Growth and Instability in area, Production and Productivity of Banana in Tamil Nadu

ABSTRACT

The present study used the secondary data collected from secondary sources. The area under banana in Tamil Nadu was decreased (-4.06 per cent) but India was increased (one per cent) in the current year, over the base year. The growth rate for production and productivity were negative in Tamil Nadu and that were positive in India except productivity. The area and its interaction effect with area were found to be responsible for decrease in the production of banana in India. In Tamil Nadu area and yield were identified as major contributors for decrease in the production of banana. The change in production of banana is high rather than area and productivity. Hence the study recommends Government also used to formulate the policy to support fruit growers by announcing minimum support price and by providing cold storage facilities at minimum cost and subsidies for exporting fruits to other countries.

Key words- Growth Rate, Production, Productivity, Instability, Interaction Effect, Yield Effect,

1. INTRODUCTION

Fruits and vegetables account for nearly 90% of total horticulture production in the country. India is now the second largest producer of fruits and vegetables in the world and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra. (Horticultural at Glance, 2017). A large variety of fruits are grown in India, of which banana, citrus, guava, grapes, pineapple are the major ones. Apart from there fruits growing states are Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Uttar Pradesh and Gujarat. Grapes occupies the premier position in exports with 232.9 thousand tonnes valued at Rs. 2,08,835 lakhs. Other fruits which have attained significant position in exports are Banana and Mango. It is estimated that per capita fruits availability in our country is 230 gms per capita per day.

Banana (*Musa* sp.) is the second most important fruit crop in India next to mango. Its year round availability, affordability, varietal range, taste, nutritive and medicinal value makes it as the favourite fruit among all classes of people. It has also good export potential. Hi-tech cultivation of the crop is an economically viable enterprise leading to increase in productivity, improvement in produce quality and early crop maturity with the produce commanding premium price. Banana and plantains are grown in about 120 countries. India is leading the world in the production of banana with 77.5 million hectares of land and 26.5 million MT of production. India produces a total of 25.6 per cent of the entire world production of banana. (National Horticulture Board, 2012-13). Hence, the present study is attempted with the following specific objectives;

- To analyse the growth of area, production and productivity of banana in India and Tamil Nadu.
- To estimate the contribution of area and yield towards change in production of banana in India and Tamil Nadu.
- To study the growth and instability in area, production and productivity of banana in India and Tamil Nadu.

2. METHODOLOGY

The time series data on area, production and productivity and export of banana in India and Tamil Nadu were collected from publications of National Horticultural Board (NHB), APEDA (Agricultural Processed Food Products and Export Development Authority), Agricoop (Agriculture Co operation and Farmers welfare) Tamil Nadu statistical Hand Books, reports, Journal, periodicals and News Paper etc.,

i) Growth rate was calculated for area, production, productivity and export of fruits in India in the present study.

$$\mathbf{Y = a\, b^t e}$$

Where,

Y - Dependent variable for which growth rate is estimated, a - Intercept, b - Regression coefficient, t - Time variable, e - Error term.

The logarithmic form of the above equation estimated the compound growth rate

$$\mathbf{\log Y = \log a + t \log b}$$

The compound growth rate (g) was estimated by using

$$\mathbf{g = [Anti\ log\ of\ (b) - 1] * 100}$$

ii) Decomposition is a technique to discern out the effect of technology or environmental damage or any other impact on production. The following decomposition model (**Thakor, 2018)** was used for estimation of contribution of area and yield towards change in production (positive/negative) is expressed as:

$$\mathbf{\Delta P = A_0\, \Delta Y + Y_0\, \Delta A + \Delta A \Delta Y}$$

Change in production = Area Effects + Yield Effects + Interaction Effects.

Area Effects: percentage share of area in total production. $\boldsymbol{AE = \frac{(A_n - A_0)Y_0}{P_n - P_0} \times 100}$

Yield Effect: Percentage of share of average yield in total production. $\boldsymbol{YE = \frac{(Y_n - Y_0)A_0}{P_n - P_0} \times 100}$

Interaction Effect: $\boldsymbol{IE = \frac{(A_n - A_0)(Y_n - Y_0)}{P_n - P_0} \times 100}$

Where,

Ao= Triennium average of area in base year, An= Triennium average of area in current year, Po= Triennium average of production in base year, Pn=Triennium average of production in current year, Yo= Po/Ao, Yn= Pn/An

iii) Measure of Instability: The instability in area, production and productivity and export of banana crops is measured in relative terms by the Cuddy-Della Valle index (1978) and Coppock index (1962).

a) Cuddy-Della Valle index

The instability index IX, is given by the expression: IX = $C.V \times \sqrt{(1-\bar{R}^2)}$

Where, CV = coefficient of variation (in percent), R^2 = coefficient of determination from a time-trend regression adjusted by the number of degrees of freedom.

b) **Coppock Index:** Instability was also analysed using Coppock's Index which is calculated as the antilog of the square root of the logarithmic variance using the following formula

$$\text{Coppock Index} = (\text{Antilog})\sqrt{vlog-1} * 100,\ V\log = \frac{1}{(N-1)}\sum(logp_{t+1} - log_t - M)^2$$

$$M = \frac{1}{(N+1)}\sum(logp_{t+1} - log_t)$$

Coppock's Instability index is a close approximation of the average year to year percentage variation adjusted for trend and the advantage is that measures the instability in relation to the trend in area. A higher numerical value for the index represents greater instability.

3. RESULTS AND DISCUSSION

The results of the study was presented and discussed in two sections (i.e) Area, Production and Productivity of Banana and Measure of Instability.

A) AREA, PRODUCTION AND PRODUCTIVITY OF BANANA

i) GROWTH RATE

The area, production and productivity of banana were evaluated and results are presented in the Table-1 and in figures 1 and 2.

Table 1: Growth of area, production and productivity of Banana in India and Tamil Nadu during the period (2008 – 2018)

Particulars	The base year (TE	The current year (TE	Absolute change	Relative Change	Standard deviation	Co- efficient of variance	Compound growth rate

	2008)	2018)					
AREA (000 ha)							
India	799.13	854.66	55.53	6.94	33.44	4.06	1.00
Tamil Nadu	123.16	87.92	-35.24	-28.61	18.13	21.04	-4.06
PRODUCTION (000 t)							
India	28234.9	29987.67	1752.76	6.20	1421.08	4.93	0.96
Tamil Nadu	6656.76	3348.68	-3308.08	-49.69	1670.25	49.98	-8.42
PRODUCTIVITY (000 t)							
India	35.33	35.08	-0.24	0.693	1.052	3.005	-0.99
Tamil Nadu	54.04	38.08	-15.96	-29.53	8.42	21.73	-3.92

The area under banana lessening from 123.16 thousand ha to 87.92 thousand ha in Tamil Nadu. Besides, it would to be decreased by 28.61 per cent in the current year over the base year with the fluctuation of 21.04 per cent and occurrence of highly significant decline in the area with compound growth rate of – 4.06 per cent during the period of ten year. In India, similar trend was observed and area was found increased by 6.94 per cent in the current year (854.66 thousand ha) over the base year (799.13 thousand ha) with the fluctuation (4.06 per cent) and compound growth rate of 1.00 per cent respectively. The production of banana in Tamil Nadu was build up to abatement by 49.69 per cent in current year (3348.68 thousand ha) over the base year (6656.76 Thousand ha) with fluctuation of 49.98 per cent and compound growth rate of Tamil Nadu was -8.42 per cent. The productivity of Banana in Tamil Nadu was begin to be decreased by 29.53 per cent in the current year (38.08 kg/ha) over the base year (54.04 kg/ha) with fluctuation of 21.73 per cent at the same time the productivity of banana in India was increased by 0.69 per cent in the current year (35.08 kg/ha) over the base year (35.33 kg/ha) with fluctuation of 3.00 per cent. For Tamil Nadu all the three parameters had negative growth rate and for India, except productivity of banana other two factors had positive growth rate.

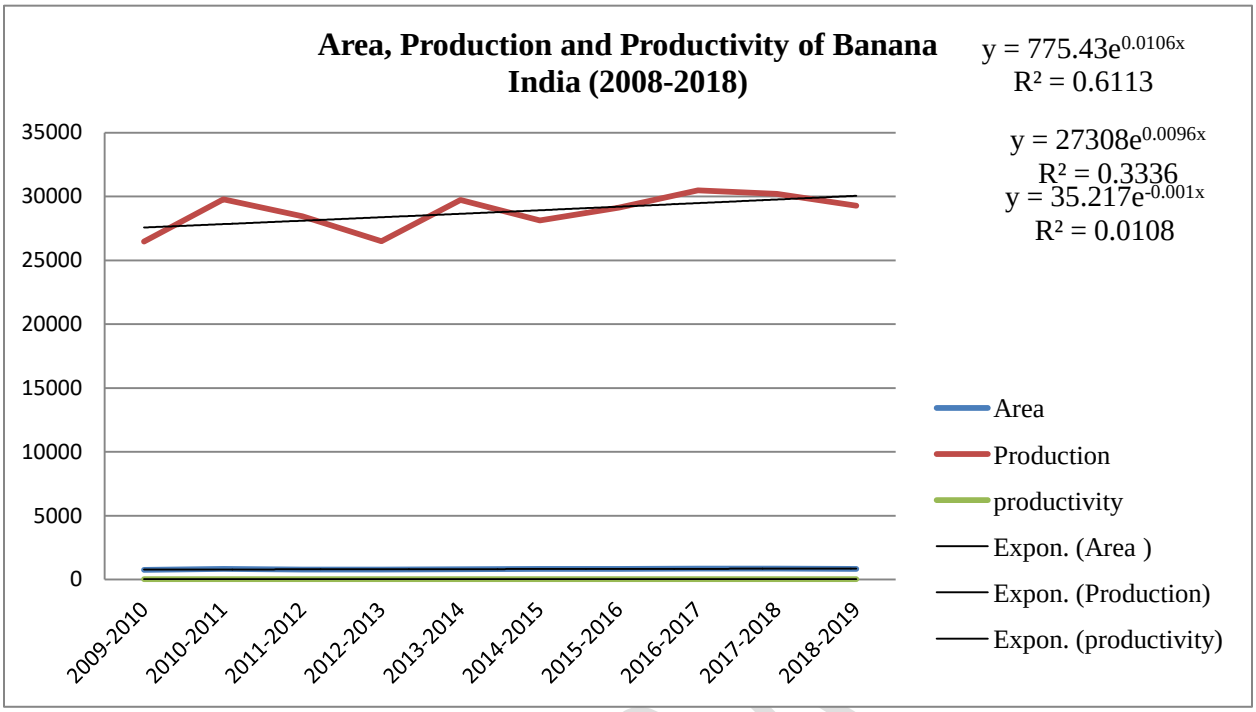

Fig- 1 Growth of Area, Production and Productivity of Banana in India

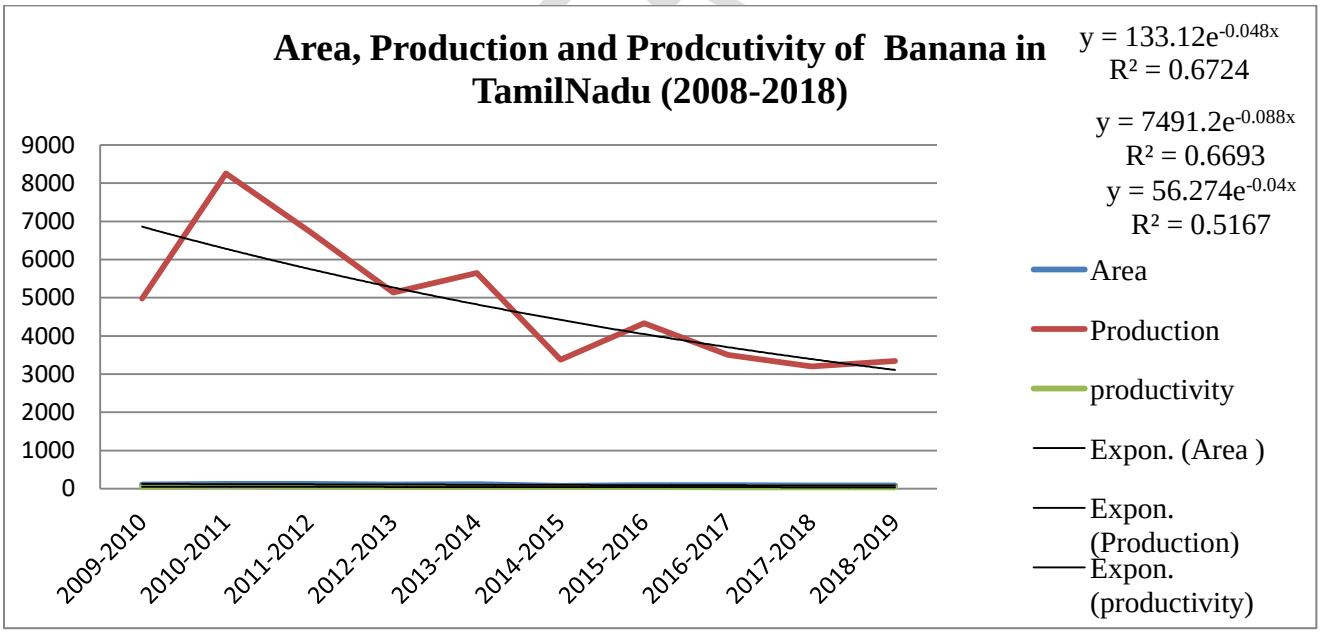

Fig- 2 Growth of Area, Production and Productivity of Banana in Tamil Nadu

i) Decomposition of growth components

The total change in the production of selected banana crop was decomposed in to three effect (i.e) area effect, yield effect and interaction effect during the period 2008-2018. The results are presented in Table - 2

Table – 2 Contribution of area, production and productivity of banana (%) in India compare as Tamil Nadu

S.No	Particulars	Tamil Nadu	India
1	Area effect	57.57	111.93
2	Yield Effect	59.43	-11.16
3	Interaction Effect	-17.00	0.77
	Total	100.00	100.00

It could be observed from the data that the yield effect (59.43 per cent)and area effect (57.57 per cent) followed by were found to be major contributors towards production of banana in Tamil Nadu. The area and its interaction effect with yield were found to be responsible for decrease in the production of banana in India.

B) MEASURE OF INSTABILITY

i) Measure of Instability in area, production and productivity of Banana in India and Tamil Nadu

Instability analysis on the area, production and productivity of banana for period of ten years was carried out. Instability measures such as co – efficient of variation. Cuddy-della valle index and Coppock index were determined and presented in Table – 3

Table – 3 Measure of instability in Area, Production and Productivity of Banana in India and Tamil Nadu

S.No	Measure of Instability	India			Tamil Nadu		
		Area	**Production**	**Productivity**	**Area**	**Production**	**Productivity**
1	CV	4.06	4.93	3.00	21.04	49.98	21.73
2	Cuddy – Della Valle Index	0.46	0.49	0.300	0.42	0.99	0.434
3	Coppock Index	3.65	6.91	5.30	16.65	33.23	20.66

The fluctuation in agriculture measured with the help of simple co- efficient of variation (CV) but often contains the trend component and thus over times the level of instability in time series data characterized by long term trend. The overcome this problem , this study used Cuddy-Della and Coppocks instability Index which correct the co-efficient of variation.

The estimated Cuddy – Della Valle instability indices for India as well as Tamil Nadu were found to be higher in production (0.49 and 0.99) followed by area (0.46 and 0.42). The co-efficient of variation (CV) and Coppock's instability index techniques were employed. The CV was found to be more in production both in India and Tamil Nadu (4.93 and 49.98) followed by area and productivity. The Coppock Index was found to be more in production (33.23 and 6.91 in Tamil Nadu and India) followed by productivity and area respectively.

4. CONCLUSIONS

The present study was undertaken with a view to analyse trend, growth and stability of banana in decade's periods of India and Tamil Nadu. The area and production of banana increased in India but the productivity was declined in the same decade period. The interaction effect of area and yield and yield effect were found to be a major contributor for decrease in the production of banana in both state and country. Among the three measures of instability, two measures confirmed that the change in production of banana is high rather than area and productivity.

The fruit growing farmers need to be properly educated about the techniques of growing of banana with minimum cost. Efficient crop management could increase the profit of local farmers by reducing the production cost. The fluctuation in the production of banana and instability in export volume may be reduced by providing training on storing the fruits and production of value added products. Government also used to formulate the policy to support fruit growers by announcing minimum support price and by providing cold storage facilities at minimum cost and subsidies for exporting fruits to other countries.

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