following pages an attempt is made to analyse the factor product relationship in Nendran production.

Resource Productivity in Nendran Production:

Resource efficiency studies are designed to examine whether resources employed in production, namely land, labour, capital etc., are being used in a manner that would maximise returns and to give guidelines to adopt the most efficient resource use pattern.

There are two methods of estimating resource productivity namely 1. average productivity and 2. marginal productivity.

Average productivity of resources:

The estimation of average productivity of resources was developed by Warren 1910. The estimation of average productivity of a particular resource may be by way of 1. gross average productivity estimate or 2. residual average productivity

Table 25

Details of loss incurred in disposing of standing crops

Area cultivated by 25 growers who marketted their produce	Value of produce when sold as standing crop	Value of produce when marketted	Cost of harvesting and marketing	Value of the produce less marketing cost	Loss incurred in selling standing crop	Percentage of loss to the income received.
Acre	Rs	Rs	Rs	Rs	Rs	Rs
3.92	8594	9358	322	9036	442	5.14%

Table 24

Family labour income

Names of villages	Net return from an average area of 10 cents Rs	Cost of Family labour in 10 cents Rs	Family labour income Rs	Remuneration per man day unit of family labour Rs
1. Kadiyeri	289	80	369	823
2. Eruvatty	246	81	327	807
3. Kadirur	305	89	394	885
4. Eranjoli	203	83	286	689
5. Kottayam	227	74	301	8.14
6. Pathiriyad	140	69	209	6.06
7. Chockli	186	58	244	8.41
8. Peringathore	98	112	210	3.57
9. Pinarayi	136	77	213	5.53
10. Dharmadam	102	101	203	4.02
Block average	249	81	330	6.19

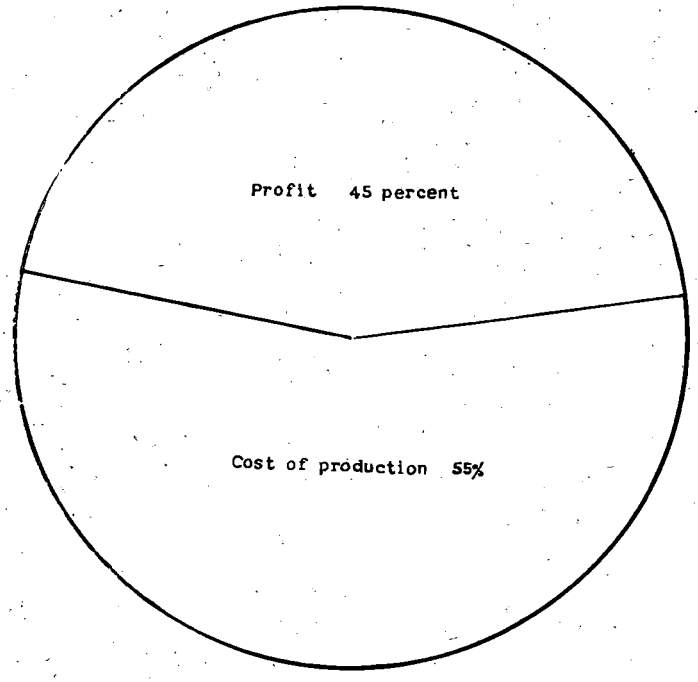
The net return from an acre, net return from the average area cultivated by a grower and return from each rupee worth of resources employed in production of Nendran are worked out in Table 23.

By undertaking Nendran production on one acre a net return or profit as large as Rs. 1606 could be received in Kadirur village. Profit from Nendran production was also very high in the villages of Kodiyeri, Eruvatty, Kottayam Eranjoli and Chokli. The lowest net return amongst the villages was received in Peringathore, being Rs. 516. The average net return in the block area as a whole was Rs. 1308 per acre.

The figures in column No.5 in Table 23 are the net returns or profits, received by a grower cultivating an average area of 19 cents. In Kadirur village the net profit received by an average grower was Rs. 305. The net return received by an average grower, on an average in the block area was Rs. 249. The net profit gained by each rupee employed in production is given in column No.6. There was even a one to one correspondence between the cost involved and profit gained in Nendran production in Kadirur village. A rupee worth of resource employed in Nendran production gained a profit of 90 paise in Kodiyeri, 88 in Kottayam and 67 in Eranjoli. The lowest return per rupee was received in Perengathore. The block average was Rs. 0.82.

'Family Labour Income' received by an average grower and the remuneration which accrued to every unit of man day

PROPORTION OF COST OF PRODUCTION AND PROFIT
IN GROSS RETURN



and to avoid frills and wastes for achieving maximum output and profit. Estimation of productivity coefficients through regression equations and derivation of marginal productivities of resources provide information on the transformation of factor services into products and thus give guidance in the reallocation of resources. The factor product relationship has therefore been estimated through regression analysis. Based on the regression coefficients derived from the analysis a production function has been fitted. The function fitted in this study is of the Cobb-Douglas type, which is most widely used in the production function analysis of farm data.

In the production function fitted, Land, Labour and Manures and Fertilizers have been taken as input factors x_1, x_2 and x_3 respectively and the banana fruit produced in each cultivation unit in the sample as product Y.

In the regression analysis land has been expressed in units of cents. Human labour contributed all the motive force required in Nendran production. Hence labour has been recorded in man day units. The kinds of fertilizers and manures used were many and their composition varied. The transformation of the various manures and fertilizers into a common unit was impossible and hence the value of the fertilizers and manures in rupees has been used in computation.

To carry out the regression analysis, the data were converted into logarithmic values and simple correlations between the individual factor inputs and product outputs were first computed. The correlation matrix thus derived is presented in Table 27.

Table 28

Regression Coefficients and test of significance

Particulars	Partial Regression coefficients	Calculated 't' value
Y on x_1 (b_1)	0.37715	5.304
Y on x_2 (b_2)	0.12929	1.972
Y on x_3 (b_3)	0.49424	11.256

All the correlation coefficients in the matrix were found to be statistically significant at one per cent level of probability. As the correlation coefficients were found statistically significant, regression analysis was attempted.

Abbreviated Doolittle method as detailed by Freedman and Foote (1957) has been made use of in solving the normal equations and estimating the partial regression coefficient The regression coefficients derived from the analysis are furnished in Table 28. The partial regression coefficients were also tested for significance. The calculated 't' values for the respective regression coefficients are also presented in Table 28.

The regression of yield on land (x_1) and manure (x_3) were found to be significant at one per cent level of probability while that on labour was not significant. Even the partial regression coefficient of labour is on the verge of significance at 5 per cent level of probability and the calculated value of 't' exceeds the book value of 't' at 10 per cent level of probability.

Employing the partial regression coefficients a multiple regression function of the Cobb-Douglas type, the multiple correlation coefficient 'R' and the coefficient of predictability R^2 were also calculated. The multiple correlation coefficient was found to be highly significant.

Coefficient of Predictability - R^2

The coefficient of determination estimated was 0.9751.

This indicates that 97.5 per cent of the variation in output is accounted for by the factors considered namely, land, labour and manure in Nendran production. The very high value of the coefficient of determination indicates the possibility of having close agreement between the actual values and those predicted using the production function.

The final equation that could be fitted with the partial regression coefficients derived from the analysis is as follows:

$$Y = 1.36924 \quad X_1^{0.37715} \quad X_2^{0.12929} \quad X_3^{0.49424}$$

Standard errors of partial regression coefficients S.E. b_1 .09317 S.E. b_2 .06443 S.E. b_3 .0335

$R = 0.9875$, $R^2 = 0.9751$, Sum of elasticities = 1.00068

$N = 120$

$\bar{Y} = 1236$ (kg of fruit) $\bar{x}_1 = 18.08$ (cents) $\bar{x}_2 = 47.35$ (man day units) $x_3 = 122.4$ (rupees)

Elasticity of Production

The regression coefficients indicate the variation in the dependent variable for unit change in the independent variable or what may be called the elasticities of production. The sum of elasticities of the factors, land, labour and manures, considered in the production function is 1.00068. This indicates constant returns to scale, i.e., a one per cent increase in all the inputs from the level of their means is accompanied by a one per cent increase in production from its mean level.

the closeness between observed and expected values. Another graph is also plotted to show the closeness of fit taking the observed values on 'X' axis and predicted values on y axis.

Marginal Productivity of resources

The most important use of production function is in the estimation of marginal productivity which would serve as a guide line to production decisions. Each marginal product indicates the expected increase in output forthcoming from the use of an additional unit of relevant input, the level of other inputs being unchanged. In general, the marginal productivity of any resource depends on the quantity of it, that is already being used and on the levels of other resources with which it is combined in the production process. For this reason the marginal productivity estimates derived at mean input levels are more accurate.

The marginal productivities of the resources evaluated at respective mean levels of product and factors in this study are given in Table 29.

The opportunity cost mentioned above indicates the market prices of various resources which prevailed during the period of the survey. The market price of the land has been taken as the annual rent on one cent of land. The rate given for the man day unit was the rate of wages paid for the casual labour.

The ratio of marginal value product to opportunity cost, provides a measure of the efficiency of resource use prevailing on the average in the sample studied. If the ratio is less

than one, it indicates that too much of the particular resource is being used under the existing price conditions, given the levels at which other resources are operating. Maximum efficiency in resource use occurs when the revenue from using one additional unit of input is equal to the cost of that additional unit., i.e., when the marginal value product to opportunity cost ratio is equal to unity. Under such conditions entrepreneurial profit will be at a maximum.

Optimum resource use pattern

Out of the resources employed in the production of Nendran in Tellicherry block it appears from the study that the labour input is too much. A reduction in the use of labour, or an increase in the input of other factors of production will result in the economic use of labour.

The use of labour in Nendran production in the area was more probably because the under employed family labour was engaged in excess of requirements. As the enterprise itself is taken up to provide gainfull employment to the underemployed family labour, the great potentiality that exists for enhancing the profitability of the enterprise by employing more of resources as land and manures and fertilizers may be better exploited at the present level of labour input. Accordingly, an estimation has been made to find out the most suitable levels of combinations of land (x_1) and fertilizer and manures (x_3) with the existing level of labour to make the utilisation of labour most efficient and economic. Values at different levels of inputs of land and manures are substituted in succession in the production function

keeping the level of labour input constant and the corresponding expected yield are calculated and examined. Taking the limited possibilities of expanding the area under cultivation, into consideration, the most suitable levels of land and manures and fertilizers with the present mean level of 47.4 man day units of labour input, is found to be about 24 cents of land and Rs. 175 worth of fertilizers and manures.

Comparative efficacy of wood ash and other manures and fertilizers.

It has been pointed out earlier in this Chapter that the Nendran growers are very particular about the application of wood ash to the crop. Out of a total expenditure of Rs. 672 on all kinds of manures and fertilizers per acre in the block area, Rs. 277 or 41.2 per cent represented the cost of wood ash alone. In Peringathore village, an amount as large as Rs. 523 or 66.1 per cent of the total cost of all manures and fertilizers was spent on the application of wood ash. On estimation it is found that the unit cost of nutrients in wood ash is much higher than the unit cost of nutrients in the fertilizers, which would supply the same kind of nutrients. A regression analysis has therefore been taken up to bring out the relative efficacy of wood ash and fertilizers and other manures in production.

In the regression analysis, the cost of wood ash applied in each holding has been taken as one factor (x_1) and the cost of all other manures and fertilizers together as a second factor (x_2) and the value of fruit yield as product (Y). The matrix of single correlation between the factors is presented in Table. 30 .

The correlation coefficient of yield and fertilizer and other manures is 0.5179 and is highly significant, while the correlation coefficient of yield and wood ash is not significant. The correlation coefficients indicate that fertilizers and manures applied to the crop have a definite positive relationship with yield, while no evidence exists on such a relationship between yield and quantity of wood ash applied.

A multiple regression equation of the linear, additive model is constructed for the yield (Y) and the two other factors x_1 and x_2 to assess the yield based on the relative contribution of x_1 and x_2

The model of the equation is:

$y = a + b_1 x_1 + b_2 x_2$, where 'a' is a constant and b_1 and b_2 are the partial regression coefficients of y on x_1 and x_2 respectively. The multiple regression equation fitted to this model is given below:

$Y = 2480.8291 + 0.1668 x_1 + 0.5290 x_2$

S.E. of b_1 = 0.0925, of b_2 = 0.0793

$R = 0.544$ $R^2 = 0.296$

$\bar{Y}$ = Rs. 2736.31 $\bar{X}_1$ = Rs. 289.62 $\bar{X}_2$ = Rs. 391.63

The partial regression coefficient of yield on fertilizers and other manures is highly significant, while the coefficient of yield on wood ash is just significant. This shows that the application of manures and fertilizers other than wood ash exerts a relatively much greater influence in increasing production than the application of wood ash.

DISCUSSION

CHAPTER V

DISCUSSION

Cost of Production

The per acre cost of production of Nendran banana estimated in the previous chapter is found to be very high when compared to the cost of production of other food crops. The production cost per acre of Nendran ranged from Rs. 1360 in Kottayam village to Rs. 1880 in Peringathore with an overall average of Rs. 1598/- for the block area. This revealed that there was an overall intensified level of cultivation in Nendran crop in the area under study.

But the unit cost of production or cost of production per tonne of Nendran was much cheaper than many other food crops. It ranged from a minimum of Rs. 208/- in Kadirur village to a maximum of Rs. 338/- in Peringathore, the block average being Rs. 230/- Even when the per acre cost of production was high, the unit cost of production was cheap because of the high productivity of Nendran crop in comparison to other food crops. An estimate of the cost of production and yield of paddy per acre in the same area shows that the cost of production was Rs. 315 and yield was 675 kg. per acre in one crop. The cost of production per tonne of paddy is therefore Rs. 467/-

Nendran is having not only a comparative advantage in per unit cost of production and in producing increased quantity of more valuable food material, but also in fetching a higher price in the market and larger return to the farmer. Paddy is

having a competing claim over Nendran as both the crops are grown in wetlands. But it pales into insignificance when the productivity and profitability of Nendran are considered against paddy crop. Yet the unit area of Nendran cultivation is extremely small.

The reasons for the smallness of the unit area of cultivation were found to be threefold. The chief amongst them was the difficulty in securing the large working capital required in the cultivation of the crop and the non-availability of easy and cheap credit. Fifty two and a half per cent of the growers could not enlarge the area of Nendran crop due to this reason. The Kuttimakkool Banana cultivators Cooperative Marketing Society has been organised with the object of rendering financial aid to Nendran growers. Though the society has been doing some useful service to the Nendran growers since its inception in August 1960 it could so far touch only a fringe of the problem. On a rough estimate the annual credit requirements of the Nendran growers in the block area was about Rs. 1,50,000. As against this the loans provided by the society during the year 1963-64 was Rs. 18,840. Further the activities of the society are mainly confined to two villages namely Kodiyeri and Kadirur, though the area of operation of the society is the entire block. At present, the State Government has also not hunched any scheme to provide credit facilities to the banana growers. As the majority of the growers are not having any proper security to offer, the possibility of securing credit from banking institutions is also ruled out. If sufficient arrangements are made to provide the growers with their full credit requirements by intensifying and extending the

activities of the Kuttimakkool Banana cultivators' Cooperative Marketing Society and by organising a few more societies in important banana growing villages and also by launching special loan schemes by the State Government there is a possibility of expanding the area and increasing the production of Nendran considerably.

The second factor standing in the way of expanding the area was the inability of the growers to meet the large labour required in irrigating the plants during the summer months. About 26 per cent of the growers investigated were not willing to extend the area under Nendran due to this difficulty. On an average 120 man day units were required for irrigating one acre of the crop and this constituted 48.4 per cent of the total labour requirements of the crop. The present mode of irrigation is pot watering by manual labour, though for this tedious work, electricity and other mechanical power can be advantageously harnessed. At present no individual cultivator can embark upon such a venture. Only a pooled effort launched through a Cooperative institution can help them in this difficulty.

Dr. Otto Schiller in his article entitled "Cooperative Farming Organisations - Some examples in Germany" has pointed out the remarkable achievement of a 'Spray Irrigation Cooperative Society' in the South German province of Baden in rendering valuable service to small tobacco growers whose individual plots were only of the size of 0.12 to 0.25 hectares. An area of 24 hectares in the vicinity of the well from which water for the sprinkler would be drawn was put at the disposal of the irrigation Cooperative.

All works other than irrigation were done individually. The tobacco growers whose crop was in the irrigated area were persuaded to become members of the society. To facilitate irrigation some regulations in the matter of the time of planting, spacing etc., were introduced.

Organisation of this type can render very great service to the banana growers in the Tellicherry block. The rivulet 'Kunduchira' with a vented dam already constructed is a good source of irrigation to the two villages of Kadirur and Kodiyeri. If motor pumpsets are established on the banks of the rivulet and banana plots are connected with pipes, the irrigation of the crop can be carried out very easily and cheaply and thereby the cultivators of these villages can be saved from the odium of this tedious manual labour.

As the water table in the region as a whole is high, in other villages wells fitted up with pumpsets can serve as sources of irrigation and can be arranged through cooperative societies.

The third reason for the unit area being small was the difficulty in getting suitable lands by the Nendran growers. About 28 per cent of the cultivators could not expand the area under Nendran as suitable land was not available. Due to desire of the people to cling on to the land though they may not be able to make the best use of the same a solution to this problem is not easy.

The constituent items which figured in the cost computation were rent for the land, cost of manures and fertilizers, labour

charges, cost of props and seed materials and interest on working capital.

The share of land in the cost of production of Nendran has been estimated in terms of rent payable for the land. Rent was found to be the most suitable medium for costing land in this study because 116 out of 120 cultivators investigated were producing Nendran on rented lands. There was more or less uniform rental rate for temporarily leased lands and also a ready demand for land suitable for Nendran cultivation to be taken on lease in every village. Computation of rent for the remaining four owner operated banana plots, based on opportunity cost is therefore reasonable. However there is found to be a difference in rental rate between permanently leased lands and temporarily leased lands and also between lands leased some years back and recently because demand for land and thereby rental rate increased as years pass by. So the nature of lease was the causative factor for the difference in rate of rent rather than the fertility status of the soil.

The average rate of rent in the block as a whole was Rs. 135.31 or 8.4 per cent of the total cost. The rates of rent were found to be comparatively high in the villages of Pathiriyad, Eruvatty, Kottayam, Dharmadham and Eranjoli. This was because, the increase in the number of temporary lease holders, automatically raised the rate of average rent. In the villages of Pathiriyad, Kottayam and Dharmadham, all the growers investigated, held land on temporary lease. Twenty two out of 23 growers in Eruvatty village and 12 out of 15 in Eranjoli village were also temporary lease holders.

The procedure of costing the land adopted in this study is on the lines of views expressed by Patil (1933) and Shirname (1952).

Nendran banana is a labour intensive crop and the entire work in connection with the production of Nendran is carried out by human labour. On an average 248.1 man day units of labour were used in the production of Nendran on an acre. As already pointed out the single item of work which required by far the largest amount of labour was irrigation. About 120 man days or 48.4 per cent of the total labour requirements of the crop was on account of irrigation alone.

Manuring operations were the second major item in respect of labour requirements. Thirty nine man days or 15.7 per cent of the total labour engaged was required for manuring one acre.

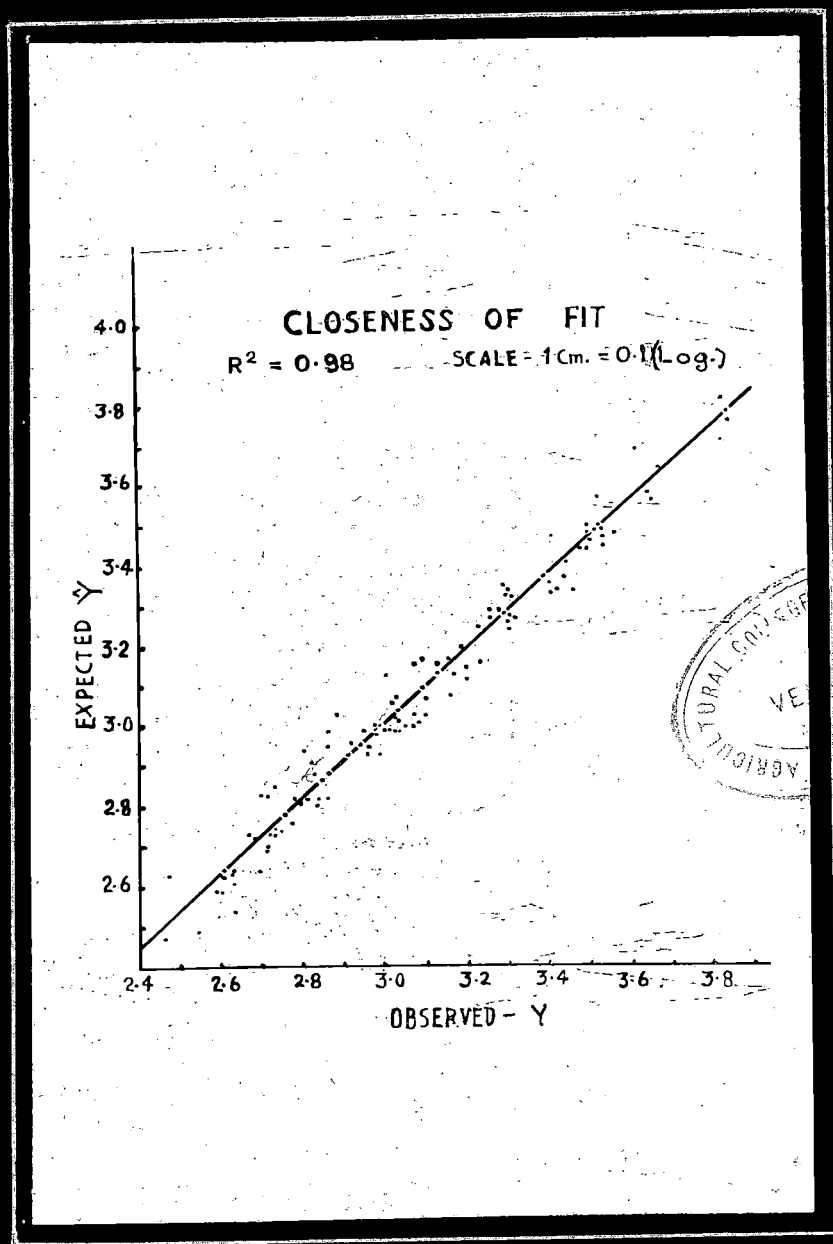
The labour requirements of preparatory cultivation in various villages showed wide variation. It ranged from a minimum of 14.8 man day units in Kodiyeri village to a maximum of 65.4 man days units in Peringathore. The mode of planting, difference in soil texture and the large size of the drainage channels required in some villages accounted for this variation. However, the increase in labour input in preparatory cultivation was not found to correspond with increase in output.

In all operations in Nendran production, the lions' share of labour was contributed by the grower and other members of his family. This was because the purpose of taking up the productions itself was to find full time work to the under employed agricultural labourers and the extent of the area put

Table 30

Correlation matrix

	Y (Yield)	x_1 (Wood ash)	x_2 (Fertilizer other manures)
Y	1.0000	0.1315	0.5179**
x_1		1.0000	= 0.0667
x_2			1.0000


CLOSENESS OF FIT
R^2 = 0·98
SCALE = 1 Cm. = 0·1 (Log.)
EXPECTED Ŷ
OBSERVED - Y
4·0
3·8
3·6
3·4
3·2
3·0
2·8
2·6
2·4
2·6
2·8
3·0
3·2
3·4
3·6
3·8

The partial regression coefficient of a particular factor input shows the elasticity of production due to that input. For example the elasticity of production of manures and fertilizers (x_3), indicates that an increase in the cost of manures at one per cent Ceteris Paribus brings about an increase of 0.49 per cent in the total product. Similarly a one per cent increase in each of land or labour, other factors remaining constant should be expected to produce an increase of 0.38 per cent or 0.13 per cent respectively in the total product. The elasticities of production thus provide the information on 'returns to scale', a most valuable piece of knowledge in the economics of production.

Graphical representation of closeness of fit.

A graph to show the agreement between the actual and predicted values of output (y) has been plotted in the following way.

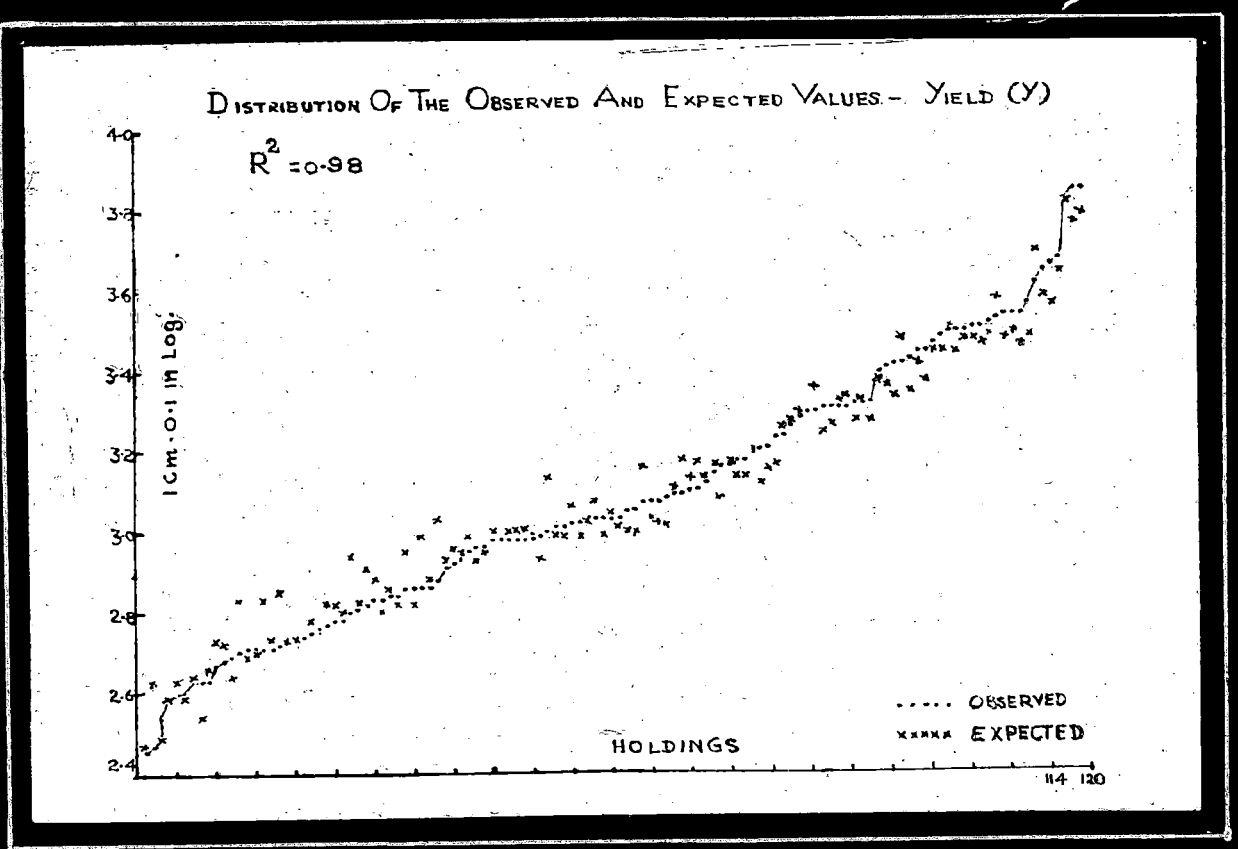
The cultivation units in the sample after arranging them in ascending order according to the quantity of observed yield is taken on the x axis. The measure of yield is taken on y axis. Then points corresponding to the holding number and yield are plotted in the graph. The points thus plotted are connected with a smooth curve.

Making use of the elasticities of production, derived from the regression analysis, the expected product output in each sample unit has been calculated. As done in the case of observed values, the predicted values are also marked against the corresponding holding numbers. The graph shows

Table 29

Marginal Productivity Estimates

Sample Mean	Marginal physical productivity in kg.	Marginal value productivity	Opportunity costs Rs	Ratio of value of marginal product to opportunity cost
$\bar{Y}$ (Nendran fruits in kg.) = 1236	-	-	0.40	-
$\bar{X}_1$ (Land in cents) = 18.08	25.78	10.31	1.75/cent	5.9
$\bar{X}_2$ (Labour in man day units 45.35	3.37	1.35	2.00/man days	0.68
$\bar{X}_3$ (Manures and Fertilizers) 122.4	4.99	1.996	1.00	1.99


DISTRIBUTION OF THE OBSERVED AND EXPECTED VALUES - YIELD (Y)
R^2 =0·98
4·0
3·8
3·6
3·4
3·2
3·0
2·8
2·6
2·4
1 Cm. 0·1 in Log.
..... OBSERVED
xxxxx EXPECTED
HOLDINGS
114 120

under Nendran was generally limited to the excess labour force available in the family. Almost the entire labour required for irrigation was contributed by family labour. In eight villages out of the ten investigated no casual labour was employed for this purpose. On an average in the block area only 1.2 per cent of the labour required for irrigating the Nendran crop was met by engaging casual labour. Eighty five per cent of the labour required for propping 80 per cent required for planting and 62.8 per cent for preparatory cultivation were met by family labour. In villages where the unit area of Nendran cultivation was comparatively large and some of the growers were not actually workers, but were employed as teachers or petty shop keepers the percentage of casual labour employed was found to be comparatively greater. On an average in the block area out of 248.1 man day units required for the production of Nendran in one acre 211.9 man day units or 85.4 per cent was contributed by family labour.

The assessment of the items of work executed by family labour in this study has been done by reckoning the man hours required for such items of work if it were done by casual labour in order to avoid over estimation or under estimation of the work done by family labour. Labourers working on regular or permanent basis are totally absent in the area under study, and in places nearby. Hence the costing of the family labour has been done at rates paid to casual labourers. The error in evaluating family labour at the wage rates of casual labour would have been eliminated by the procedure explained above.

The Indian Council of Agricultural Research in the study conducted during 1933-36 and in the Pilot Enquiry conducted in Akola district during 1952-54 evaluated family labour at the rates paid to casual labour. The Indian Society of Agricultural Economics (1952) also maintained the view that where the employment of permanent labour was not in vogue, family labour may be evaluated at the rate prevalent for casual labour. The average cost of labour in the production of Nendran was estimated to be Rs. 496.4. Labour cost is the second largest item in Nendran production and it amounted to 31.1 per cent of the total cost.

The cost of seed materials required for planting one acre of land on an average was found to be Rs. 70.00. This accounted for 4.4 percent of the total cost of production of Nendran per acre.

The vast majority of the Nendran growers were conscious about the necessity of selecting quality seed materials to get increased yield. The criteria for selecting the seed material were conventional.

No improved strain of seed material has so far been evolved either by selection or by hybridization in the Nendran variety of banana. Thus the only alternative for securing quality seed materials was to select suckers which possessed characters associated with increased yield.

There are two types of suckers in banana. One is the sword sucker. In the early stages, the pseudostem of this type of sucker develops with a pointed tip and puts forth sword

shaped leaves. The second type of sucker is what is termed the broad leaved or water sucker.

The investigation revealed that 103 out of 120 Nendran growers or 85.8 per cent of the total selected sword suckers with medium sized and round shaped rhizomes for planting. The preference of sword suckers to water suckers is in line with the popular belief that sword suckers are capable of giving better yields. Gopalan Nair (1962) observed that the planters throughout the world take care to eliminate broad leaved suckers at the time of planting. He also pointed out that studies made at the Agricultural Research Station, Aduthurai in the Madras State showed that sword suckers of both the monthan and Poovan varieties had flowered and fruited earlier than broad leaved suckers.

There is always a ready market for suckers, as its rhizomes are also used as a food article by poor people apart from its general use as seed materials. The rates prevalent in all the villages were found to be more or less uniform.

The evaluation of the seed material produced in the farm has also been done according to the rate prevalent in the villages. Patil (1933) adopted the same procedure in his studies. Agrawal (1952) observed that in the case of seed, the market price appeared to be more convenient as seed forms only a small percentage of the total produce much of which is either sold or consumed at home. Prevailing market rate was also taken to compute the cost of seed in the Pilot Survey (1953-54).

Manures and Fertilizers occupied the most prominent place in the cost budget of a Nendran grower

Very heavy doses of manures and fertilizers were being applied to the banana crop. The cost of manures and fertilizers applied to one acre of Nendran crop amounted to Rs. 672, on an average in the block area. This seemingly high cost of manuring a crop in one acre, is due to the fact that banana in general is a very heavy feeder. An acre of banana crop removes from the soil, on an average, as estimated in 'A Note Book of Agricultural Facts and Figures (Page 135) 90.71 kg. of nitrogen, 36.3 kg. phosphorus and 362.9 kg. of potash. Though the manuring schedule adopted by the Nendran growers in the Tellicherry block area was not based on any experimental findings, the experiences gained through generations have been able to guide them in manuring almost on the above lines. The nitrogen, phosphorus and potash contents of the manures and fertilizers applied to an acre of Nendran crop on an average in the block area were 63.6 kg., 101.5 kg. and 245 kg. respectively. As the soil in this Coastal part is naturally deficient in phosphorus a marked increase in the phosphorus content of the manures applied is also a necessity.

Very great stress was found to have been laid by the Nendran growers on the application of wood ash, which was the only available source of potash in the villages in the past. Invariably all the growers applied wood ash in large quantities and the cost of wood ash formed the major item of manure cost in Nendran production. As the growers from their long experience believed that the application of wood ash was always

associated with increased production, no other substitute to wood ash it was thought, would be able to produce a good crop of Nendran. Accordingly they were hesistant to substitute wood ash with modern chemical fertilizers like muriate of potash and super phosphate which would have supplied to the crop an equal quantity of the nutrient content of the wood ash at a much cheaper cost. Because of this lure for wood ash amongst the banana growers, the cost of wood ash in the area has been increasing while the quality standard of the stuff available is going down.

On an average the price of wood ash which prevailed during the investigations was Rs. 1/10 kg. If the nutrient content is taken as 5.8 per cent of K_2O and 1.68 per cent of P_2O_5 in the wood ash (A Note book of Agricultural Facts and Figures - p. 129) the same quantity of nutrient can be supplied by 62 paise worth of Muriate of potash and super phosphate. However a realisation of this fact took roots in the minds of only a few enlightened growers. A few cultivators substituted a portion of the wood ash generally applied, by muriate of potash for the crop raised in 1964-65. It was felt during the investigation that even this few were still doubtful about the efficacy of the substitute.

Some growers had a belief that if cattle manure was applied to banana crop the rhizome especially that of the young developing suckers would become diseased. But this belief was not found to have been founded upon facts, as many growers using cattle manure produced healthy suckers in the villages of

Kodiyeri and Kodirur. Non-availability of cattle manure was also another reason for the non application of the same by some growers.

The application of green manure was found to be popular among the banana growers. Some of the growers did not apply green leaf manure, only because the same was not easily available to them. In the early growing periods of banana, a green manure crop can be easily grown as an inter crop and the expenditure on green leaf manure can be saved with the additional advantage of fixing nitrogen in the soil by the green manure plants. But only very few growers had taken up this practice. The reason for this was found to be the general ignorance of the growers about suitable green manure crops and the difficulty of getting seed of such crops namely sunhemp, sesbania, dainche, crotaleria etc., in the case of the few who were willing to raise the crop.

The preparations of compost manure was also not found to have been widely taken up by the growers. Compost manufacture could have been easily taken up by Nendran growers if they realised the benefit that can be derived and also if a piece of suitable land near the Nendran plot was available as a lot of plant residues would be available at the time of the harvest of the crop.

It was surprising and was also a sign of the leaning of the agriculturists towards scientific farming that without any exception all the Nendran growers investigated applied chemical fertilizers to the crop. The difference was only in the quantity

of the fertilizer applied. The use of chemical fertilizers in the production of Nendran was found to be increasing year after year as a result of which the crop was being made increasingly profitable and the mode of cultivation taken nearer to commercial farming from subsistence farming.

Jacob (1952) observed that the intensive application of manures and systematic cultural operations practiced in the case of Nendran crop has got a forcing effect on the Nendran plant to put forth bunches in a shorter period than normally taken by a banana plant.

The costing of manures and fertilizers has been done in this study according to the purchase price prevalent for them in the villages. As a considerable number of growers had to purchase even the indigenous manures from outside there was a ready market rate for all the manures considered above. The full cost of the manures and fertilizers has been apportioned to the crop as the area is subjected to heavy rainfall and in many cases Nendran crop is repeated year after year in the same field. The evaluation and apportionment of cost of manures in this way falls in line with the procedure adopted in the studies conducted by the Indian Council of Agricultural Research and also with the views expressed by Patil (1933), Pande (1952) Shirname (1952) and Agrawal (1960).

Expenditure on propping is a special item of cost in banana production. It accounted for Rs. 223 or 13.9 per cent of the total cost. The bamboos or wooden posts used for propping

lasted for two or three years. So the apportionment of this item of cost to the crop has been done in proportion to the number of years, the props were used in each case.

As the cost involved in Nendran production was large and the period for which the capital was locked up was considerably long, it was found necessary to include interest on working capital as an item of cost. Patil (1933) Singh (1952) and Shirname (1952) had suggested including interest on working capital as an element of cost. As the period in which the total working capital on an average would have been locked up in production wa s found to be roughly six months, interest has been charged for six months on working capital at the rate, charged by cooperative societies for agricultural loans. The interest on working capital amounted to Rs. 56 or 3.4 per cent of the total expenditure.

All the operations connected with Nendran production demand very large investment of short term capital. The per acre cost of production of Nendran, as has already been pointed out, was Rs. 1698 in Tellicherry block area. Even an average grower who was only cultivating an area of 10 cents had to invest a money capital of Rs. 283 apart from contributing family labour. This was too heavy a burden for an ordinary grower who was leading a hand to mouth existence. As a consequence of this they were exposed to the exploitation of usurers. As many as 54 per cent of the growers as seen in the previous chapter, were forced to cut short their manuring schedules and to carry out propping operations etc., too late as they were not able to get their full credit requirements and

this would have definitely resulted in the reduction of yield. Another evil effect of this, was that the peculiar practice of selling the produce very early before the produce was mature, for harvest, incurring heavy loss has become widely prevalent in the area and also has created a class of exploiters called the contractors or Pattakkaran in local language. The difficulty of the growers to transport and dispose of the produce in the market in small quantities also has created a favourable atmosphere for the contractors.

The Kuttiamakkool Banana cultivators' Cooperative Marketing Society was started with the twin object of rendering credit facilities to the growers and arranging for the marketing of their produce without giving a chance to the private merchants and contractors to exploit them. The inadequacy of the credit facilities offered by the society has already been discussed at the beginning of this chapter.

The Society purchased banana fruits valued at Rs. 63502.57 from the cultivators and marketed the same during the year 1962-63. The growers appreciated the benefit of the service rendered by the society as they were able to get a reasonable price for their produce and also as no reduction was made from the amount paid to the growers at the time of the settlement of the account as was done by the contractors. But due to some loss incurred by the society in the transaction and difficulty in getting sufficient funds from the financing banks and also due to the sudden demise of the founder secretary the society could not take up marketing service during the year under study.

The contractors again got an opportunity to have their sway over Nendran producers.

Even during the period when the society took up the marketing of the produce of the members, it could not handle even 10 per cent of the produce in the area. Further the work centred in two villages only namely Kadirur and Kodiyeri. To save the growers from the exploitation of usurers and contractors a few more societies in the important Nendran producing centres should be organised for advancing sufficient credit and for arranging for the marketing of the produce of the growers. The Kuttimakkool Banana Cultivators' Cooperative Marketing Society should also resume the useful work which it had already started.

Production cost and Return:

In some of these villages, there was no relation between the costs incurred in production and returns received. For example, while the cost of production was highest in Peringathore village, it was one of the villages where the lowest income from Nendran production was received. Similar was the case in Chockli village. Though there may be difference in the inherent fertility level of the soil, it was more because of irrigational pattern of resource use. Out of an expenditure of Rs. 702 on manures and fertilizers in Peringathore village, Rs. 523 on was spent on wood ash, whereas the expenditure on fertilizers was merely Rs. 50. In Kodiyeri village where the income received from Nendran production was the maximum, the expenditure on wood ash and fertilizers were Rs. 265 and Rs. 324 respectively In Kadirur village where also the income from Nendran crop was high, the expenditure on fertilizers was Rs. 316. There was n

an average expenditure of Rs. 151 per acre on preparatory cultivation in Peringathore village while the expenditure on the same item in Kodiyeri and Kadirur was Rs. 30/- and Rs. 33 respectively. So the high cost of production in such villages was due to wastage and improper use of factors of production. A more rational use of resources avoiding wastage in such villages may increase efficiency in production.

The maximum net return per acre and also the maximum return on each rupee of production cost, were received in Kadirur village. The net income per acre in this village was Rs. 1606. Every rupee employed in production fetched an additional rupee. The net income from Nendran crop was also comparatively high in the villages of Kodiyeri, Eruvatty, Kottayam and Eranjoli. If the resources used are also examined, it may be seen that comparatively large quantities of fertilizers were used in these villages and the fertilizer cost was almost the same in different villages. It may also be seen that the expenditure on irrigation was also high in Kadirur and Kodiyeri villages. The application of farm yard manure was also found to be more in these villages.

Compared to the expenditure on fertilizers, the amount spent on wood ash was less in the above villages. As already mentioned, the expenditure on preparatory cultivation was also comparatively less in these villages. Increased use of more efficient resources on one side and reduction of wastage on production on the other side would have resulted in increased production and more net income in these villages.

The average net return per acre in the block area was Rs. 1309. Even a grower cultivating an average area of 19 cents was able to get a sizeable profit from Nendran production. In Kadirur village the net income received by an average grower was Rs. 305 while the average for the block as a whole was Rs.249.

The real measure of the benefit gained by the family engaged in the enterprise is the 'Family Labour Income'. Patil (1933) first introduced the concept of 'Farm Income' and 'Family Labour Income' in his studies on farm costing. 'Family Labour Income' is the remuneration received by a family by taking up an enterprise and contributing to it the available labour force in the family. This is calculated by subtracting the production cost both fixed and variable except the cost of family labour from total income. The 'Family Labour Income' gained by an average grower family, from this small enterprise of Nendran production was substantial in Tellicherry Block area. The average 'Family Labour Income' in different villages ranged from Rs. 394 to 200 with an over all average of Rs. 330/- The 'Family Labour Income' in the villages of Kadirur and Kodiyeri amounted to Rs. 394/- and Rs. 369/- respectively. The fact that this high income is received from a subsidiary occupation outside their regular work, indicates the lucrative nature of the enterprise and the desirability of taking it up by many more agricultural labourers in the area.

If the family labour income is considered as the wages received for the total man day units of family labour contributed in the enterprise, the rates of wages accruing to each

man day unit was very high and was far above the normal wage rates existing for casual labour in the area. The rates of wages gained per man day unit of family labour was as high as Rs. 9.23 in Kodiyeri and Rs. 8.85 in Kadirur. The block average was Rs. 8.12.

Resource efficiency in Nendran production:

The Cobb-Douglas model of Production function has been employed in this study to estimate the resource efficiency in Nendran production because it has certain advantages over other types of production functions. Heady and Dillon (1961) observed that of all the possible algebraic forms, Cobb-Douglas function had been the most popular in farm firm analysis because this algebraic form provides a compromise between adequate fit of the data and computational feasibility.

The important advantages of this function as given by Tintner (1964) are two fold. The coefficients of the function are equal to the elasticities of production in respect of the different inputs which is the same as saying b_1, b_2..... b_n are the elasticities of production of the input items x_1, x_2 .....x_n respectively. Secondly the function makes it possible for the principles of deminishing returns to operate within the scale. Heady and Dillon also observed that this function allows either constant, increasing or decreasing marginal productivity.

The Cobb-Douglas's function is linear in logarithm and relatively easier to fit than the other curve linear functions.

Three factors namely Land, Labour, and Manures and Fertilizers and one product namely Nendran fruit figured in the resource productivity analysis. The factors, land and labour and the product have been computed in physical units. Manures and fertilizers have been taken in terms of its' cost in rupees. This procedure is in line with the views expressed by Heady and Dillon (1961). They observed that ideally input and output variables should be measured in physical units of homogenous nature and heterogenous capital forms which have no common physical units may be aggregated to some extent and measured in value terms for computational purposes. In this case as fertilizers and manures used vary in their nutrient contents, and cannot be reduced to a single physical unit, this item of input has been measured in value terms. But grouping the manures and fertilizers into one category also satisfies the condition prescribed by Heady and Dillon, namely "the inputs within an individual category should be as nearly perfect substitutes or perfect complements as possible".

In the production functions fitted the above three input factors were only computed as these appeared to be the predominant contributors to yield. Seed is one of the factors which is normally taken to have decisive influence on agricultural production. But in this study seed has not been considered as an item of resource because the number of suckers planted in each plot was invariably proportional to the area of the plot. Hence it was thought impossible to detect any separate influence of seed rate other than that of the land on production. As no improved strain of seed material has been evolved and used in Nendran

cultivation, variation due to the quality of the seed also does not arise. Heady and Dillon (1961) observed that one of the general rules that should be followed in deciding on the various individual items to be placed in each category is that "relative to each other, the categories of inputs should be neither perfect substitutes nor perfect compliments". Here, though the seed and land are not substitutes, there may not be any perceptible variable influence due to these factors individually as they were used in proportion.

The expenditure on props was another item which figured in the cost computations. This and other minor miscellaneous items like covering of bunches etc., were purely exogenous with regard to the product output in Nendran.

In the regression analysis these assumptions were borne out by facts. The coefficient of determination (R^2) arrived at in the analysis was 0.9751. This denotes that as high as 97.5% of the variation in yield is explained by the input factors, land, labour and manures and fertilizers. The variation of the remaining 2.5% in yield may be attributable to seasonal and other imperceptible factors.

As the value of the coefficient of predictability is very high the agreement between the actual and predicted values would be very close and a reasonable degree of reliance can be placed on the predictability of the equation.

The total elasticities of production of all the input factors considered in the production function is 1.00068. This

indicates constant returns from the enterprise which in other words means that a percentage change in all the input factors will bring about the same percentage change in product output. As Nendran production in the area under discussion is highly profitable at mean levels of input, this finding opens up scope for increasing the inputs, to yield greater profits.

The marginal value productivity of land expressed in cents was Rs. 10.31. This indicates that an increase of one cent of land over mean level would yield Rs. 10.31. The average rental rate of land in the area at present is Rs. 1.75 per cent. This reveals a great scope for expanding the area under cultivation to increase the returns of the individual growers. The marginal value productivity of the manures and fertilizers expressed in rupees at mean level of input was Rs. 1.99. So far every rupee invested to supply manures and fertilizers to the crop, the return is almost double.

But marginal value productivity of labour shows that for every man day unit of labour increased over the mean level, the additional output would only be Rs. 1.35 worth of produce. The present rate of wages of labour being Rs. 2 per man day, addition to every unit of labour would result in a loss of 65 paise.

As all the excess labour force available in the family is absorbed in Nendran production it is likely that there may be excess use of labour than what is actually required. As the lion's share of the labour requirements in Nendran production is contributed by family labour, the excess use of labour indirectly indicate the desirability of increasing the volume of the enterprise by expanding the area under the crop and investing

more capital on manures and fertilizers to make economic use of the family labour and to maximise the 'Family Labour Income".

An estimation made taking into consideration of the limited possibility of getting more land for the expansion of Nendran cultivation shows that 84 cents of land and Rs. 175 worth of fertilizers and manures in an optimum level to which these inputs may be raised from their mean levels to make the most economic use of the family labour. At this level of inputs, the ratio of marginal value product to opportunity cost, with regard to labour is approaching unity which indicated the maximum efficiency in the employment of labour. The ratio of marginal value product to opportunity cost with regard to land and manure and fertilizer are also closer to unity at these levels than they are at mean levels.

Comparative efficacy of wood ash and other manures and fertilizers.

Nendran growers firmly believe in the superior efficacy of wood ash in production though the unit cost of nutrients as already pointed out was not in favour of wood ash in comparison with the unit cost of nutrients in the other manures and fertilizers. A separate regression analysis conducted to bring out the relative merits of wood ash, and other manures and fertilizers, in production, proved that this belief of the growers is baseless.

The multiple regression equation derived from the analysis is presented in the previous chapter.

While the highly significant correlation coefficient of yield and fertilizers and other manures, shows a definite relationship between yield and other manures, the insignificant correlation coefficient of yield and wood ash gives no evidence of the existence of such a relationship between wood ash and yield.

The regression coefficients of yield on fertilizers and other manures, and wood ash being 0.5290 and 0.1668 respectively, also show that the application of manures and fertilizers exerts a relatively much greater influence in increasing production than the application of wood ash.

While the above inferences may be safely made, the multiple regression equation as a prediction formula for yield is not a precise one because in the regression analysis only two of the inputs are considered and the variations in these inputs only cover 30 per cent of the variation in the product. The balance is naturally accounted for by other influences on yield and these influences have already been estimated in the production function of the Cobb-Douglas type fitted.

The coefficient of correlation between wood ash and other manures and fertilizers is a negative one. But it is not statistically significant. However it shows a trend in the reduction of fertilizers and other manures where the quantity of wood ash applied is in large quantities. This would definitely result in poor returns.

It may therefore be pointed out that the emphasis on application of wood ash even at the cost of other manures and

fertilizers lacks scientific sanction. The Nendran cultivators may therefore shift the present emphasis on wood ash to the application of fertilizers and other manures.

SUMMARY AND CONCLUSION

CHAPTER VI

SUMMARY AND CONCLUSION

Nendran production in Malabar is having many special features. Unlike in other parts of the country, this variety of banana is taken up by underemployed agricultural labourers in small strips of temporarily leased lands as a supplementary avocation. Nendran production provides gainful employment to hundreds of them and helps to elevate themselves from the low economic level of their counterparts. A large amount of resources goes into the production of Nendran and it involves a heavy investment of working capital. The utilisation of the resources are generally patterned according to tradition and convention.

The present study is an attempt to throw light on the volume of cost involved in Nendran production, the remuneration received by an average Nendran grower, the pattern of resources use, its productivity and the optimum resource use pattern that would maximise returns.

The study is based on the cultivation of Nendran banana in the year 1963-64 in Tellicherry Community Development Block area. The data required for the purpose were gathered by the survey method of investigation from a ten per cent sample of the banana growing area in the block. One hundred and twenty growers were selected for investigation, employing the stratified one stage random sampling technique with Tellicherry block as the universe and all the villages in the block as strata.

To estimate the factor product relationship and to indicate the productivity of the resources used, a production function of the Cobb-Douglas type has been fitted.

There were 1512 growers engaged in Nendran production in an area of 280.76 acres in Tellicherry block. The average size of the area per grower was 18.57 cents.

The cost involved on an average to produce Nendran crop in one acre of land in the block area was Rs. 1595/- The cost of production of one tonne of banana was Rs. 230. An average grower had to invest a working capital of Rs. 223 apart from contributing his family labour.

Cost of manures and fertilizers was found to be the most expensive item in Nendran production. It accounted for Rs. 672 or 42.1 per cent of the total expenditure per acre. The manures and fertilizers applied to one acre of Nendran crop contained 63.6 kg. of nitrogen, 101.5 kg. of phosphorus and 245 kg. of potash. Considerable stress was often laid by the growers on the application of wood ash and the maximum cost on any single item of manures was incurred on wood ash. But a regression analysis taken up to bring out the relative efficacy of wood ash, and fertilizers and other manures used in production shows that the application of manures and fertilizers other than wood ash exerts relatively a much greater influence in increasing production than the application of wood ash.

All the growers investigated applied fertilizers to their crop and the average cost of fertilizer applied per acre was Rs.261.

Labour was the second largest item of cost in Nendran production. The average labour cost per acre was Rs. 496.4 or 31.3 per cent of the total expenditure. On an average the labour of 237.3 men and 32.9 women or 248.3 man day units of labour went into the production of Nendran in one acre. The most arduous work in Nendran production was the pot watering of the plants during summer months and it required 120.2 man day units or 48.8 per cent of the total labour requirements of the crop. In all operations in Nendran production, family labour was by far the major motive force and 85.4 per cent of the total labour required per acre was contributed by family labour.

The other constituents of cost of production in the order of magnitude were cost of props, rent for the land, cost of seed materials and interest on working capital. The cost incurred on these items were Rs. 169, Rs. 135, Rs. 70 and Rs. 56 respectively or 10.6, 8.4, 4.4 and 3.4 per cents of the total cost.

Due to the heavy investment required in the production of Nendran, 81 per cent of the growers had to largely rely on brrowed capital. The growers were also forced to sell the standing crop before it came to maturity, to meet their financial commitments Consequently they were exposed to the exploitation of usurerd and merchants. Disposal of the standing crop alone entailed a loss of 5.14 per cent of the gross income or 11.4 per acre of the net income and an average grower lost Rs. 28.4 from his net income on this account.

The net return or profit from one acre of Nendran crop on an average in the block area was Rs. 1308. An average grower having a plot of nineteen cents under the crop earned a 'Family labour income' of Rs. 330/- Every man day unit of family labour employed in Nendran production received a remuneration of Rs. 8.12. The return on every rupee invested in the enterprise was Rs. 1.88.

The regression coefficients or the elasticities of production derived from the resource productivity estimate are 0.37715 (b_1) for land expressed in cents, 0.12929 (b_2) for labour expressed in man days units and 0.49424 (b_3) for the cost of manures and fertilizers expressed in rupees. The coefficient of determination (R^2) estimated from the regression coefficients is 0.975 and it shows that 97.5 per cent of the variation in output is accountedfofor by the input factors, land, labour and manures and fertilizers in Nendran production. The sum of all the aforementioned elasticities of production is 1.00068 and this indicates constant returns to scale from the enterprise.

The marginal value productivities of the resources evaluated at their geometric mean levels were Rs. 10.31 per cent of land, Rs. 1.35 per man day unit of labour and Rs. 1.996 for every rupee worth of manures and fertilizers. The rate of rent per cent of land was Rs. 1.75 and wages per man day unit was Rs. 2. At the present level of resource utilization, the labour input appeared to be excessive and addition of every man day unit at the mean level would result

in a loss of 65 paise. Great potentiality therefore existed for enhancing the profitability of the enterprise by employing more of land and manure and fertilizer at the existing level of labour input.

Applicability of the findings of the study

Nendran production as a subsidiary occupation is a very lucrative enterprise and therefore it is desirable that many more under employed agricultural labourers may take it up.

To make the most economic use of the underemployed family labour force available in the family of Nendran growers, the inputs of land and fertilizers and manures may be raised from its present mean levels to 24 cents and Rs. 175 respectively.

The present emphasis laid by the growers on the application of wood ash even at the cost of other manures and fertilizers results in the reduction of efficiency in production. The Nendran cultivators may shift the present emphasis on wood ash to the application of fertilizers and other manures to increase their profit from the enterprise.

Harvesting and marketing of the produce by the growers themselves instead of selling the harvesting right of the bunches early at its very tender stage would result in the enhancement of the net income of an average grower by Rs. 28.4 or 11.4 per cent.

To arrange for the marketing of the produce of the Nendran growers and to provide them with easy and cheap credit in order to exterminate the exploitation of the contractors and usurers, cooperative societies may be organised at important Nendran producing centres. The Kuttimakkool Banana Cultivators' Cooperative Marketing Society should resume the marketing activities which it had once started and also should expand the credit facilities rendered to the growers. The State Government may also launch special loan schemes to lighten the heavy financial burden of the growers.

Attempts may also be made to introduce mechanised irrigation through cooperative efforts which would save the growers from the odium of the tedious manual work for pot watering the plants and would also open up scope for the elargement of the unit area of cultivation.

In the early growing periods of banana, a green manure crop can be grown as an intercrop and the expenditure on green leaf manure can be saved with the additional advantage of fixing nitrogen in the soil by green manure plants.

Compost manufacturing also can be profitably taken up by Nendran growers as a lot of plant residues will be available at the time of the harvest of the crop. This will considerably reduce the cost budget of the Nendran growers.

The State may adopt measures suitable for the expansion of Nendran production. As Nendran is having comparative

advantage in per unit cost of production, in producing increased quantity of more valuable food materials per unit area of cultivation, in fetching higher price in the market and larger return to the grower and also in providing remunerative employment to many underemployed agricultural labourers, any measures taken up for the expansion of production of this unique crop will not be more than what it deserves.

In another context also, the increased production of Nendran assumes great importance. There is a great potentiality for export of banana as the demand from foreign countries is on the increase. Nendran banana endowed with more keeping quality offers good scope as an earner of foreign exchange.

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APPENDIX

Relation of the size of the holding to Productivity.

S.No.	Names of the villages	Yield per cent in size group below 26 cents in kg.	Yield per cent in size group above 25 cents in kg.	Village Total
1.	Kodiyeri	76.15	78.25	154.40
2.	Eruvatty	67.18	68.65	135.83
3.	Kadirur	70.85	79.12	149.97
4.	Eranjoli	64.95	63.43	129.38
5.	Kottayam	60.59	60.23	120.82
6.	Pathiriyad	53.00	53.33	106.33
7.	Menappuram	64.24	66.43	130.67
8.	Peringathore	55.62	(57.20)	(112.82)
9.	Pinarayi	51.48	52.02	103.50
10.	Dharmadham	49.45	(51.62)	(101.07)
	Block Total	614.51		

There was no holdings under size group '25 cents above' in the villages of Peringathore and Dharmadham. Hence for the purpose of conducting analysis of variance the missing values have been calculated using the missing plot technique and the values are given in brackets.

Analysis of variance Table

Source	Degrees of freedom	Sum of squares	Mean square	F
Villages	9	1601.5286	1779.48	
Size groups	1	12.4347	12.4347	2524
Error	7	34.4882	4.9169	
Total	17	1648.4515		