

Original Research Article

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An Investment Pattern in Banana Plantations of Tamil Nadu

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ABSTRACT

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The study was aiming to address the economic incentives that are associated with cultivation of different varieties of Banana in Central Tamil Nadu because the farmers in the Cauvery Belt are practicing the traditional method of Banana cultivation instead of precision approaches. In this circumstance, a study has been initiated to address the reasons behind it as well as assessing the type of costs involved and the returns realized per unit of land. From this study, one could understand that the Nendran and Yelakki varieties of Banana are able to fetch considerable revenue than the other varieties. Efficiency measures indicated that Rasthali variety is also equally contributive but its genetic potential were not utilized by applying appropriate technologies.

Introduction

Banana is the vast produced and maximum consumed amongst the fruits cultivated in India. The area under Banana is reflecting an increasing trend which was raised to 8.46 lakh ha during 2015 – 16 from 6.58 lakh ha during the year 2007-08 registering a 29 per cent increase in the area. Such increase is invisible in respect of annual crops other than Banana. The area and production of Banana over years had given a marginally increasing signal to the nation (NHB, 2018). India ranks first amongst the Banana cultivating countries of

the world with an annual production of 297 lakh tonnes during 2013-14 which decreased to the level of 291 lakh tonnes during the year 2015-16. The reason for sliding from 297 lakh tonnes to 291 lakh tonnes need to be examined and appropriate strategies have to be implemented to enhance the production and productivity of Banana. The present production of Banana in the country however, is highly inadequate. It is appraised that, the present annual per capita consumption of Banana in India is 50 kg which is very low when compared with other progressive Banana growing countries such as Jamaica,

Congo, Ecuador and Uganda. Thus, there is a vast opportunity of increasing Banana production in the country to meet the needs of ever increasing population.

When comparing the production data in respect of Banana over a decade of time, it showed a fluctuation trend from 238 lakh tonnes during 2007-08 and 291 lakh tonnes during the year 2015-16. In the middle of the years, the production of Banana even has touched to the level of 298 lakh tonnes. In the meantime, production of Banana faced lots of ups and downs due to variation in productivity which is hovering between 34 tonnes to 37 tonnes per ha. It might be due to erratic weather and rainfall. But the data revealed that the 2016-17 is being the normal year and there was no much damage. Low realization of productivity might be due to the lack of precision approaches in realizing the higher productivity. For that the awareness creation exercise by the Department of Horticulture and Plantation Crops should take an appreciable effort to scale up the precision farming practices in Banana. On doing the planned action of promotion of Precision Farming, the productivity would touch a new height and pave way for the higher export earnings from Banana and its produce.

However, the productivity of Banana showed a mixed trend over years revealed that the precision technologies applicable to Banana is not at all practiced positively. If the precision technology was adopted in a phased manner, the production and productivity of Banana would have touched a new peak due to sustained efforts. Another issue is investment cost. Though the details on cost of production and cost of cultivation of Banana is known to the farmers through their sustained cultivation practices, a comparative picture on different varieties and its cost and return realization are dismal to the farming lots and hence an effort has been taken to appraise the costs and returns realizable in different varieties of

Banana cultivated in Tamil Nadu.

Materials and Methods

Design of the study

In Tamil Nadu Banana cultivation is widely practiced because of its commercial importance and consumer acceptance. The farmers of different regions were cultivating Banana based on their experience gained over generations. However, in Central Tamil Nadu, though the resources are much conducive, their way of practicing Banana farming is little traditional and hence special effort has been taken to identify the Banana farmers and their cultivation practices and an economic appraisal was made for different varietal cultivation of Banana.

Selection of the study area

The area under Banana in Tiruchirappalli District is arrived at 7002 ha. When one could compare the area under Banana in the state of Tamil Nadu, Trichy is in fifth place and Erode District is in the first place with 12335 ha. When one could compare the productivity of Banana, Coimbatore District is in the first place with 42.49 Tonnes per ha followed by 42.31 Tonnes per ha with Erode District. Tiruchirappalli District is in the Third place in productivity revealed that there exists potential to expand the area and yield of Banana in Trichy district. However, Trichy district is augmented with different varieties of Banana because of suitability of soil and climate. The varieties cultivated in Tiruchirappalli District are Sakkai, Poovan, Ney Poovan, Red Banana, Rasthali, Monthan, Karpuravalli, Peyan, Yelakki, Nendran and Grand Naine are cultivated widely in this district and have to assess the reasons for being in the fifth place in respect of area under banana, reasons for the preference of farmers to raise different varieties in their farm lands for cultivation and to explore the

possibilities of enhancing the productivity of Banana in Tiruchirappalli District. The Productivity of Banana is only 39 tonnes per ha in Tiruchirappalli District. Whereas, Theni and Cuddalore Districts outperformed other districts and other states in terms of Productivity of Banana and in possession of 64 tonnes and 59 tonnes respectively. In this context, assessing the reasons for low productivity too is much important to the researcher.

Sampling procedure

Tiruchirappalli district was once popular in area and production of Banana in Tamil Nadu and stood at the first place have been eroded in area and production of Banana during recent years and stood in fifth place in terms of area under Banana. Considering the potentials available in the district, the Indian Council of Agricultural Research, New Delhi has also established a National Research Centre for Banana in Tiruchirappalli due to the favorable soil, climate and other factors for conducting Banana Research. On the other side, the banana production and productivity was low in Tamil Nadu state, it might be due to some pressing problems in cultivation of Banana and in this circumstance it is important to the researcher to analyze the reasons for the reduction in area, production and productivity and hence Tiruchirappalli district was purposively chosen in the first stage. Tiruchirappalli district consists of fourteen blocks with 507 revenue villages. Among the 14 blocks available in Tiruchirappalli District, the blocks like Lalgudi, Anthanallur and Thottiyam occupied with 75 per cent of total Banana area available in Tiruchirappalli District and hence these three blocks were purposively chosen in the second stage.

Among the three blocks, five villages from each block were selected at random. Totally

15 villages with 300 farmers were selected as sample size for the study through multi stage random sampling technique. They were interviewed for generating primary data through a structured and pretested questionnaire designed for that purpose.

Period of study

The period of study was restricted to the agricultural year 2017-2018 (Normal Year) with normal rainfall, which is sufficient for undertaking the purpose and an in-depth study.

The field enquiry was conducted from the month of May to November 2018 to collect the data requirement of the study. The data presented are related to the agricultural year of 2017.

Design of interview schedule

A reconnaissance survey was undertaken before shaping the research problem and the researcher met the farm households in person, officials of Department of Agriculture, Department of Horticulture and Plantation Crops, Department of Economics and Statistics, Tahsildars and other revenue officials such as Revenue Inspectors and Village Administrative Officers to have a holistic view about the agricultural production scenario especially the Banana cultivation in the study area and to ensure the availability of consistent, relevant, accurate and adequate data for the study. Additional information gathered and personal observations made during the preliminary survey formed the basis for developing hypotheses.

Based on the preliminary survey, the interview schedule was prepared in consultation with the experts in the field of agricultural economics of Tamil Nadu Agricultural University, Coimbatore. The

interview schedules thus prepared were pre-tested to evaluate its field applicability with some selected respondents and the questionnaire has been revised and the final edition of the questionnaire was prepared and multiple copies were made to perform the inquiry with the sample respondents.

Method of inquiry

The selected farm households have been personally contacted and the required primary data were collected through interview method by administering the pre tested interview schedules.

The objectives and importance of the study were explained to the respondents briefly to solicit their co-operation. Supervision has been taken to record the quality data by administering the questions repeatedly if the researcher feels inconsistency in getting the answers.

Tools of analysis

Conventional analysis

Simple average and percentage analysis were used to study the farm oriented variables such as size of operational holdings, irrigation sources, cropping pattern, inputs used, cost of cultivation, costs and returns involved in Banana, yield of different varieties of Banana, Price of output, farm income, crop loans disbursed and the resource availability in the farms.

Co-efficient of variation

Co-efficient of variation of the selected variables such as crop expenses, crop income, yield of crops, value of assets and resource endowments were worked out to study the variations in the above said variables in the farms across scale of farming (Table 1).

Cost concepts

The technique of tabular presentation was used to assess the cost, returns and profits of crops in the study area. The percentages and averages of variable costs and fixed costs were computed based on the methodology followed by the Commission on Agricultural Costs and Prices (CACP).

All the cost concepts used in farm management studies viz., Cost A₁, Cost A₂, Cost B₁, Cost B₂, Cost C₁, Cost C₂ and Cost C₃ were used in the present study. The details of cost concepts adopted in this study are furnished as follows:

Cost A₁ – It includes the following Costs

Value of Human Labour
Value of Machine Labour
Value of Manures and Fertilizers
Cost of Seeds
Plant Protection Chemicals
Irrigation Charges
Land Revenue, Cess and other taxes
Depreciation Charges on farm implements, machinery, buildings, irrigation structures
Interest on Working Capital and Miscellaneous Expenses

Cost A₂: Cost A₁ plus Rent paid for leased land.

Cost B₁: Cost A₂ plus Interest on fixed capital (excluding land).

Cost B₂: Cost B₁ plus Rental value of owned land.

Cost C₁: Cost B₁ plus Imputed value of family labour.

Cost C₂: Cost B₂ plus Imputed value of family labour.

Cost C₃: Cost C₂ plus 10% of Cost C₂ to account for managerial input of the farmer.

Cost of Production: The cost of cultivation was worked out by using following formula:

$$\text{Cost of production per tonne} = \frac{\text{Cost of Cultivation (Cost C}_3\text{) per ha}}{\text{Quantity of Output Realized per ha}}$$

Similar methodology was practiced by Ramakrishna *et al.*, during 2017 and Agarwal *et al.*, during 2018 by using Cost C₃ as cost of cultivation. However, in this study, the author has used Cost C₂ to assess the total cost of cultivation.

Income measures: Following income measures were calculated.

Gross Income (GI): It is calculated by using the following formula.

$$GI = (Q_m \times P_m)$$

Where,

GI = Gross Income

Q_m = Quantity of Main Product in Kgs

P_m = Price of Main Product per Kg

Returns over Variable Cost (RVC)

$$RVC = \text{Gross Income} - \text{Cost A}_1$$

Farm Business Income (FBI)

FBI = Gross Income – Cost A₂ Similar approach was also practiced by Agarwal *et al* (2018)

Family Labour Income (FLI) or Returns to Family Labour

$$FLI = \text{Gross Income} - \text{Cost B}_2$$

Net Income (NI)

$$NI = \text{Gross Income} - \text{Cost C}_2$$

Returns to Management (RM)

$$RM = \text{Gross Income} - \text{Cost C}_3$$

Returns per Rupee (RPR)

$$RPR = \frac{\text{Gross Income per Ha}}{\text{Cost C}_2 \text{ per Ha}}$$

Similar Farm Efficiency Measures were also practiced by Ramakrishna *et al.*, during 2017. Besides these, one would be interested in assessing the productivity turned to the usage of Labour and Fertilizer used as the main input becomes important.

Labour productivity

Labour productivity measures the amount of product and services manufactured by one hour of labour. It was calculated by using the following formula:

$$\text{Labour Productivity} = \text{Yield (Kgs)} / \text{Amount of Human Laborers Used (Man Days)}$$

Fertilizer productivity

Fertilizer productivity measures the amount of goods and services produced by one unit of fertilizer. It was calculated by using the following formula:

$$\text{Fertilizer Productivity} = \text{Yield (Kgs)} / \text{Amount of Fertilizers used (Kgs.)}$$

With this background information of the methodological approach, the data were analyzed and the results are appropriately interpreted and discussed in the results section.

Results and Discussion

Economic appraisal of different varieties of Banana are assessed on the following lines. They are

Costs Incurred and Returns Realized from Different Varieties of Banana

Type of Costs Involved in Establishment of Banana Plantations

Efficiency Measures of Banana Farms

Costs incurred and returns realized from Yelakki variety of banana

Yelakki variety of Banana is small to medium sized tasty fruit capable of providing moderate yield. It is a hard variety and it performs well even in complete shade suited for planting in coconut gardens as intercrop. The pulp of the fruit is so tasty and appears in light orange yellow color.

The plant resembles that of Red Banana with red colored pseudo stem. It is capable of tolerating leaf spot and widely cultivated in Tiruchirappalli District. The fruit is much attractive one to the consumers because of its rich taste and a mild aroma. The costs and returns realized from Yelakki variety of Banana is analyzed and the results are presented in Table 2.

Table 2 revealed that the total cost of cultivating the Yelakki variety of Banana was arrived at Rs 4.07 Lakhs. Among the total costs, the material input required for establishment of Yelakki variety of Banana was accounted for 28.51 per cent to the total costs. The total variable cost consumed by the Yelakki variety of Banana plantation per ha accounted for around 50 per cent of the total costs. From that one could infer that the Banana plantation is capable of consuming higher cost for its establishment. The small farmers may find many difficulties in

investment on commercial plantations like Banana.

The Gross Return realized from the Yelakki variety of Banana Plantation is arrived at Rs 6.93 lakhs and on deducting the Cost C₂, the net return was arrived at Rs. 2.67 lakhs. The yield of Yelakki variety of Banana per ha was arrived at 31487 kgs or 31.50 tonnes per ha. When compared to the yield of other varieties, Yelakki is capable of providing lesser yield but attracts considerable price per kg of Yelakki variety of Banana in the open market.

The cost of production of One Kg of Yelakki variety of Banana was arrived at Rs. 13.52 and it is capable of fetching an attractive price of Rs 22 per kg of Yelakki variety and hence the farmer could generate a net return of Rupees 8.50 per Kg of Banana. Output is referred to as gross return realized per ha and input is the cost that was arrived in Cost C₂. When one could examine the Output-Input Ratio, it was arrived at 1.63 revealed that the Yelakki variety of Banana could generate Rs. 1.63 for one rupee of investment. Though the market demand is almost stable for this variety, a group approach to marketing by establishing a Farmer Producer Company is warranted to have collective bargaining of Price per unit of Yelakki variety of Banana.

Since Tiruchirappalli farmers are not facing any constraint related to the water input while their counterparts in other districts were much demanding for the water input, the farmers were reluctant to change their traditional way of harnessing certain inputs to get the yield of Banana and hence the Department of Horticulture and Agriculture should pay much attention on Changing the attitude of the farmers by approaching some management institutions on giving a psychological aspects of change management so that they will be willingly take up the modern practices of

managing the commercial plantations in their soils.

Costs Incurred and Returns Realized from Nendran Variety of Banana

Nendran Variety of Banana is widely distributed in all Banana growing areas of Kerala, Karnataka and Tamil Nadu including Pondicherry. It is a fairly tall and robust plant weighing a bunch of 18 to 21 Kgs. The fruits are very bold, knobbed and pale green in Colour. It is widely used for Chips making in Kerala, Karnataka and Tamil Nadu and the Chips are exclusively fried in Coconut oil adds taste to the taste buds of the human and hence it has attractive market in all southern states. The Chips are drawn from partially ripen fruits and fully ripen fruits which have different taste while adding value in the coconut oil. Apart from its culinary uses, pith is highly relished as a vegetable with lot of medicinal properties and hence it has great demand. Because of great demand, the farmers in Tiruchirappalli has also started cultivating the fruits in their holdings. In the sample farms, the Nendran variety of Banana has occupied an area of 85 ha and hence the costs and returns are analyzed separately and the results are presented in Table 3.

Table 3 revealed that the total cost of cultivating the Nendran variety of Banana was arrived at Rs 4.16 Lakhs. Among the total costs, the material input required for establishment of Nendran variety of Banana was accounted for 28 per cent to the total costs. The total variable cost consumed by the Nendran variety of Banana plantation per ha is accounted for around 79 per cent of the total costs. From that one could infer that the Banana plantation is capable of consuming higher cost for its establishment. When compared to the total cost incurred in respect of Yelakki variety, Nendran is capable of consuming lesser cost and hence the semi-

medium, medium and large category of farms can take up this venture.

The Gross Return realized from the Nendran variety of Banana Plantation was arrived at Rs 7.69 lakhs and on deducting the Cost C2 incurred in cultivation, the net return was arrived at Rs. 3.30 lakhs which is marginally high when compared to the net return obtained from Yelakki variety of Banana. The yield of Nendran variety of Banana per ha was arrived at 28487 kgs or 28.49 tonnes per ha. When compared to the yield of other varieties, Nendran is capable of providing lesser yield but attracts considerable price per kg of Nendran Banana in the open market. The cost of production of One Kg of Nendran variety of Banana was arrived at Rs. 15.42 and it is capable of fetching an attractive price of Rs 27 per kg of Nendran which is marginally high when compared to the price of Yelakki variety and hence the farmer could generate a net return of Rupees 12 per Kg of Banana. Though the market demand is almost stable for this variety, a group approach to marketing by establishing a Farmer Producer Company can be thought off to have collective bargaining of Price per unit of Nendran variety of Banana.

When compared to the costs and returns realized in respect of Nendran with that of Yelakki, there were only marginal difference and these two varieties were almost having a steady market demand and capable of fetching higher price per unit.

Costs incurred and returns realized from Poovan variety of banana

Poovan variety of Banana is an important commercial variety of Tamil Nadu produced year round in large quantities. Plants grow tall and vigorous during its vegetative stage. The Bunch of Poovan variety are large and weighs up to 25 kgs. It may contain up to 20 fingers.

A total of 200 or more fruits per bunch is normally visible. The fruits are medium in size, cylindrical, pronounced nipple will be there. The skin of the fruits are so thin, bright yellow in color and peels off easily. The pulp of the fruit is soft, juicy, acid-sweet taste and good flavor when it ripened. The duration of the crop is ranging between 11 to 14 months. It is highly susceptible to Banana Mosaic Virus and Banana Streak Virus which causes reduction in the yield. However, the area under Poovan variety of Banana is considerably higher when compared to all other varieties. It was cultivated in an area of 186 ha in the sample farms. In this context, the costs incurred and the return realized details are analyzed and the results are presented in Table 4.

Table 4 revealed that the total cost of cultivating the Poovan variety of Banana was arrived at Rs 3.55 Lakhs. Among the total costs, the material input required for establishment of Poovan variety of Banana was accounted for 27 per cent to the total costs. The total variable cost consumed by the Poovan variety of Banana plantation per ha is accounted for around 75 per cent of the total costs. From that one could infer that the Banana plantation is capable of consuming higher cost for its establishment. When compared to the total cost incurred in respect of Yelakki and Nendran varieties, Poovan is capable of consuming lesser cost and hence the semi-medium, medium and large category of farms can take up this venture.

The Gross Return realized from the Poovan variety of Banana Plantation was arrived at Rs 4.86 lakhs and on deducting the Cost C2 incurred in cultivation, the net return was arrived at Rs. 1.63 lakhs which is comparatively low when compared to the net return obtained from Yelakki and Nendran varieties of Banana. The yield of Poovan variety of Banana per ha was arrived at 29487

kgs or 29.48 tonnes per ha. When compared to the yield of other varieties, Poovan is capable of providing better yield next to Yelakki variety but attracts low market price per kg of Poovan Banana in the open market. The cost of production of One Kg of Poovan variety of Banana was arrived at Rs. 11 and it is capable of fetching low procurement price which is arrived at Rs 16.50 per kg of Poovan which is very low when compared to the price of Yelakki and Nendran varieties and hence the farmer could generate a net return of Rupees 5.50 per Kg of Banana. Though the market demand is uncertain and fluctuating for this variety, a value addition could be thought off after establishing the farmer producer companies.

When compared to the costs and returns realized in respect of Poovan with that of Yelakki and Nendran, there are very low returns from Poovan variety. But the area under this variety is found to be considerably high and the variety is being preferred by the traders and farmers because of Banana leaves and for fruit purpose and hence Poovan variety may be given best possible value addition so as to enhance its market potential and make the market steady for the Poovan variety of Banana. According to Nandini (2017), Poovan variety is enriched with the highest amount of protein which is arrived at 1.37 grams per one hundred gram of fruit and was significantly different from other varieties and hence the consumption of Poovan should be encouraged among the children and hence it has positive attribute to cultivate in higher area.

Costs incurred and returns realized from Rasthali variety of banana

Rasthali is the most preferred variety among the traders and the consumers because of sweetness. It is a delicious variety grown mostly in Erode and Tiruchirappalli Districts

of Tamil Nadu. Poovan variety commands tall suckers which is yellowish green with brownish blotches, reddish margins of petiole and leaf sheath. The harvested bunch of Rasthali weighs between 15 to 20 Kgs in which the number of hands will be of 8 to 16 and the number of fruits per bunch will be around 60 to 80 fruits. The fruits are medium sized, cylindrical to spindle shaped, weak pedicel, thin skin and peels easily. The colour of the fruit is ivory yellow and produces pleasant aroma. The demerits of the variety is it is susceptible to Panama wilt, formation of hard lump in pulp and easy dropping of fruits from the bunch when it fully ripens. The duration of the crop will be ranging between 14 to 15 months. Rasthali is the variety cultivated in very small area. In the sample farms, it is cultivated only around 50 ha. In this context, it is important to document the costs incurred and the returns realized details and hence these results are presented in Table 5.

Table 5 revealed that the total cost of cultivating the Rasthali variety of Banana was arrived at Rs 4.01 Lakhs. Among the total costs, the material input required for establishment of Rasthali variety of Banana was accounted for 28 per cent to the total costs. In terms of absolute figures, Material cost for Rasthali found to be marginally higher than the Poovan variety. The total variable cost consumed by the Rasthali variety of Banana plantation per ha is accounted for around 76.19 per cent of the total costs. From that one could infer that the Banana plantation is capable of consuming higher cost for its establishment. When compared to the total cost incurred in respect of Yelakki, Nendran and Poovan varieties, Rasthali is capable of consuming higher cost than the Poovan variety and hence the semi-medium, medium and large category of farms can take up this venture.

The Gross Return realized from the Rasthali variety of Banana Plantation was arrived at Rs 5.90 lakhs and on deducting the Cost A2 incurred in cultivation, the net return was arrived at Rs. 1.37 lakhs which is comparatively higher when compared to the net return obtained from Poovan variety of Banana. The yield of Rasthali variety of Banana per ha was arrived at 32787 kgs or 32.79 tonnes per ha. When compared to the yield of other varieties, Rasthali is capable of providing better yield but attracts optimum market price per kg of Rasthali Banana in the open market. The cost of production of One Kg of Rasthali variety of Banana was arrived at Rs. 13.83 and it is capable of fetching low procurement price which is arrived at Rs 18 per kg of Rasthali which is comparatively higher when compared to the price of Poovan variety and hence the farmer could generate a net return of Rupees 4 per Kg of Banana. The low price prevailed for Rasthali variety was mainly due to withering of fruits from its fingers immediately after ripening and hence consumer acceptance in that case becomes poor and hence the share in the retail price is poor to the farmers. Though the market demand is stable for this variety, higher support price could be realized on establishing the farmer producer companies.

When compared to the costs and returns realized in respect of Rasthali with that of Yelakki, Nendran and Poovan, there are considerable returns from Poovan variety. But the area under this variety is found to be much low and the variety is being preferred by the traders and farmers because of its taste and aroma and hence Rasthali variety may be given a special emphasis so as to enhance its area under this variety and make the market steady for the Rasthali variety of Banana.

To sum up, among the varieties, Yelakki and Nendran are found to be the sweetest varieties which are capable of providing higher yield

and net return over the total cost. Poovan is the variety which is capable of yielding more, its market price is very low and hence value addition possibilities could be thought off besides promoting the Poovan for its better nutritional value among the Children's diet.

Types of costs incurred in different varieties of banana cultivation

According to Commission on Agricultural Costs and Prices in Government of India, the Cost categories are classified as Cost A₁, Cost A₂, Cost B₁, Cost B₂, Cost C₁, Cost C₂ and Cost C₃. How these costs are arrived and spread between different varieties of Banana are an important question and hence these details are analyzed and the results are presented in Table 6.

Table 6 revealed the status of cost involvement in establishing Banana plantation in one ha of land. When one could examine the Cost A₁, it is too low in respect of Poovan variety which is arrived at 2.68 lakhs. Highest Cost A₁ was incurred in respect of Nendran variety of Banana. The average of Cost A₁ incurred in all the varieties is arrived at Rs. 3.05 lakhs. Similar cost involvement is also reported by Ramakrishna *et al.*, during 2017.

When one could examine the Cost A₂, it has also become the lowest in respect of Poovan variety which stood at Rs 2.68lakhs. The highest Cost A₂ was incurred in respect of Nendran variety of Banana. Similar results are obtained in respect of Cost B₁, Cost B₂, Cost C₁, Cost C₂ and Cost C₃.

All these costs are comparatively low in respect of Poovan variety when compared to all other varieties followed by Rasthali and Nendran varieties which are commanding the highest cost among all the varieties of Banana. From that one could infer that the establishment of Nendran and Rasthali

varieties commands higher cost and the Poovan variety is capable of consuming the lowest cost.

Efficiency measures in banana farms

A measuring stick is necessary to provide guides and standard for appraising accuracy of decisions regarding the use of resources available in the farm. One method of production is said to be more efficient than the other when it yields greater valuable output per unit of valuable input. From an economic perspective, efficiency is desirable. Efficiency can be related to the operation of farm business as a whole, any individual phase of the business, line of production, the use of various factors of production in the farm or any single input and its contribution to the output like fertilizer or labour and or both.

Various efficiency measures, therefore, need to be developed to express technical efficiency in various farm business and to relate these to the financial success. One such measures are analyzed and the results are presented in Table 7.

Table 7 revealed that the gross return realizable in per ha plantation of Banana is in favour of Nendran, Yelakki and Rasthali varieties as these varieties are capable of fetching 7.69 lakhs, 6.93 lakhs and 5.90 lakhs respectively. The Poovan variety is able to generate only around 4.87 lakhs as its Gross return. The low return from Poovan variety when compared to their counterparts is mainly because of low procurement price from the farmers and in the market, it commands less price and preference over other varieties.

The Return over Variable Cost (RVC) is favourable in respect of Nendran variety followed by Yelakki variety of Banana which

are respectively able to generate Rs. 4.41 lakhs and 3.74 lakhs. The Return over Variable Cost is very low in respect of Poovan variety of Banana. However, the average variable cost is arrived at Rs. 3.30

lakhs which is a considerable income to the farmers. But the sample farm households should think of alternative variety like Yelakki or Nendran or Rasthali in the place of Poovan variety for generating higher income.

Table.1 Measurement of variables

Name of the Variables	Measurement of Variables
Seedlings or Suckers	Commercial farmers have obtained the Suckers / Corms / Tissue culture plantlets at local or distant place based on the prevailing market price. The actual price paid by the farmers per unit was used.
Human Labour	The total number of male and female laborers used are measured in terms of number of man days. The labour cost of family labour and hired labour was converted to common physical unit (1 Man days = 6 working hours). The family labour was considered separately and added to the hired labour to calculate the total labour requirement.
Machineries	The total machineries used was measured in terms of machine hours and the price paid per machine hour was taken into account.
Organic Manures and Inorganic Fertilizers	The data of farm yard manure produced at farm level or neighbor farms were valued at prevailing market price in kgs and chemical fertilizers of N, P, K were valued at actual procurement price paid by the farmers per kg of fertilizers
Weeding and Spraying	The total number of laborers needed per weeding and the labour value was measured in terms of Man days and spraying were measured in terms of number of spray multiplied by cost involved per spray.
Interest on Working Capital	Components included in the working capital were cost of human labour, manures, fertilizers, and weeding. Interest on working capital was computed at the rate of seven per cent per annum, which was charged by commercial bank for short-term loans.
Interest on Fixed Capital	Interest on fixed capital was computed at twelve per cent, which is the interest charged for investment loans sanctioned by commercial banks in the study area.
Rental Value of Owned Land	It refers to the part of payment made by a tenant for the use of land per annum. The contribution of land towards the crop enterprise was accounted for based on the rental value of land prevalent in the area.
Land Revenue	Land revenue was taken at the rates levied by the government. Land revenue paid by the farmers during the current year was considered for this study.
Yield	The total yield of Banana bunches obtained by the farmers was expressed in terms of tonnes per ha.
Gross Return	The gross returns per ha was calculated based on what the sample farmers actually realized as yield multiplied by the market price per unit of the produce.
Net Returns	The net return was calculated by subtracting gross returns from the Cost C2.
Depreciation	Depreciation of farm buildings can be financed to the independent venture in percentage to the total area under an enterprise in case the building is used for different enterprises. However, if the building was used for single enterprise, the entire depreciation was charged to that particular enterprise As in case of farm buildings, the depreciation or minor repairs can be charged to individual enterprise in proportion to the area under a given enterprise. Possibly, time consumed on separate venture by a given machine / tool and implements formed the basis for charging depreciation.

Table.2 Costs and returns in cultivation of Yelakki variety of banana

Sl. No	Particulars of Cost	Inputs / ha	Amount in Rs / ha	Percentage to Total
A	Material Cost			
01	Number of Suckers	2415	20528	05.05
02	Farm Yard Manure in Kgs	7016	9472	02.33
03	Quantity of Weedicide (Litres)	04.87	1460	00.36
04	Sucker Treatment	21.54	1793	00.44
05	Quantity of Pesticide in Litres	01.79	1978	00.49
06	Number of Casuarina Pole for Propping (Life of Poles will be for 5 years – Cost per Annum)	2419	25230	06.20
07	Quantum of Micronutrient (Kgs)	391.05	6890	01.69
08	Quantum of Nitrogen (Kgs)	715.23	6888	01.69
09	Quantum of Phosphorous in Kgs	658.25	13079	03.22
10	Quantum of Potassium in Kgs	1365.28	21845	05.37
11	Quantum of Bio-fertilizers in Kgs	36.52	530	00.13
12	Miscellaneous Inputs	87	6273	01.54
	Sub Total (A)		115964	28.51
B	Operational Cost			
13	Land Preparation - Machine Hours	09.18	7344	01.81
14	Formation of Bunds – Men Labour	47.57	18969	04.66
15	Drenching – Men Labour	54.13	23010	05.66
16	Planting of Suckers – Men Labour	28.16	8758	02.15
17	Planting of Suckers – Women	11.69	1528	00.38
18	Application of Fertilizers - Women	09	1964	00.48
19	First Application	11.56	2265	00.56
20	Second Application	12.65	2459	00.60
21	Third Application	12.89	2529	00.62
22	De-suckering – Men Labour	18.24	7263	01.79
23	Drenching – Men Labour	41.65	15734	03.87
24	Irrigation – Men Labour	17.36	6946	01.71
25	Weeding Men + Women Labour	06.19	1351	00.33
26	Weedicide Application – Men Labour	64.23	25692	06.32
27	Weedicide – Women Labour	52.36	10076	02.48
28	Pesticide Spray – Men Labour	4.89	1956	00.48
29	Propping – Men Labour	21.69	8695	02.14
30	Propping – Women Labour	31.68	6375	01.57
31	Bunch Spray for Maturity	03.12	858	00.21
32	Harvesting of Banana – Men Labour	58.29	23315	05.73
33	Miscellaneous Charges		4568	01.12
34	Interest on Working Capital @12%		21798	05.36
	Sub Total (B)		203450	50.01
C	Total Variable Cost (A + B)		319415	78.52
D	Total Fixed Cost (D)		87372	21.48

35	Rental Value of Owned Land		57964	14.25
36	Rent Paid for Leased-in Land		19687	04.84
37	Land Revenue		0360	00.09
38	Interest on Fixed Capital @ 12%		9361	02.30
E	Total Cost of Cultivation (A+B+C+D)		406787.00	100.00
39	Yield of Banana in Kgs per Ha	31487	692714.00	
40	Gross Return Realized in Rupees		692714.00	
41	Net Return Realized in Rupees/Ha		267075.00	
42	Output – Input Ratio		01.63	
	Cost of Production per Kg of Banana		13.52	

Table.3 Costs and returns in cultivation of Nendran variety of banana

Sl. No	Particulars of Cost	Inputs / ha	Amount in Rs / ha	Percentage to Total
A	Material Cost			
01	Number of Suckers	2315	21993	05.28
02	Farm Yard Manure in Kgs	7016	9472	02.28
03	Quantity of Weedicide (Litres)	04.87	1460	00.35
04	Sucker Treatment	24.54	2042	00.49
05	Quantity of Pesticide in Litres	01.90	2100	00.50
06	Number of Casuarina Pole for Propping (Life of Poles will be for 5 years – Cost per Annum)	2319	24187	05.81
07	Quantum of Micronutrient (Kgs)	401	7067	01.70
08	Quantum of Nitrogen (Kgs)	715	6888	01.65
09	Quantum of Phosphorous in Kgs	658	13079	03.14
10	Quantum of Potassium in Kgs	1465	23444	05.63
11	Quantum of Bio-fertilizers	38.52	559	00.13
12	Miscellaneous Inputs like Fuel	67	4831	01.16
	Sub Total (A)		117121	28.13
B	Operational Cost			
13	Land Preparation - Machine Hours	09.18	7344	01.76
14	Formation of Bunds – Men Labour	47.57	18969	04.56
15	Drenching – Men Labour	54.13	23010	05.53
16	Planting of Suckers – Men Labour	28.16	8758	02.10
17	Planting of Suckers – Women	11.69	1528	00.37
18	Application of Fertilizers - Women	09.12	1964	00.47
19	First Application	12.56	2460	00.59
20	Second Application	12.65	2459	00.59
21	Third Application	13.89	2726	00.65
22	De-suckering – Men Labour	18.24	7263	01.74
23	Drenching – Men Labour	41.65	15734	03.78
24	Irrigation – Men Labour	17.36	6946	01.67
25	Weeding Men + Women Labour	06.19	1351	00.32
26	Weedicide Application – Men Labour	64.23	25692	06.17

27	Weedicide – Women Labour	52.36	10076	02.42
28	Pesticide Spray – Men Labour	04.89	1956	00.47
	Propping – Men Labour	21.69	8695	02.09
	Propping – Women Labour	31.68	6375	01.53
29	Bunch Spray for Maturity	05.12	1408	00.34
30	Harvesting of Banana – Men Labour	62.29	28652	06.88
31	Miscellaneous Charges		4568	01.10
32	Interest on Working Capital @ 12%		22552	05.42
	Sub Total (B)		210483	50.56
C	Total Variable Cost (A + B)		327604	78.69
D	Total Fixed Cost (D)		88716	21.31
33	Rental Value of Owned Land		58964	14.16
34	Rent Paid for Leased-in Land		19787	04.75
35	Land Revenue		0460	00.11
36	Interest on Fixed Capital @12%		9505	02.28
E	Total Cost of Cultivation (A+B+C+D)		416320.00	100.00
37	Yield of Banana in Kgs per Ha	28487	769149	
38	Gross Return Realized in Rupees		769149	
39	Net Return Realized in Rupees/Ha		329859.00	
Cost of Production per Kg of Banana			15.42	
Output – Input Ratio			01.75	

Table.4 Costs and returns in cultivation of Poovan variety of banana

Sl. No	Particulars of Cost	Inputs/ ha	Amount in Rs / ha	Percentage to Total
A	Material Cost			
01	Number of Suckers	2016	17128	04.82
02	Farm Yard Manure in Kgs	5916	7987	02.25
03	Quantity of Weedicide (Litres)	04.17	1250	00.35
04	Sucker Treatment	17.54	1460	00.41
05	Quantity of Pesticide in Litres	01.49	1647	00.46
06	Number of Casuarina Pole for Propping (Life of Poles will be for 5 years – Cost per Annum)	2019	21058	05.93
07	Quantum of Micronutrient (Kgs)	371	6538	01.84
08	Quantum of Nitrogen (Kgs)	615	5925	01.67
09	Quantum of Phosphorous in Kgs	608	12086	03.40
10	Quantum of Potassium in Kgs	1065	17044	04.80
11	Quantum of Bio-fertilizers	26.52	384.54	00.11
12	Miscellaneous Inputs like Fuel	57	4110	01.16
	Sub Total (A)		96616	27.20
B	Operational Cost			
13	Land Preparation - Machine Hours	7.18	5744	01.62
14	Formation of Bunds – Men Labour	46.57	18570	05.23
15	Drenching – Men Labour	49.13	20885	05.88
16	Planting of Suckers – Men Labour	25.16	7825	02.20
17	Planting of Suckers – Women	15.69	2051	00.58

18	Application of Fertilizers - Women	10.12	2179	00.61
19	First Application	11.56	2265	00.64
20	Second Application	09.65	1875	00.53
21	Third Application	09.89	1941	00.55
22	De-suckering – Men Labour	18.24	7263	02.04
23	Drenching – Men Labour	31.65	11956	03.37
24	Irrigation – Men Labour	13.36	5345	01.51
25	Weeding Men + Women Labour	06.19	1351	00.38
26	Weedicide Application – Men Labour	44.23	17692	04.98
27	Weedicide – Women Labour	32.36	6227	01.75
28	Pesticide Spray – Men Labour	04.89	1956	00.55
29	Propping – Men Labour	21.69	8695	02.45
30	Propping – Women Labour	21.67	4362	01.23
31	Bunch Spray for Maturity	03.12	858	00.24
32	Harvesting of Banana – Men Labour	48.29	19315	05.44
33	Miscellaneous Charges		4568	01.29
34	Interest on Fixed Capital at 12%		18351	05.17
	Sub Total (B)		171274	48.21
C	Total Variable Cost (A + B) Cost A1		267889	75.41
D	Total Fixed Cost (D)		57964	16.32
33	Rental Value of Owned Land		19687	05.54
34	Rent Paid for Leased-in Land		360	00.10
35	Land Revenue		9361	02.64
36	Interest on Fixed Capital @12%		87372	24.59
E	Total Cost of Cultivation (A+B+C+D)		355262	100.00
37	Yield of Banana in Kgs per Ha	29487	486535	
38	Gross Return Realized in Rupees		486535	
39	Net Return Realized in Rupees/Ha		163106	
	Cost of Production per Kg of Banana		10.97	
	Output – Input Ratio		01.50	

Table.5 Costs and returns in cultivation of Rasthali variety of banana

Sl. No	Particulars of Cost	Inputs / ha	Amount in Rs / ha	Percentage to Total
A	Material Cost			
01	Number of Suckers	2215	18828	04.70
02	Farm Yard Manure in Kgs	6016	8122	02.03
03	Quantity of Weedicide (Litres)	05.87	1760	00.44
04	Sucker Treatment	20.54	1709	00.43
05	Quantity of Pesticide in Litres	04.79	5293	01.32
06	Number of Casuarina Pole for Propping (Life of Poles will be for 5 years – Cost per Annum)	2219	23144	05.77
07	Quantum of Micronutrient (Kgs)	441.05	7771	01.94

08	Quantum of Nitrogen (Kgs)	675.23	6502	01.62
09	Quantum of Phosphorous in Kgs	628.25	12483	03.11
10	Quantum of Potassium in Kgs	1365.28	21845	05.45
11	Quantum of Bio-fertilizers in Kgs	41.52	602	00.15
12	Miscellaneous Inputs like Fuel	67	4831	01.21
	Sub Total (A)		112890	28.17
B	Operational Cost			
13	Land Preparation - Machine Hours	09.18	7344	01.83
14	Formation of Bunds – Men Labour	47.57	18968	04.73
15	Drenching – Men Labour	49.13	20885	05.21
16	Planting of Suckers – Men Labour	20.16	6270	01.56
17	Planting of Suckers – Women	19.69	2573	00.64
18	Application of Fertilizers - Women	10.12	2179	00.54
19	First Application	13.56	2656	00.66
20	Second Application	15.65	3042	00.76
21	Third Application	16.89	3314	00.83
22	De-suckering – Men Labour	19.24	7661	01.91
23	Drenching – Men Labour	39.65	14978	03.74
24	Irrigation – Men Labour	15.36	6146	01.53
25	Weeding Men + Women Labour	15.19	3315	00.83
26	Weedicide Application – Men Labour	54.23	21692	05.41
27	Weedicide – Women Labour	32.36	6227	01.55
28	Pesticide Spray – Men Labour	04.09	1636	00.41
29	Propping – Men Labour	18.69	7492	01.87
30	Propping – Women Labour	27.68	5570	01.39
31	Bunch Spray for Maturity	04.02	1106	00.28
32	Harvesting of Banana – Men Labour	59.29	23715	05.92
33	Miscellaneous Charges		5068	01.26
34	Interest on Fixed Capital at 12%		20620	05.15
	Sub Total (B)		192458	48.02
C	Total Variable Cost (A + B) Cost A1		305348	76.19
D	Total Fixed Cost (D)		95436	23.81
35	Rental Value of Owned Land		58964	14.71
36	Rent Paid for Leased-in Land		25687	06.41
37	Land Revenue		560	00.14
38	Interest on Fixed Capital @12%		10225	02.55
	Total Cost of Cultivation (A+B+C+D)		400784	100.00
39	Yield of Banana in Kgs per Ha	32787	590166	
40	Gross Return Realized in Rupees		590166	
41	Net Return Realized in Rupees/Ha		136711	
Cost of Production per Kg of Banana			13.83	
Output – Input Ratio			01.30	

Table.6 Types of costs incurred in different varieties of banana cultivation

Sl. No	Cost Category	Cost in Lakhs of Rupees (rs/ha)				
		Yelakki	Nendran	Poovan	Rasthali	Average
01	Cost A ₁	03.19	03.28	02.68	03.05	03.05
02	Cost A ₂	03.39	03.47	02.68	03.06	03.15
03	Cost B ₁	03.49	03.57	02.89	04.01	03.49
04	Cost B ₂	04.07	04.16	03.06	04.27	03.89
05	Cost C ₁	03.68	03.80	03.04	04.28	03.70
06	Cost C ₂	04.26	04.39	03.23	04.53	04.10
07	Cost C ₃	04.68	04.83	03.56	04.98	04.51

Table.7 Income realized from different varieties of banana

Sl. No	Income Measures	Income in Lakhs of Rupees Per ha				
		Yelakki	Nendran	Poovan	Rasthali	Average
01	Gross Return Realized (Rs.in Lakhs) per ha	06.93	07.69	04.87	05.90	06.35
02	Return Over Variable Cost per ha	03.74	04.41	02.19	02.84	03.29
03	Farm Business Income	03.54	04.22	02.19	02.84	03.20
04	Family Labour Income	02.86	03.53	01.81	01.63	02.46
05	Net Income per ha	02.67	03.30	01.64	01.37	02.24
06	Returns to Management per ha	02.25	02.86	01.31	0.92	01.83
07	Returns per Rupee of Investment	01.63	01.75	01.50	01.30	01.54

Table.8 Details of input productivity realized in Kgs per ha

Sl. No	Input Productivity / Ha	Yelakki	Nendran	Poovan	Rasthali	Average
08	Labour Productivity in Kgs	62.05	55.26	69.63	67.94	63.72
09	Fertilizer Productivity in Kgs	09.94	08.69	10.98	10.40	10.00

Farm Business income refers to profits and losses incurred through operation of the farm. A farm income statement is a summary of income and expenses that occurred during a specified accounting period or calculating period. The Farm Business Income was found to be higher in Nendran and Yelakki varieties which are respectively accounted for 4.22 lakhs and 3.54 lakhs. In respect of Farm Business Income also, the Poovan variety is capable of generating very low return.

Family Labour Income is the income to be generated from the farm because of their active involvement in crop production. Because of the family labour participation in the farm operations, the hired wage labour will equally be contributing to the productivity of the farm and hence the income in general could be enhanced. In this respect, the family labour income was assessed and the income is favorable in respect of Nendran variety and Yelakki variety of Banana. Both of the varieties are capable of contributing to

the level of 3.53 lakhs and 2.86 lakhs respectively towards family labour income.

Return per Rupee of Investment is another appraising tool in which how much return a farmer could generate for a rupee of invested money in the crop production activities. Here, the Banana varieties are offering a different rate of return per rupee of investment. The return per rupee of investment is favorable with Nendran and Yelakki varieties of Banana which are capable of yielding 1.75 and 1.63 respectively. It implied that for one rupee of investment in Nendran variety of Banana, it is capable of generating 75 paise as net return to the farmer. In an overall perspective, anything more than a rupee is the profit. Efficient resource management and time bound application in split doses as per the recommended technology alone could enhance the return per rupee of investment. A study conducted by Ramakrishna et al. during 2017 indicated that the small farms are less productive in respect of Banana and the medium and large farms are able to generate higher return per rupee of investment. However, contribution to specific inputs like labour and fertilizer is also important and hence these details are analyzed and the results are presented in Table 8.

In respect of input productivity, two inputs were mainly considered as it contributes greatly to the output of Banana. In this respect, on examining the labour productivity, one unit of labour force effectively utilized in the production of Banana, it could be able to deliver around 64 kgs of Banana on an average. But, the labour productivity was much higher in respect of Rasthali variety which stood at 68 kgs and the same was found to be around 70 kgs in Poovan and 62 Kgs in respect of Yelakki varieties. But the labour productivity was found to be dismal in respect of Nendran variety of Banana. The reason might be due to the genetic potential of the

variety and it consumes higher labor for different operations.

Another important input is the fertilizer. For every level of fertilizer application as recommended by the technocrats coupled with water management would definitely contribute to enhanced level of productivity. When comparing the actual productivity obtained for the fertilizer input across the varieties, the fertilizer productivity was found to be the highest in respect of Poovan variety followed by Rasthali and Yelakki which are respectively accounted for 10.98, 10.40 and 9.94 kgs per ha. If the farm households apply one unit of fertilizer to the production of Banana, it would be able to deliver the output to the tune of 11 Kgs, 10.40 Kgs and 10 Kgs respectively. From the input productivity, one could understand that the production of Banana is not scientifically practiced in the study environment and hence the poor yield in certain varieties could be seen and hence proper awareness on technology adoption either through workshops or training to the farm households are much important in this context.

In conclusions and policy options an economic appraisal of different varieties of Banana outlined that the Nendran and Yelakki varieties are capable of fetching highest return per ha. This is visible through costs and returns analysis and through the farm efficiency measures. Besides, the varieties like Rasthali and Poovan are able to generate less return. But the labor and fertilizer productivity outlined that the Poovan and Rasthali varieties have resource potentials. If resources are aptly used on time, they could generate higher return on par with the varieties like Nendran and Yelakki. In this context, it is reiterated that the resource use is found to be inappropriate and hence recommended technological practice and time bound input application would impart the

genetic potential of different varieties of Banana and hence awareness creation exercise among the farm households about technology adoption need to be carried out by the Department of Horticulture and Plantation Crops. The NRCAB can also join with this venture to upscale the productivity of Banana by practicing appropriate schemes in the farm lands.

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