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# ANALYSIS OF LONG-TERM TRENDS IN BANANA SECTOR OF SRI LANKA

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## ABSTRACT

**Banana is an important fruit crop cultivated in Sri Lanka. A study was carried out to analyse the long-term trends in extent, production and cost of cultivation of banana, and the profitability of the banana venture to the farmer. Long-term data (1973-2000) on extent and production, wholesale and retail prices, exports and imports and cost of cultivation were analyzed using regression statistical technique. The results of the analysis revealed that the extent of banana has increased at a rate of 841 hectares per year during the period from 1973 to 2000. The increasing trend from 1973 to 1980 and a sharp decreasing trend from 1980 to 1985 and a stable production around 421,000 t after 1985 was observed. The trends in productivity are also discussed. The change in prices of *Kolikuttu* and Ambun was higher than the change in Colombo Consumer Price Index (CCPI) and it is lower in other varieties. Therefore, Cultivation of *Kolikuttu* and *Ambun* is more profitable and *Ambul* and *Seeni* varieties are less profitable to the farmer. The Benefit-Cost analysis showed that the Benefit: Cost ratio for banana is decreasing over the years and it was 0.34 during 2000. These results suggest that profitability of banana sector is fast decreasing and hence a development plan is required.**

**KEY WORDS:** Banana, Trend Analysis, Profitability

## INTRODUCTION

Banana is an important fruit crop cultivated in Sri Lanka. Weerasingha (2001) reported that approximately 100,000 Sri Lankans are engaged in the banana industry. The land extent under banana is 48,686 ha and this extent varied between 47,000- 48,000 ha over the last four years (Census and Statistics, 1998). The data in the same report showed that the annual extents of papaw and pineapple are 6,000 ha and 3,476 ha, respectively and these crops are in the second and third places.

Government agencies such as Department of Census and Statistics, Hector Kobbakaduwa Agrarian Research and Training Institute (HARTI), Department of Customs, Department and Ministry of Agriculture collect data on extent and production, wholesale and retail prices, exports and imports and cost of cultivation of Sri Lanka. Analysis of this long-term data to determine the trends is important to describe the production system.

*Ambun, Kolikuttu, Seeni* and *Ambul* are popular banana varieties in Sri Lanka cultivated in large extents. The exact figures of extents of cultivation on variety basis are not available. The prices of these varieties are different and it determines the income for the farmer. Therefore, studies of long-term trends in

price fluctuations of different varieties are important to determine the income to the farmer.

The Colombo Consumer Price Index (CCPI) is an indicator to determine the income required to sustain the livelihood of farmers. The income for varieties should be similar to the trend in CCPI. Hence these studies are important to determine the profitability of banana farmers. Therefore, this study was conducted with the following objectives;

(a) To study the long-term trends in extent of cultivation, production and national average yield of banana.

(b) To study the trends in profitability of banana cultivation

## MATERIALS AND METHODS

The total extent of banana cultivated in each year and corresponding national production were collected from the records of Department of Census and Statistics, Sri Lanka (Census and Statistics, 1998). The data for a period of 27 years from 1973 to 2000 were used to analyse the long-term trends in extent, production and productivity of banana.

The wholesale prices per kilogram of banana (annual average) at the Pettah market were collected from the records published by HARTI (1998). The prices were recorded separately for 5 different varieties; *Ambul, Kolikuttu, Seeni, Anamalu* and *Ambun* and used to analyse the long-term trends. The monthly average prices of banana for the 5 varieties were also collected for the years 1998 and 1999. These data were analysed to study within year price fluctuations.

The data on Colombo Consumer Price Index (CCPI) were collected from the reports of Central Bank of Sri Lanka, for a period of 7 years from 1993 to 2000. (Central Bank of Sri Lanka, 1999). The trend in changing CCPI for the period considered were analysed and compared with the trends in changing prices of different varieties for the same period. The year 1993 was considered as the base year as data were available from 1993.

The data on cost of cultivation (COC) of banana were collected from the reports of Socio-Economics division of the Department of Agriculture, Sri Lanka (COC Report, 2000). The costs of cultivation studies are not conducted in every year and as a result COC data were not available for some years under investigation. Therefore, a functional relationship was developed for COC and years with a correction to inflation to derive estimates of COC for some years. The income from banana cultivation was calculated multiplying average price and average production. The income and cost data for the period

from 1978 to 2000 were used to calculate the benefit cost ratio. The statistical methods such as regression analysis were employed to analyse the data.

## RESULTS AND DISCUSSION

### Long term trends in extent of cultivation

The total extent of banana cultivated in Sri Lanka has an increasing trend from 1973 to 2000 (Figure 1). This increasing trend is linear and the fitted model show that rate of increase is 841 hectares per year. In addition to linear trend component, a cyclic pattern of 10 years is also observed in the extent of cultivation. The higher production in the years of 1973, 1985 and 1993 are the cyclic pattern observed in the long-term data.

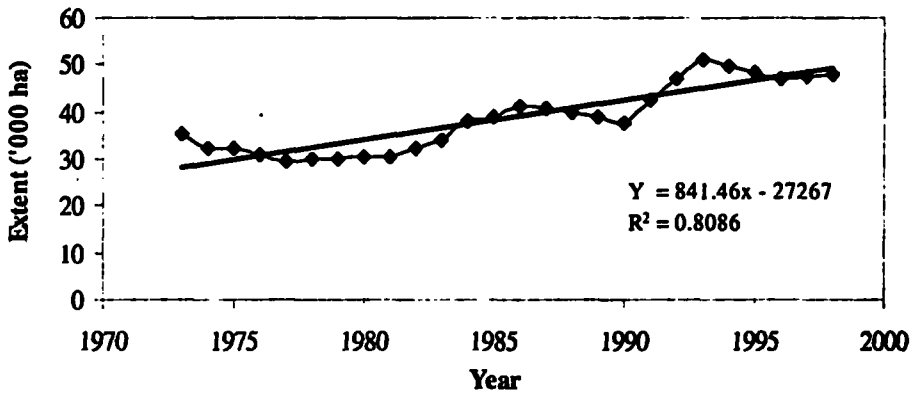


**Figure 1. The long-term trend in cultivated extent for banana from 1970 to 2000**

### Long term trends in production

The long-term trends in production of banana are shown in Figure 2. A rapid growth in production from 25,000 t/ha to 1,000,000 t/ha during the period of 1973 to 1980 is apparent in the data. The data also indicate a sharp decreasing trend in production during the period from 1980 to 1985. The production of 1,040,556 t recorded in 1980 has reduced to 410,000 t/ha in 1985. This reduction is 630,556 t and is equivalent to 60% of the production in 1980. The production was more or less stable during the period 1985 to 2000. The average production was 421,000 t and varied between 400,000- 442,000 t.

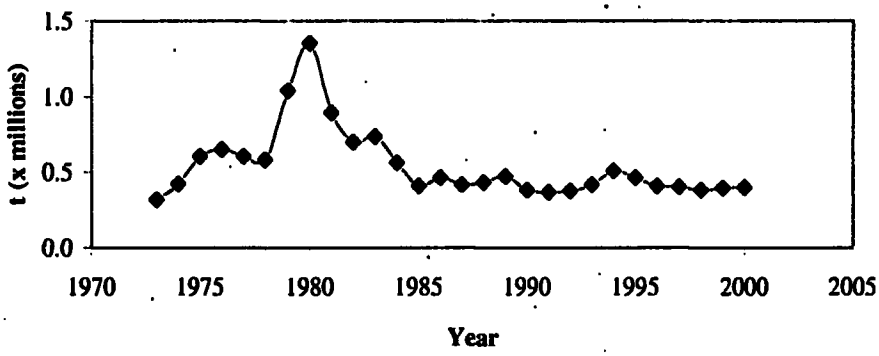


**Figure 2. The long-term trend in production of bananas**

## Long-term trends in productivity

The production per unit area of land cultivated in each year is referred to as productivity. The examination of productivity data (annual average yield) from 1973 to 2000 showed 2 distinct periods, namely, 1973-1980 period and 1980-2000 period (Figure 3). The productivity, showed an increasing trend during the period from 1973 (7.5 t/ha) to 1980 (34 t/ha). The factors contributed to this tremendous increase in productivity should be investigated.

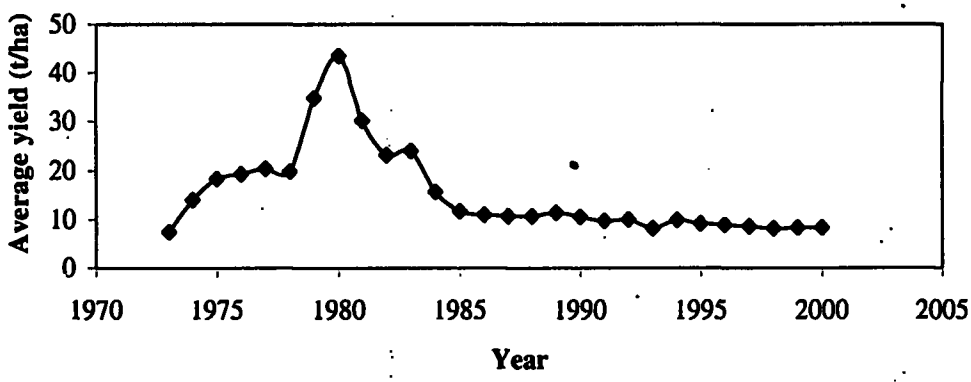


**Figure 3. The long-term trend in the productivity of banana**

The trend in the Figure 3 was divided into two periods, *i.e.* 1973-1980 period and 1980-2000 period, to fit the regression models. Fitted regression model for the data from 1973 to 1980 showed that trend in increase of productivity from 1973 to 2000 is linear and the rate of increase is 4.29 t per year. The trend in from 1980 to 2000 period showed a decreasing quadratic trend in productivity (Figure 5). The yields in recent years are stabilized around 10 t/ha.

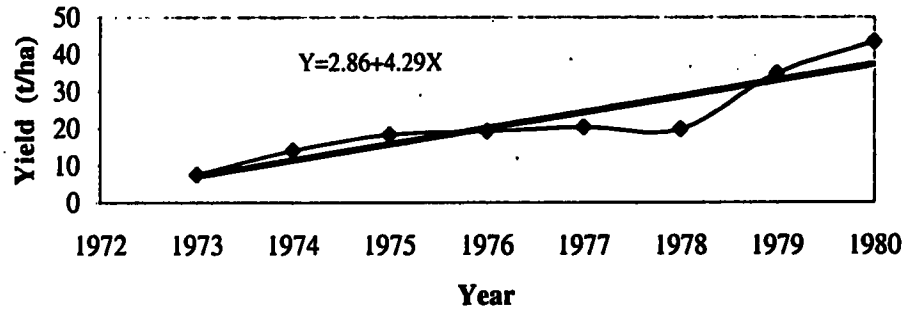


**Figure 4. Trend in productivity of banana from 1973 to 1980**

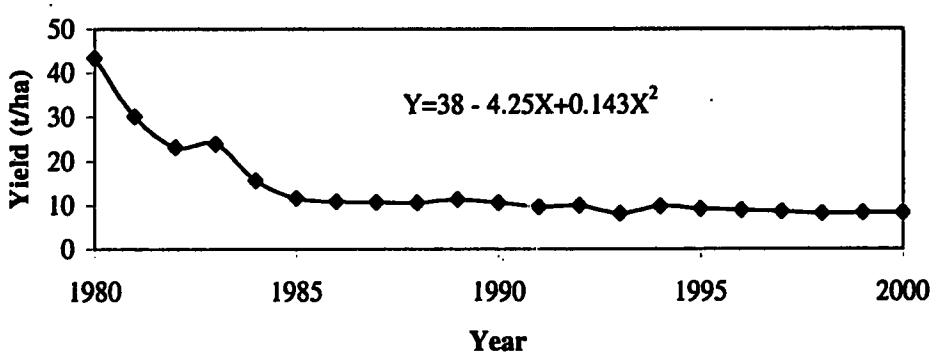


**Figure 5: The trend in productivity of banana from 1980-2000 period**

## Comparison of trends in cultivated extent, production and productivity

The indices of production, extent and productivity considering 1983 as the base year are derived and the plots of these indices are shown in Figure 6. The results indicate that the extent remain constant for the period from 1974 to 1985 (around 100). Gradual increases in extents from 1985 to 2000 indicate the success of development programs.

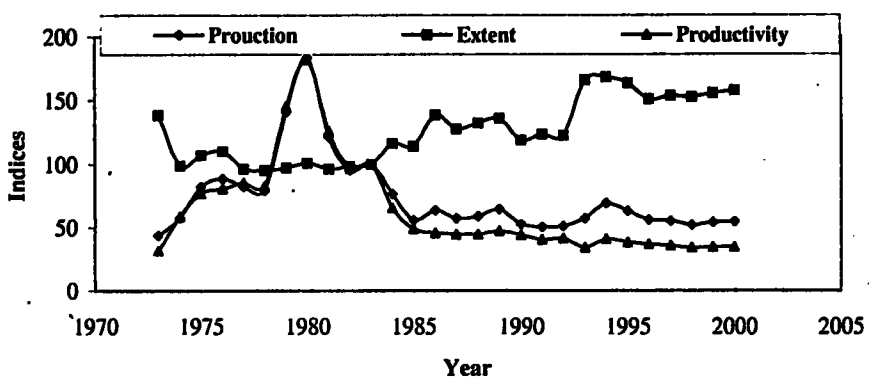


**Figure 6. The trends in indices of extent, production and productivity of banana from 1970 - 2000**

The production from 1985 is stabilized at a value that is 50% lower than that of 1983 (Figure 7). The stability in national production with increasing extents indicates the decrease in productivity, *i.e.* decreasing per hectare yields. The data indicate the decreasing trend in productivity from 1985 to 2000 period.

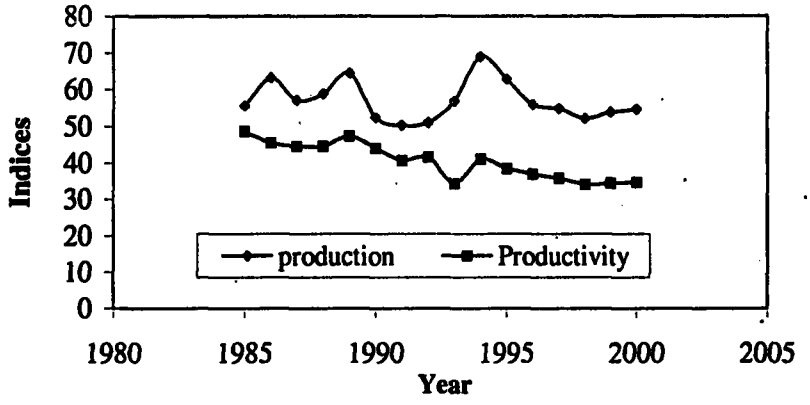


**Figure 7. Trends in indices of production and productivity of banana from 1985 to 2000**

The productivity is associated with the adoption of technology and hence the decreasing trend in productivity could be attributed to poor adoption of technology such as high yielding varieties, irrigation methods, fertilizer and other management conditions. The reasons for poor adoption of technology would be higher prices of inputs and lower prices for the product. Therefore, investigation of trends in prices is necessary.

## Price variation of banana within a year

The average wholesale price (Pettah market) of banana for each month from January to December respectively was computed for different varieties for the years 1998 and 1999. The average price for each month was estimated from this data to study within year price variation of banana. The results are shown in Figure 8.

The analysis revealed that prices of banana are high in the months of December, January, February and April. Lowest price is recorded in June. This trend is common for all the varieties of banana studied in this investigation. These results are agreement with the findings of Rupaasena (1988). It is also envident that prices of *Ambul* and Seeni are always 2-3 rupees lower than the prices of Kolikuttu, and *Ambun* irrespective of the month in a given year.

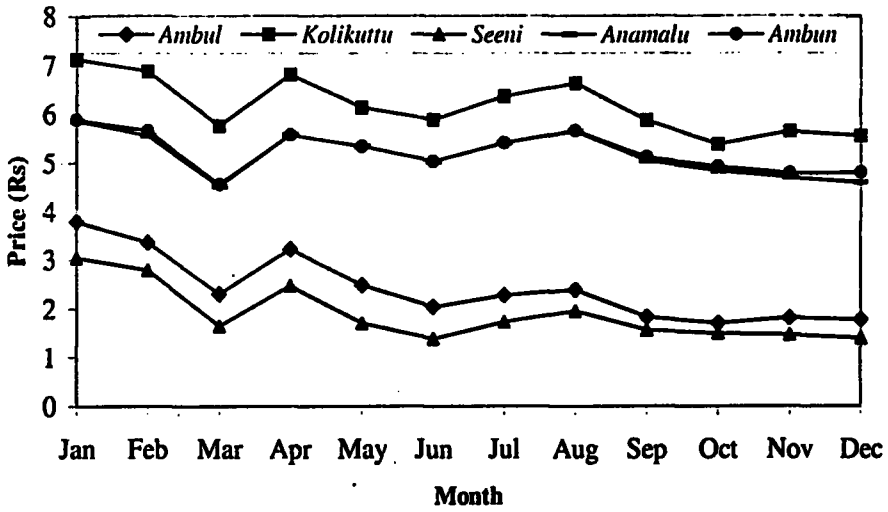


**Figure 8. Within year price fluctuation of banana varieties**

The deviations of monthly price from the annual average price of each variety were estimated and expressed as a percentage and the results are shown in Figure 9.

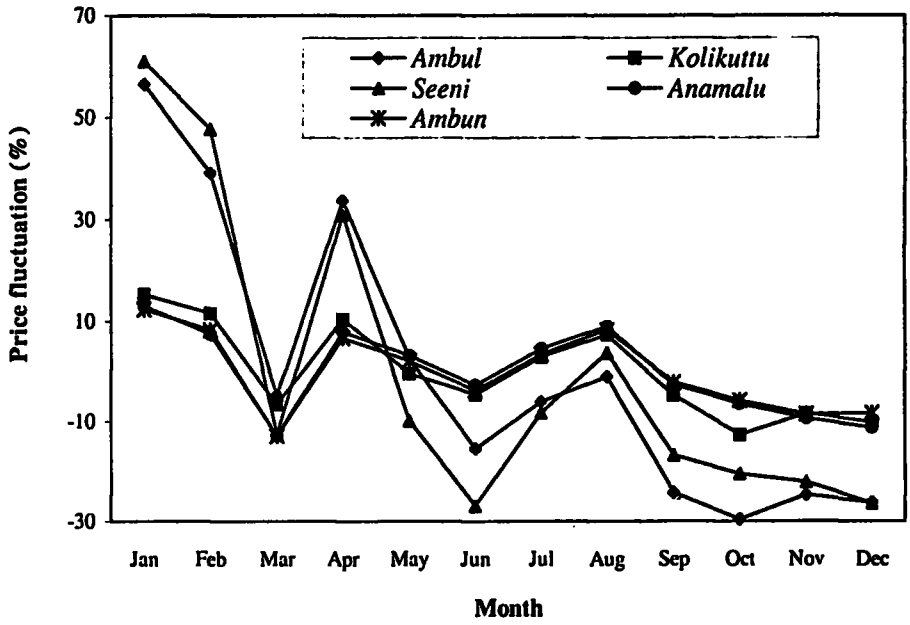


**Figure 9. Percentage price fluctuation of banana varieties**

The results indicate that price variation of Ambul and Seeni are higher compared to *Kolikuttu* and *Anamalu* and *Ambun*. For example, *Ambul* and *Seeni* get 50 percent higher price in January, and April but *Anamalu* and *Ambun* get only 10 - 12 percent higher price increase, respectively for the same months.

**Price variation of banana over the years**

The price variation of different varieties of banana over the years is shown in Figure 10. The prices of all the varieties have increased over the period investigated. However, the price difference between year 1993 and 2000 of Ambul and Seeni varieties are negligible. The price increase in varieties Kolikuttu and Ambun are comparatively better than other varieties. The increase in price in relation to increase in CCPI is important to understand the effect of changing prices on standard of living of the farmers.

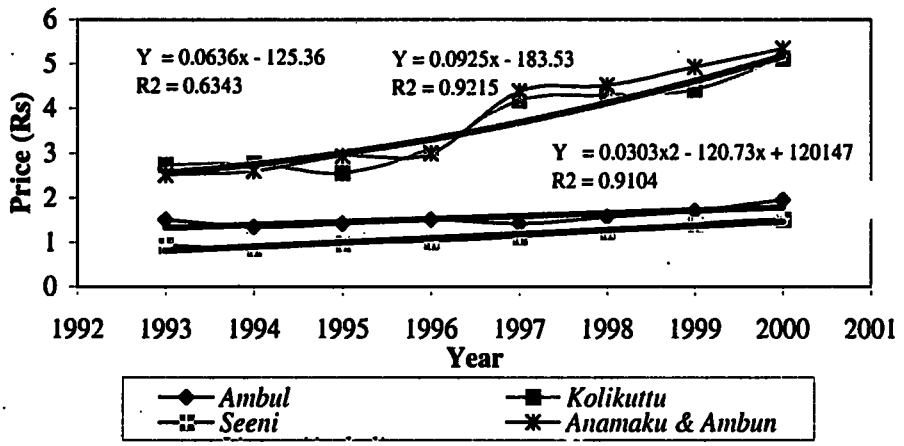


**Figure 10. Change in prices over the years for banana varieties**

CCPI is an indicator for cost of living of people in Sri Lanka in a given year. The income of banana farmers should be at least equal to or greater than CCPI to maintain standard at living. The price of banana is a proxy that indicates the income of farmers. Both CCPI and price indirectly indicate the profitability of banana enterprise.

The CCPI and prices of varieties of banana were recorded from 1993 to 2000. The price indices were calculated considering 1993 as a base year. The results are shown in Figure 11.

The CCPI and prices of the varieties showed an increasing trend from 1993 to 2000. The price increase in *Ambun* is greater than increase in CCPI. The price increase in *Kolikuttu* is similar to price increase in CCPI. However, for *Ambul* and *Seeni*, the price increase is less than the price increase in CCPI. This information indicates that farmers cultivating Ambun and Kolikuttu get an income that leads to profit and comparatively better living standards.

The relationship between income and profitability depends on COC. This issue is address in the next section. However, at this point, under the assumption that change in COC is similar to change in CCPI, it can be concluded that profitability of *Seeni* and *Ambul* industry were badly affected

in the last seven years. Therefore, a decrease in the standard of living of farmers engaged in this industry could also be expected. In contrast, profitability of *Ambun* and *Kolikuttu* industry is better. .

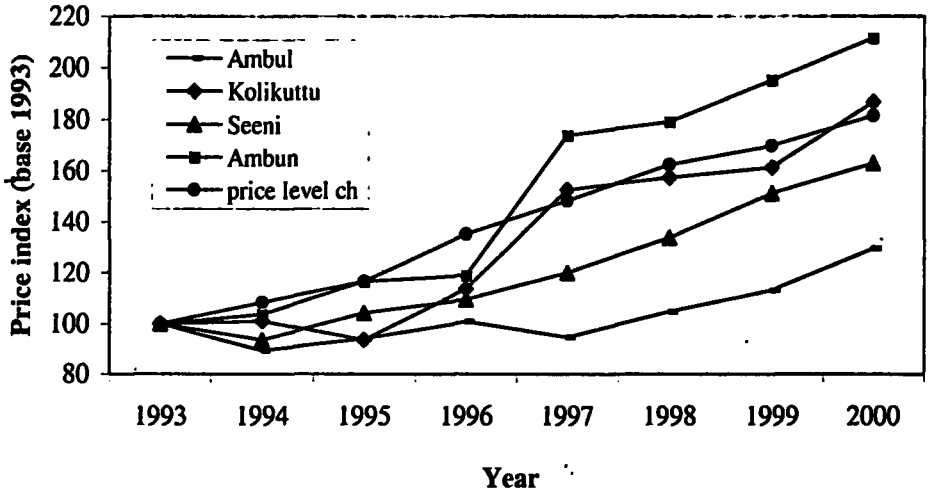


**Figure 11. Comparison of changing prices for banana varieties with Colombo Consumer Price Index**

## Cost of production and income and benefit: cost ratio

The data on cost of cultivation of banana for each variety separately for all the past years are not available. The available information on COC was used to compute the estimates considering the inflation and these estimates are shown in Table 1. Based on the data in Table 1, the cost and net benefit for each year were computed and used to compute the benefit cost ratio. The results are shown in Figures 12 and 13.

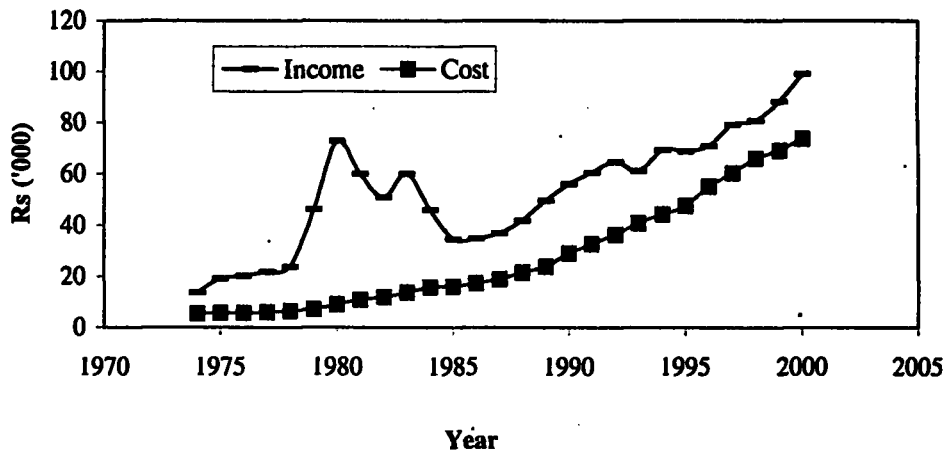


**Figure 12. The trends in cost of cultivation and income for banana**

**Table 1. Benefit to cost ratio of banana sector**

| *Year* | *Avg yld (bun/hac)* | *t/ha* | *GBPI* | *Rs/ bunch* | *Farm gate income Rs* | *With other income 18.75%* | *CCPI* | *cost /ha* | *net income* | *Benifit to cost ratio* |
|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 1165.83 | 13.99 | 0.22 | 9.92 | 11560.08 | 13727.59 | 185.80 | 5363.63 | 8363.96 | 1.56 |
| 1975 | 1527.66 | 18.33 | 0.23 | 10.61 | 16207.78 | 19246.74 | 198.80 | 5738.92 | 13507.82 | 2.35 |
| 1976 | 1601.30 | 19.22 | 0.24 | 10.71 | 17151.47 | 20367.37 | 200.70 | 5793.76 | 14573.61 | 2.52 |
| 1977 | 1702.15 | 20.43 | 0.24 | 10.84 | 18458.79 | 21919.81 | 203.20 | 5865.93 | 16053.88 | 2.74 |
| 1978 | 1650.62 | 19.81 | 0.27 | 12.16 | 20067.00 | 23829.57 | 227.80 | 6576.08 | 17253.49 | 2.62 |
| 1979 | 2898.45 | 34.78 | 0.30 | 13.46 | 39026.88 | 46344.42 | 252.30 | 7283.34 | 39061.08 | 5.36 |
| 1980 | 3618.60 | 43.42 | 0.37 | 16.98 | 61449.86 | 72971.71 | 318.20 | 9185.73 | 63785.98 | 6.94 |
| 1981 | 2518.99 | 30.23 | 0.44 | 20.03 | 50466.19 | 59928.60 | 375.40 | 10836.97 | 49091.63 | 4.53 |
| 1982 | 1926.26 | 23.12 | 0.49 | 22.21 | 42775.23 | 50795.59 | 416.10 | 12011.88 | 38783.70 | 3.23 |
| 1983 | 1992.25 | 23.91 | 0.56 | 25.31 | 50418.12 | 59871.51 | 474.20 | 13689.10 | 46182.41 | 3.37 |
| 1984 | 1308.10 | 15.70 | 0.65 | 29.52 | 38612.35 | 45852.17 | 553.10 | 15966.77 | 29885.40 | 1.87 |
| 1985 | 970.40 | 11.64 | 0.66 | 29.95 | 29063.42 | 34512.81 | 561.20 | 16200.60 | 18312.21 | 1.13 |
| 1986 | 907.83 | 10.89 | 0.71 | 32.34 | 29360.07 | 34865.08 | 606.00 | 17493.88 | 17371.21 | 0.99 |
| 1987 | 889.55 | 10.67 | 0.77 | 34.84 | 30990.74 | 36801.50 | 652.80 | 18844.89 | 17956.62 | 0.95 |
| 1988 | 886.25 | 10.63 | 0.87 | 39.71 | 35193.84 | 41792.69 | 744.10 | 21480.52 | 20312.17 | 0.95 |
| 1989 | 945.38 | 11.34 | 0.98 | 44.31 | 41885.89 | 49739.49 | 830.20 | 23966.03 | 25773.46 | 1.08 |
| 1990 | 876.37 | 10.52 | 1.19 | 53.81 | 47158.39 | 56000.59 | 1008.30 | 29107.39 | 26893.20 | 0.92 |
| 1991 | 843.35 | 10.12 | 1.33 | 60.39 | 50926.12 | 60474.76 | 1131.50 | 32663.90 | 27810.87 | 0.85 |
| 1992 | 810.32 | 9.72 | 1.48 | 67.26 | 54506.04 | 64725.92 | 1260.40 | 36384.96 | 28340.97 | 0.78 |
| 1993 | 682.65 | 8.19 | 1.66 | 75.16 | 51309.94 | 60930.55 | 1408.40 | 40657.39 | 20273.16 | 0.50 |
| 1994 | 817.98 | 9.82 | 1.57 | 71.31 | 58333.57 | 69271.12 | 1527.40 | 44092.65 | 25178.46 | 0.57 |
| 1995 | 765.25 | 9.18 | 1.67 | 75.64 | 57880.11 | 68732.63 | 1644.60 | 47475.96 | 21256.67 | 0.45 |
| 1996 | 737.10 | 8.85 | 1.79 | 81.10 | 59779.37 | 70988.00 | 1906.70 | 55042.20 | 15945.80 | 0.29 |
| 1997 | 711.62 | 8.54 | 2.06 | 93.59 | 66603.80 | 79092.01 | 2089.10 | 60307.69 | 18784.32 | 0.31 |
| 1998 | 680.66 | 8.17 | 2.20 | 100.00 | 68065.96 | 80828.33 | 2284.90 | 65960.00 | 14868.33 | 0.23 |
| 1999 | 688.63 | 8.26 | 2.38 | 108.13 | 74464.31 | 88426.37 | 2392.29 | 69060.11 | 19366.26 | 0.28 |
| 2000 | 690.49 | 8.29 | 2.67 | 121.01 | 83552.81 | 99218.97 | 2557.35 | 73825.11 | 25393.85 | 0.34 |

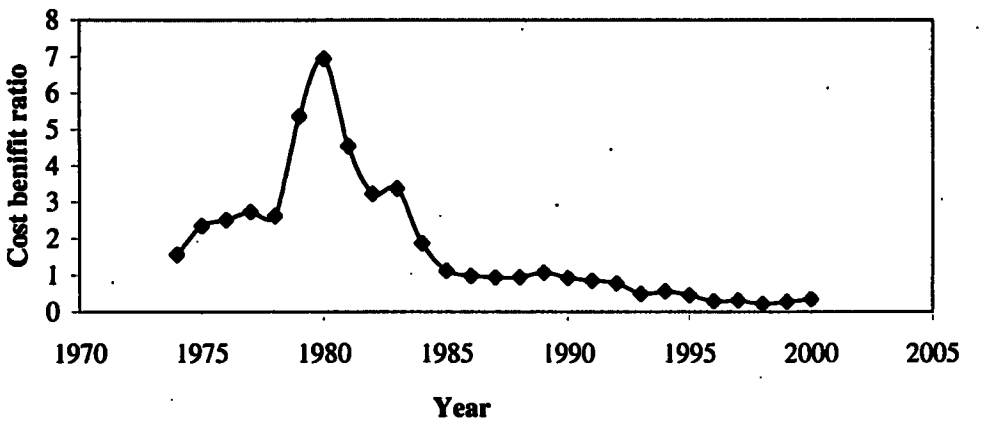


**Figure 13. The trend in benefit cost ratio**

The gap between cost of cultivation and income decreased over the years (Figure 12). More over the Benefit cost ratio in 1989 was 1.08 and since then it has decreased gradually (below 1) and in the year 2000 it was equivalent to 0.34. This indicates that profitability of the sector is fast decreasing.

**Comparison of cost of production, farm gate income and net income**

The price data of banana are available on variety basis and thus computation of income is possible on variety basis. However, the extents, production and cost of cultivation data of banana are not available on variety basis. Therefore, it is not possible to compute the benefit to cost on the variety basis. Therefore, the net income of banana could be worked based on the average price of banana. The plot of farm gate income, cost of production and net income indicate that net income is decreased as a result of increase in cost of production at a rate higher than increase in prices (Figure 14).

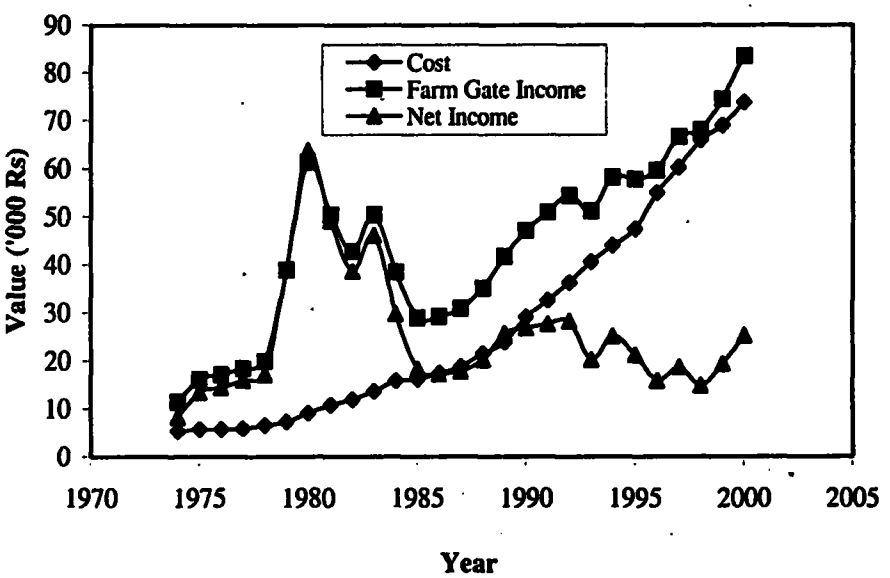


**Figure 14. Comparison of Cost of production, farm gate income and net income**

The results indicate that decreasing benefit to cost ratio of banana could be attributed to the increase in cost of production at a higher rate than net income. This general trend would be different for different varieties as real prices of varieties are lower or higher than the average price used for computation. Therefore, development of a system to collect such data for economic evaluation of banana is necessary in future.

## CONCLUSIONS

The increasing trend in the extent of cultivation is associated with decreasing trend in productivity during the period studied. The profitability of banana enterprise is fast decreasing over the years and hence a development plan is required.

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