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Growth and Instability of Fruit Production in Tripura, India

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ABSTRACT

A major share of fruit production in Tripura has been contributed mainly by jackfruit, mango, pineapple and orange. Fruit production constitute 39% of total horticulture production. The study primarily focuses on growth rate and variability of fruit production overtime i.e., from 1988-99 to 2017-18. Data analysis have been done by employing log-liner model for Compound Annual Growth Rate and Cuddy and Della Valle Index for variability / Instability. The findings of the study are positive growth rate for Area (5.3%) and Production (3.4%) but negative in case of productivity (-1.8%) and instability index shows relatively high variability in case of Area (0.17) to Production (0.14) and Productivity (0.13). These phenomena of negative growth rate of Productivity and overall instability are attributed to fall in production than area and overall rise and sudden fall in area and production in the later time period considered.

Key words: Fruit, Production, Tripura, Growth, Instability

The Cultivation of fruit is one of the important and age-old practice in India. India is one of the major producers of fruits in the world and also known as fruit basket of world. India is also a major exporter of fruits. The country has exported 326 k mt of fresh fruits (excluding Grapes and Mango) worth of 1573.26 crores during the year 2017-18 [1]. India has varieties of fruit items due to its various agro-climatic conditions, and it accounts for 13 per cent of world's total fruit production [2]. Tripura is a 3rd smallest state in India, in the state, there are several fruits suitable to its humid sub-tropical type of climate. Major fruit crops seen in the state are mango, orange, jackfruit, pineapple, papaya etc. In the year 2017-18, the total area under fruit cultivation is 44,457 hectares, the production quantity is 478 k mt and it accounts to 0.56 percent of total fruit production in India [3]. The Directorate of Horticulture and Soil conservation is a State Government body which promotes and keep record of the fruit production. Horticulture, particularly Fruit cultivation with its comparatively least annual cost of cultivation improves the economic condition of farmers and entrepreneurs, supply of raw materials to Agro-food processing industry, enhancing export and above all providing nutritional benefits to people [4]. The objective of the paper is to analyse the growth and variability in area, production, productivity and distribution of fruits in Tripura.

The study is based on secondary data. The data has been collected from the Directorate of Horticulture and Soil Conservation (DH&SC), Govt. of Tripura and Economic and Political Weekly (EPW) database. 20 years' time series data of area under cultivation, production and productivity of fruit starting from 1998-99 to 2017-18, a cross sectional data pertaining to all districts and different fruits type in Tripura have been done. The study employs semi-log model to analysis the Compound Annual Growth Rate using Cuddy and Della Valle Index and also simple representation statistical tools like table, bar and pie diagram etc.

The description of model and formulae use are as follow:

$$\text{Log } Y = \alpha + \beta t$$

Where;

Y = Dependent Variable (Area, Production and Productivity)

t = Independent Variable (Time)

α = Intercept and

β = Sloe coefficient

Compound annual growth rate

$$\text{CAGR} = [\text{Anti-Log } (\beta) - 1] \times 100$$

Where;

β = slope coefficient (Semi-log model)

Cuddy and Della Valle Index

$$\text{CDVI} = \text{CV} * \sqrt{1 - \bar{R}^2}$$

Where;

C V = Coefficient of variation,

\bar{R}^2 = Coefficient of Determination adjusted by degree of freedom.

MATERIALS AND METHODS

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RESULTS AND DISCUSSION

Based on the model and formulae mentioned above, in this section presents analysis of secondary data (time

series and cross sectional) pertaining to fruit distribution, growth and instability in Tripura and area, production and productivity of fruits analysis is done by using simple statistical tools.

Table 1 Share of different fruits in total area, production and its productivity in Tripura

Category	Mango	P-Apple	Orange	J-Fruit	Banana	Litchi	Lime	Papaya	Sapota	Musambi	Guava	Others	Total
Area (%)	19.6	12.6	12.5	23.1	4.1	4.1	10.7	5.9	0.3	2.5	1.6	2.9	100
Production (%)	26.5	5.3	28.3	22.8	1.3	1.3	5.1	5.5	0.2	0.5	0.7	2.4	100
Productivity	14.5	4.51	24.3	10.6	3.47	3.47	5.07	10.0	6.31	2.32	4.85	8.93	10.7

Source: DH&SC Govt. of Tripura, 2017-18
Note: Productivity is not in Percentage term

The above (Table 1) provides distribution of different fruits in terms of area, production and their productivity of Tripura in the year 2017-18. There are 11 major fruit and the rest grouped as others are recognized by DH & Sc. From the above table it’s observable that Jackfruit constitute the largest area under cultivation (23.1%) followed by mango (19.6%), pineapple (12.6%), orange (12.5%) and the least area among them is sapota (0.3%). In terms of production,

orange constitute largest share of production (28.3%), followed by mango (26.5%), jackfruit (22.8%) and the least production is sapota (0.2%). Unlike area and production, productivity is based on the ratio between production (MT) and area (ha), where orange has the highest productivity, followed by mango, jackfruit, papaya and the least productive is mausambi [5].

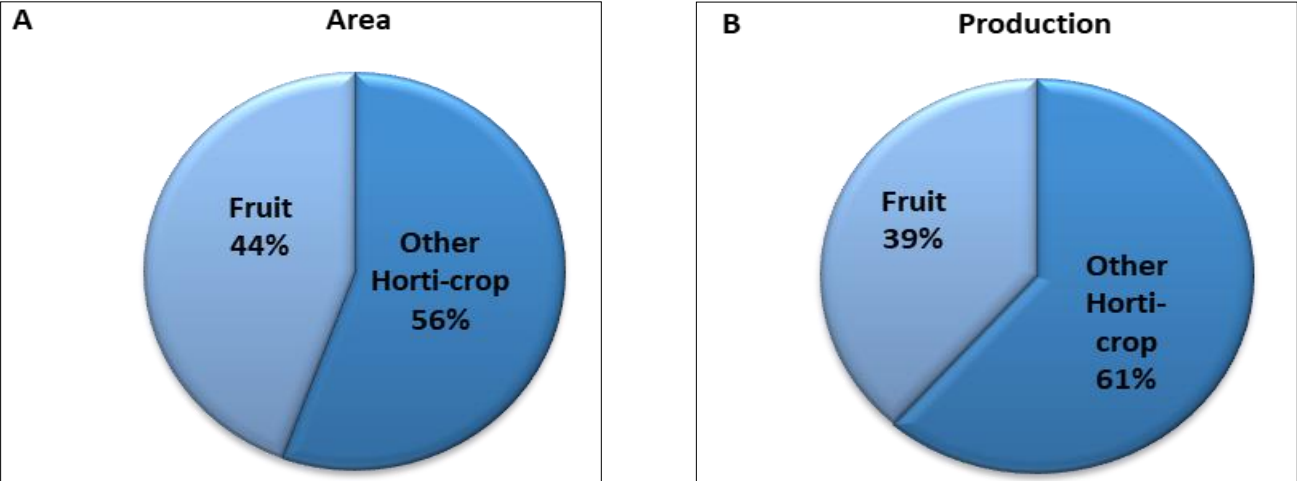


Fig 1 Share of total fruits in total horticulture in area and production
Source: DH&SC Govt. of Tripura, 2017-18

The above (Fig 1A-B) shows percentage share of fruit area in total area under horticulture and fruit production in total horticulture production. (Fig 1A) shows that out of total area under horticulture cultivation in Tripura 44.4% of area constitute fruit cultivation. Similarly, in case of production

quantity, out of total horticulture production 38.5% constitute fruit production. Implication that stands out from the above figure is that relatively fruit productivity is less than other horticulture crop [6-7].

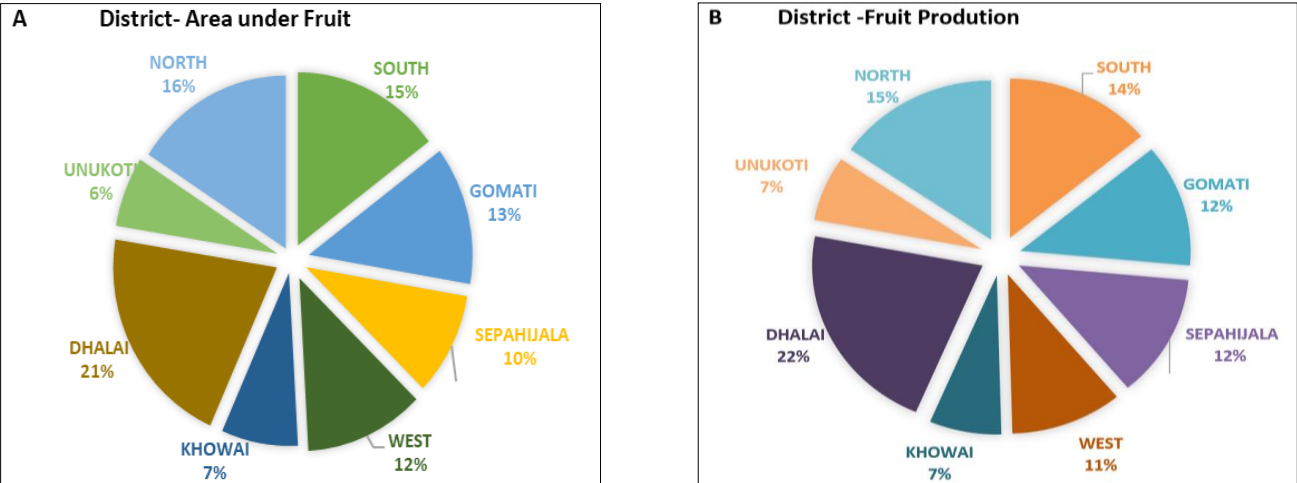


Fig 2 District-wise distribution in area and fruit production
Source: DH&SC Govt. of Tripura, 2017-18

The above (Fig 2A-B) presents share of different blocks in area and fruit production. There are 8 districts in Tripura, among them, in term of area under fruit Dhalai has the highest (21%) followed by South, North and Gomati, and in terms of production, again Dhalai has the highest (22%) followed by North, South, Gomati.

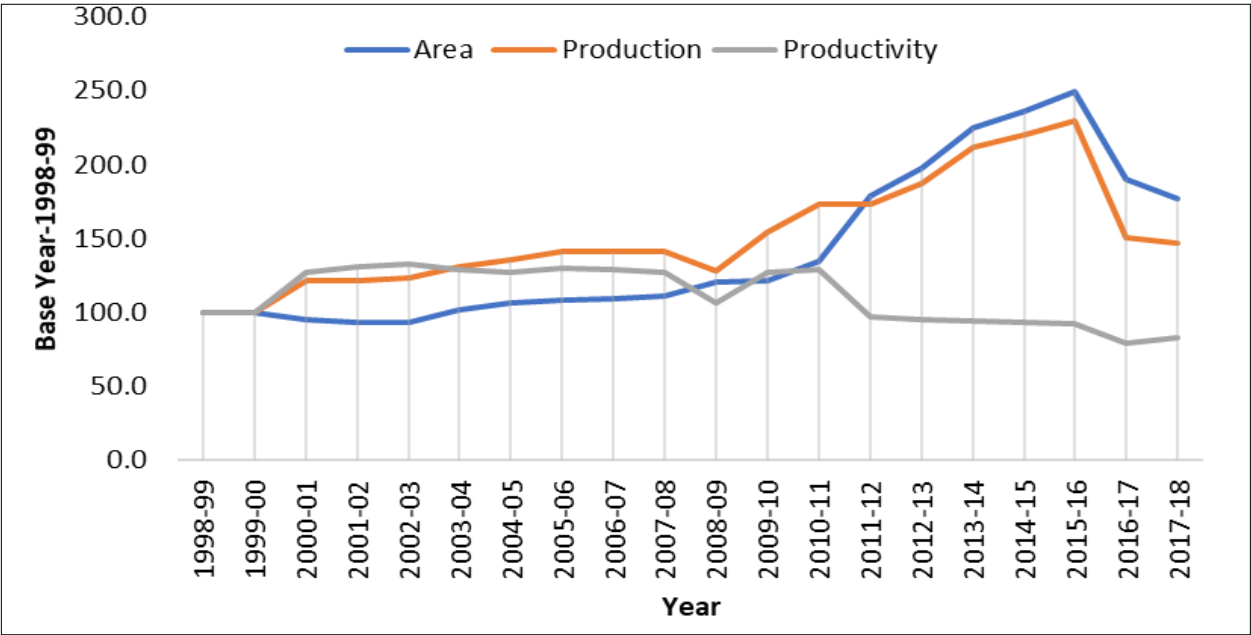


Fig 3 Trend in production, area and productivity of fruits in Tripura during 1998-99 to 2017-18
Source: <http://epwrfits.in> (1998-99 to 2017-18)

The (Fig 3) presents trend in area, production and productivity of fruit in Tripura from 1998-99 to 2017-18. From the figure it is evident that from the initial period to 2007-08 production, area and productivity are more or less constant, but production maintains a higher growth than area in this period. From 2008-09 to 2011-12 there is ups and downs in area and production, and so the productivity as well, and from 2011-12 onwards there is a steady rise till in 2015-16 followed by a sharp fall in in the later period. Implication that stands out from the above figure are growth of production and area are not steady, especially the later period witnesses a steep fall [8]. However, productivity is slightly constant as the irregularity in growth of area and production follows same pattern.

Table 2 Compound growth rate of fruit production during 1998-99 to 2017-18

Category	Area	Production	Productivity
P Value	0.000000089	0.0000077	0.0019
Model	$\ln Y=3.16+0.05\ t$	$\ln Y=5.9+0.03\ t$	$\ln Y=2.7-0.01\ t$
CAGR (%)	5.33	3.34	-1.89

Note: All models are significant at 1% level

The above table presents primarily the compound annual growth rate based on a model provided. The growth rate is for the time period of 1998-99 to 2017-18 i.e., 20 years. It is evident from the table that CAGR of area under fruit cultivation is 5.33, which is higher than the growth rate of production quantity and productivity, in fact, growth rate of productivity is negative (-1.89), this is due to the steep fall in production quantity than area in the later period of time period considered. Thus, in the recent past the state has been experiencing slowdown in growth of area, production and a particularly concern matter is the negative growth of productivity [9].

Table 3 Instability of fruit production in Tripura

Parameters	Area ‘000’ ha	Production (‘000’mt)	Productivity
Mean (μ)	43.31	563.91	13.64
STDV (σ)	16.01	137.88	2.30
C V	0.37	0.24	0.17
\bar{R}^2	0.79	0.66	0.38
CDVI	0.17	0.14	0.13

The above table primarily presents the instability index of fruit production, area and productivity by Cuddy Della Vella Index (CDVI). The other parameters Mean, Standard Deviation and Adjusted R^2 presented in the table determined the instability index. Instability index shows that area under fruit cultivation is comparatively unstable than production and productivity. Productivity being less unstable is due to minimum difference between overtime growth rates of area and production. High instability of area and production is due to steady rise and sudden fall of area

and production in the later period considered, and this phenomenon of rise and steep fall is more noticeable in case of area, thus highest instability [10-11].

Orange constitutes largest share of production (28.3%), followed by mango (26.5%), jackfruit (22.8%) and the least production is sapota (0.2%). Fruit production constitute 38.5% of total horticulture production. Among eight districts, Dhalai district has the highest quantity of food production. CAGR of area under fruit cultivation is 5.33%, production is 3.34% growth rate of productivity is negative (-1.89%), the negative growth rate of productivity and low growth rate of production is due to unsteady growth and drastic fall of production in the later years of time period considered (Vide serial no. D : Trend in area, production and productivity). Instability index presented by CDVI shows that, area under cultivation is the most

unstable, followed by production and productivity [12]. Similar to case of growth this instability is also attributed to the unstable growth in the later years.

CONCLUSION

The study presents growth and instability of fruit production in Tripura where in the recent past there has been sharp fall in fruit production, which affect the overall parameters of the findings. However, the initial period to middle period of the time period considered witness relatively stability of fruit production. Therefore, the state has to put more emphasis on promoting fruit production in present time, and also revive the productivity level by providing incentives and also marketing support to the cultivators.

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