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Estimate the Compound Growth Rate of Area, Production, and Productivity of Papaya in Bilaspur District of Chhattisgarh

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A B S T R A C T

Fruit growing is one of the important and age old practices, practiced in India since ancient times. Cultivation of fruit crops plays an important role in overall status of the mankind and the nation. The standard of living of the people of a country is depending upon the production and per capita consumption of fruits. Most of the fruits are consumed as food in fresh and processed form. The importance of fruit production for the economic development of a country can be seen in its contribution to the gross domestic product (GDP) and employment through agriculture. Most less-developed countries depend on agriculture as a major source of income and employment. The trend in area, production and productivity of papaya was estimated by computing linear equation for the period of 2007-08 to 2016-17. The area of papaya increased from 1602 hectares in 2007-08 to 1889 hectares. In 2016-17 showing a tremendous increasing in the area of papaya, the production of papaya also increased from 32,144 metric tonnes in 2007-08 to 46,590 metric tonnes in 2016-17. The productivity of papaya varied from 20.06 to 24.66 tonnes per hectare during this period. The improvement in productivity was due to new improved variety of papaya, availability and inputs in the study area.

Introduction

As a consequence of research and policy initiatives, India continues to be the second largest producer of fruits with a share of about 13.6 per cent to the worldwide fruits production. Due to its significant share in the worldwide horticultural production, India is very well recognized as fruits basket of the world.As per the NHB database (2016-17) India produced about 92.8 million tonnes of fruits with 6.40 million hectares land under fruits cultivation. The major fruit crops grown in Chhattisgarh state are Mango, Guava, Lime, Litchi, Cashew-nut, Cheeku etc. The total area of the fruit crops in the state is" 26,1,512 hectares. Along with the production of 25,92,450 million tonnes in the year 2017-2018.Fruit production in Chhattisgarh contributes 25.27 per cent of total horticultural crops. Mango is having highest area among the fruit crops followed by

banana, papaya,and guava while in terms of fruit production. The highest papaya fruit production in state with 51,221 metric tonnes in Durg district and area under papaya cultivation Bilaspur district ranks first with 1,959 hectares. The value in human consumption, horticultural crops play an important role in commerce, particularly in export trade and processing industry. Horticulture is "now regarded as the largest sub-sector of agriculture producing high quality traditional and exotic fruits. Employment opportunities provided by this sector to the farm population engaged in production, transportation, processing and marketing operations in addition to the entrepreneurs seeking self-employment. Keeping in view its importance much emphasis has been laid to augment the production of horticultural crops in our national plans.

Materials and Methods

The current study made use of secondary time series data on area, production and productivity from 2007-08 to 2016-17 was collected from various issues of horticulture data of National Horticulture Board (NHB), Agricultural and Processed Food Products Export Development Authority (APEDA) and Directorate of Horticulture Government of Chhattisgarh. To estimate growth rate of area, production and productivity under study in papaya fruit.

Estimation of growth rates

Annual compound growth rates in area, production and productivity of papaya fruit were estimated from 2007-08 to 2016-17 in the study area, all the agro climatic zones and for Chhattisgarh state by fitting an exponential function of the following form;

$$Y=ABt$$

Where,
Log y= log A+ t log B
Y= Area, production and productivity
A= Constant.
B= Regression coefficient.
t= Time in year.
Compound growth rate has been estimated as;
r = {antilog (in b) - 1}*100

Results and Discussion

Status of papaya

The main focus of this paper is to examine how year to year fluctuations in area, production and productivity of papaya fruit in Chhattisgarh state of India and what is the effect of newly ongoing horticultural development programmes on the its instability. The present status of papaya in depicted by district and Chhattisgarh as a whole through tabulation of area, production and productivity for the year 2016-17 which is given in table 1 it reveal that total area under and production of papaya cultivation in Chhattisgarh state is observed as 14,408 hectares and 38,0445 metric tonnes.

Bilaspur, Mahasamund and Raipur district are major papaya growing districts which are jointly contributing more than 36.69 per cent area to total area and 36.85 per cent production of papaya in the Chhattisgarh state. The area under papaya cultivation in these three districts is observed as 1889 hectare, 1815 hectare and 1156 hectare area respectively of total area of the state. Similarly, the production of these three districts is estimated at 98,092 metric tonnes of the total production in the state. Durg is the highest papaya producing district of Chhattisgarh however it is due to large area under papaya cultivation.

Trend in area, production and productivity of papaya in Bilaspur District and Chhattisgarh state

The trend in area, production and productivity of papaya was estimated by computing linear equation for the period of 2007-08 to 2016-17 and which is presented in table 2, figure 1, 2 and 3. The area of papaya increased from 1602 hectares in 2007-08 to 1889 hectares in 2016-17 showing a tremendous increasing in the area of papaya, the production of papaya also increased from 32,144 metric tonnes in 2007-08 to 46,590 metric tonnes in 2016-17. The productivity of papaya varied from 20.06 to 24.66 tonnes per hectare during this period. The improvement in productivity was due to new improved variety of papaya, availability and inputs in the study area.

Table.1 Area, production and productivity of papaya in Chhattisgarh state (2016-17)

District	Area	Production	Productivity
Raipur	1156 (8.02)	46818 (12.30)	40.05
Balodabazar	972 (6.74)	21839 (5.74)	22.46
Gariyaband	0 (0.00)	0 (0.00)	0.00
Mahasamund	1815 (12.59)	4684 (12.31)	25.80
Dhamtari	450 (3.12)	3744 (0.98)	8.32
Durg	1300 (9.02)	51400 (13.51)	39.53
Balod	177 (1.22)	7104 (1.86)	40.13
Bemetara	655 (4.54)	26335 (6.92)	40.20
Rajnandagoan	355 (2.64)	6568 (1.72)	18.50
Kabirdham	270 (1.87)	3259 (0.85)	12.07
Jagdalpur	100 (0.69)	2518 (0.66)	25.18
Kondagoan	353 (2.45)	8507 (2.23)	24.09
Kanker	210 (1.45)	3385 (0.88)	16.11
Dantewada	44 (0.30)	1084 (0.28)	24.63
Sukma	30 (0.20)	300 (0.07)	10.00
Bilaspur	**1889**	**46590**	**24.66**

	(13.11)	**(12.24)**	
Mungeli	500 (3.47)	13816 (3.63)	27.63
Janjgeer	758 (5.26)	17358 (4.56)	22.89
Korba	102 (0.70)	3488 (0.91)	34.19
Raigarh	354 (2.45)	12213 (3.21)	34.05
Jaspur	110 (0.76)	2585 (0.67)	23.05
Surguja	600 (4.16)	8855 (2.32)	14.75
Balrampur	988 (6.85)	18771 (4.93)	18.99
Koriya	600 (1.16)	14625 (3.84)	24.37
Narayanpur	201 (1.39)	6030 (1.58)	30.00
Bijapur	165 (1.14)	660 (0.17)	4.00
Surajpur	254 (1.76)	5752 (1.51)	22.64
Total	**14408 (100.00)**	**380445 (100.00)**	

Source: Directorate of Horticulture, Chhattisgarh
Note: Figures in the parenthesis indicate the percentage area of papaya.

Table.2 Area, production and productivity of papaya in Bilaspur district

S.NO.	Years	Area (in ha.)	Production (mt)	Productivity (t/ha.)
1	2007-08	1602	32144	20.06
2	2008-09	1750	32147.5	18.37
3	2009-10	1785	32243.94	18.06
4	2010-11	1785	40341	22.60
5	2011-12	1578	43480.5	27.55
6	2012-13	1626	44133	27.14
7	2013-14	1785	44195	24.76
8	2014-15	1810	47885	26.46
9	2015-16	1875	46410	24.75
10	2016-17	1889	46590	24.66

Table.3 Area, production and productivity of papaya in Chhattisgarh state

S.NO.	Years	Area (in ha.)	Production (mt)	Productivity (t/ha.)
1	2007-08	7409	136077	18.37
2	2008-09	8063	148117	18.37
3	2009-10	3341	211734	63.37
4	2010-11	10597.3	247051	23.31
5	2011-12	11042.8	268308	24.30
6	2012-13	11884	289886	24.39
7	2013-14	11459	286844	25.03
8	2014-15	12410	245788	19.81
9	2015-16	13722	341932	24.91
10	2016-17	14408	380445	26.40

Table.4 Compound growth rate of area, production and productivity of" papaya in Bilaspur district and Chhattisgarh state

S.No.	Particular	Compound growth rate (2007-08 to 2016-17)	
		Bilaspur district	Chhattisgarh state
A	Area	1.26*	10.57*
B	Production	5.08**	10.40*
C	Productivity	3.77**	-0.12

Note: *significant in 1% level of probability, **significant in 5% level of probability

Fig.1 Area of papaya in Bilaspur district

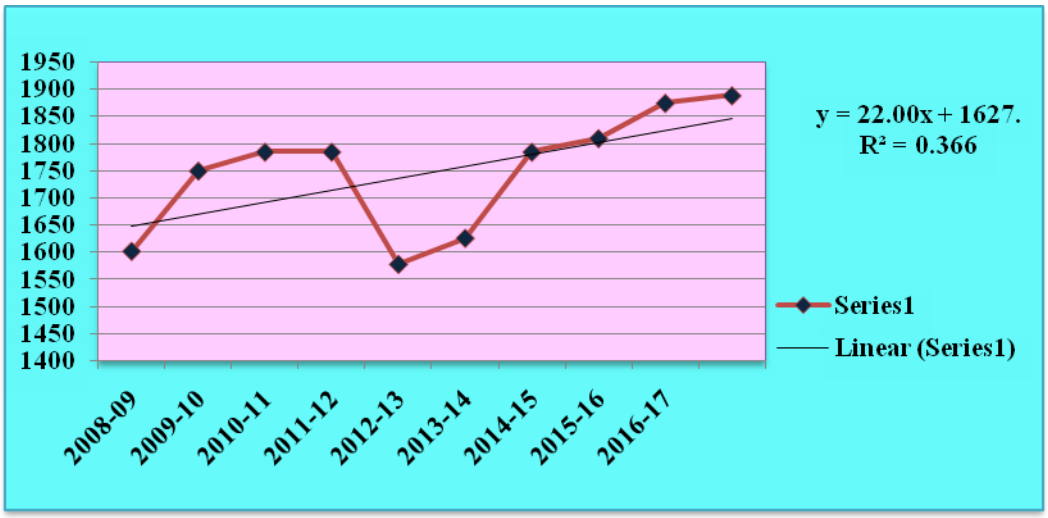


Fig.2 Production of papaya in Bilaspur district

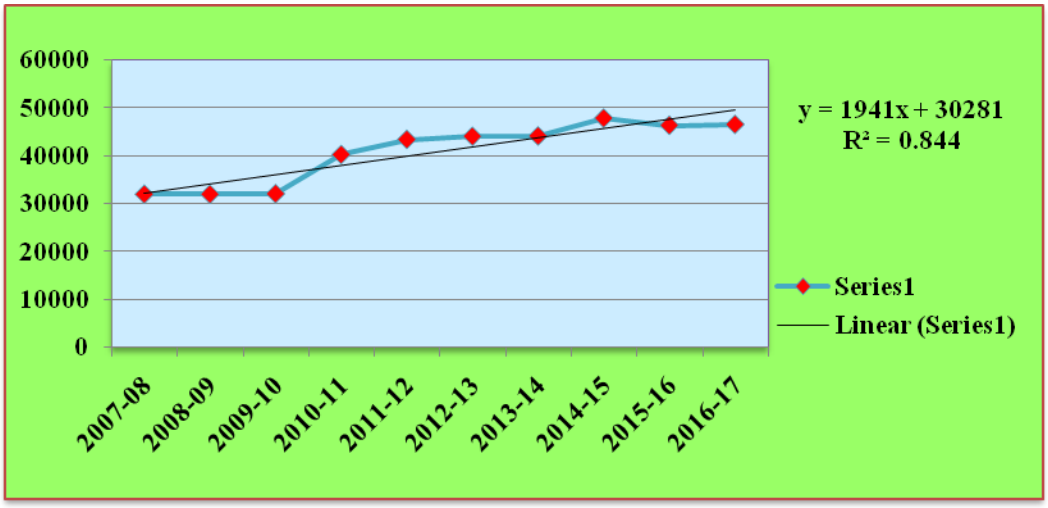
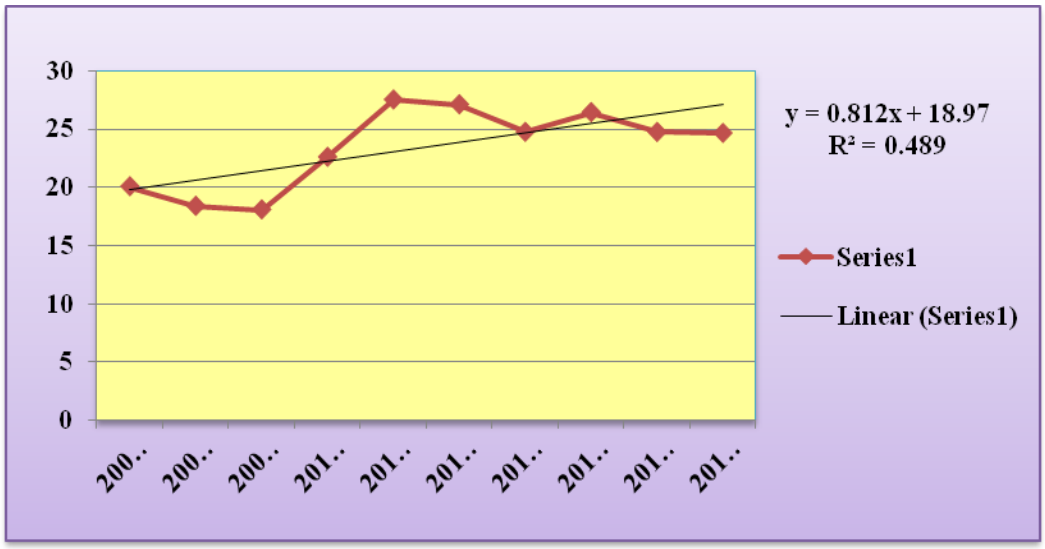


Fig.3 Productivity of papaya in Bilaspur district



Compound growth rate in area, production and productivity of papaya

The compound growth rate was computed on the basis of 10 years secondary data of area, production and productivity ofpapaya (2007-08 to 2016-17). It is presented in growth in area of papaya in Bilaspur district was found 1.26 per cent which were significant at 1 per cent, production and productivity of papaya in Bilaspur district was found 5.08 and 3.77 per cent respectively which were significant at 5 per cent probability level of distribution. It can be inferred from the result that significance increased in growth of production was due to significance increase in area and productivity of papaya.

The growth in production of papaya in Chhattisgarh state was found in 10.40 per cent which was attributed by significantly increase in area by 10.57 per cent only write growth in productivity was found to be negative and non-significant (Table 4).

In conclusions, compound growth rate in area, production and productivity of papaya was found positively significant in Bilaspur district of Chhattisgarh state. The growth rate was varied significantly among the fruits. Increased in area rather than yield of individual fruit was mostly responsible for changing the output growth significantly between the periods. Reasons for increased the growth rates might be accelerated to create awareness and profitability of those fruits. Similarly, reasons for lower growth rates of the selected fruits might be responsible for lower adoption of improved varieties and lack of improved management practices.

Recommendation and Policy Implications

1.Demonstrate various applications like drip irrigation, green house construction, plastic mulching at Government farms and farms belonging to ICAR Institutes, State Agricultural Universities, NGO's and progressive farmers.

2.The NHB was promote integrated development of horticulture, to help in coordinating, stimulating and sustaining the production and processing of fruits and vegetables and to establish a sound infrastructure in the field of production, processing and marketing with a focus on post-harvest management to reduce losses.

3.Conduct applied research, and organize training programme through Plasticulture Development Centres (PDCs).

4.Assist R&D programmes to develop products suited for specific varieties with improved methods and horticulture technology.

5.Provide training and education to farmers and processing industry personnel for improvement of agronomic practices and new technologies.

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