



## **Analysis Growth Rate in Area, Production and Productivity of Sapota in Gujarat, India**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The present investigation was "Analysis growth rate in area, production and productivity of Sapota in Gujarat". A multi stage random sampling design was used for selecting the sample. The study covered 2 Districts, 2 talukas, 12 villages and 120 Sapota growers from Valsad and Navsari districts. The primary data were collected for the season of 2011-2012 by personal interview method. In the results revealed that the Valsad and Navsari districts were found to having positive growth rate in area and production (0.20 and 0.73 per cent and 1.59 and 2.30 per cent, respectively). While the productivity of both the districts was positive viz., 0.54 and 0.70 respectively. On the contrary, a lower but positive and significant growth rate was observed in sapota area for the state as a whole, whereas the production and yield showed positive trend (2.01 and 2.55 respectively). The per hectare total cost of establishment for four year were Rs. 75387.59 for the orchards in Valsad district and Rs. 74025.27 for the orchards in Navsari district. The maintenance cost worked out to be as Rs. 56326.59 and Rs. 55298.27 in Valsad and Navsari district respectively. The average per ha yield from Valsad district was 10.61 tonnes and from Navsari district was 11.11 tonnes in 6<sup>th</sup> year and net returns were Rs. 113527 from Valsad district and Rs. 118877 from Navsari district.

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## 1. INTRODUCTION

India is endowed with different agro-climatic conditions that offer immense scope for cultivation of various kinds of fruit crops. This provides an excellent platform for the country to emerge as a leading producer of fruit crops. The fruit crops have established their credibility through by improving the economic condition of farmers and entrepreneurs, enhancing exports as well as providing nutritional security to people. This has assumed special significance in the context of liberalized global economy and establishment of World Trade Organization (WTO”).

Horticultural industry is fast emerging and the most remunerative sector for changing the aged-old subsistence farming especially in the rainfed, dry lands, hills, arid and coastal agro-ecosystems. The horticultural crops are characterized by high productivity, higher returns, higher potential for employment generation and exports, comparatively lower requirement of water and easy adaptability to adverse soil and waste land situations.

Pomology (cultivation of fruits) is one of the important branches of horticulture and fruits are the man's oldest food. Fruits are the prime source of vitamins and minerals without which human body cannot maintain proper health and resistance to the diseases. Indian Council of Medical Research (ICMR) has recommended the consumption of at least 92 grams of fruits per day and as much variety as the season permits. On the contrary, the per capita consumption of fruits in India is only 46 grams per day. The major fruit crops grown in India are mango, banana, citrus, grapes, guava, papaya, sapota, pomegranate, jack, ber, aonla etc.

### 1.1 Status of Sapota as Commercial Proposition

Fruits are a part of Indian heritage and culture. Sapota (*Manilkara achras* (Mill.) Fosberg) is one of the important tropical fruits belonging to the family sapotaceae. It is called by many names VIZ., chikku, sapodilla plum, zapota, and noseberry. It is said to be the native of southern parts of Mexico and it spread to other countries such as Philippines, Malaysia, United States, Sri Lanka, India and Caribbean Islands. At present, it is cultivated in all the tropical countries of the world .

As a part of new agricultural strategy towards diversification, horticulture has given a big boost both at central and state levels. Gujarat has a wide variety of soil, rainfall pattern, temperature regimes and irrigation availability. This diverse agro climatic situation across the state holds promise for development of the horticulture sector in a big way. The horticultural production has registered more than 10 per cent growth in the state during the last decade.

Gujarat is the third largest sapota producing state in the country accounts for 20.2 per cent of the total production of sapota. The state produces about 0.29 m MT of sapota from an area of 0.03 m hectare having productivity of 10 MT/ha. Major sapota producing belts in the state are Valsad, Navsari, Kheda and Bhavnagar. Major cultivation of sapota in the state are Kalipati, Bhuripati, Pillipatti, Dhola Diwani, Jhumakhia and Cricket ball. 0.23 lakh MT of sapota have been traded in organized markets with average price of Rs. 18.86/kg.

In South Gujarat 60 per cent area under sapota cultivation only in Navsari district. The area under sapota cultivation is 6000 ha and 3000 ha in Navsari and Valsad districts respectively in year 2012 as can u seen from table: 1 The districts wise acreage is shown in table: 1The rapid increase in sapota cultivation is observed nearby the towns and suburbs of the cities in South Gujarat, which is due to good co-operative network and facility for perennial irrigation in the region.

The tree bears flowers all the year round and flowering is more profuse after the rains. It is also considered as an erratic and shy bearer.

Owing to its comparative freedom from pest and diseases problems, low cost production, and high nutritive value, it is becoming popular with orchardists. Farmers sell their produce by auction through co-operative societies. Most of the Produce is sold only as fresh fruits, with major market in Surat Delhi. There is good scope for exporting this fruit to Arabian countries and thus enables the country to earn a handsome foreign exchange.

## 2. REVIEW AND LITERATURE

### 2.1 To Analysis Growth Rate in Area, Production and Productivity of Sapota in Gujarat

Subrahmanyam [1] carried out the analysis of the growth in horticultural crops over a period of 1945-46 to 1980-81 and observed that it was not sufficient to meet the requirement based on the suggested level of consumption. He further noticed that though there is a positive significant growth at India level, the position of individual state is not satisfactory and some of them have recorded negative growth rate. Particularly proper growth of fruits and vegetables, it is essential to remove some of the economic constraints which arise due to peculiar nature of these crops and there is a good scope for increasing the area as well as productivity by improved package of practices.

Raju *et al.* [2] estimated that compound growth rates of area (1967-83) and production (1970-83) for fruit crops by fitting the semi log function in Andhra Pradesh. The year to year fluctuations in area and production of fruit crops were studied with the help of index numbers and their percentage changes from the previous years. The production of grapes had showed a phenomenal increase in 329 per cent in 1973-74, the index stood at 511 per cent in 1982-83. From 1974-75 to 1977-78 there was a continuous falls in production by 27.00, 24.00, 39.00, 3.88 and 8.64 percent, respectively. Early 1980s witnessed an increasing trend in grape production. Though the area under grapes which was concentrated only in two districts (Ranga Reddy and Ananthpur) increased in absolute term, its growth rate was negative and non-significant (-2.44). The compound growth rate of grape production was 12.09 percent and statistically significant.

More [3] studied the growth rate in area, production and productivity of banana in Nanded district, Parbhani district and Maharashtra state as a whole. In Nanded district production growth rate had shown higher growth rate (21.04 per cent). The higher growth in production was contributed mainly by significant increase in area coupled with productivity. The growth rate of productivity was high (1.43 per cent) in Maharashtra state as compared to Nanded (1.40 per cent) and Parbhani (0.90 percent) district. It was due to the use of improved cultural practices, higher use of manures and fertilizers,

more use of other inputs and also increased yield levels in other districts of the state.

Gangal [4] studied the growth rate in area, production and productivity of banana in north Karnataka and Karnataka state as a whole. The growth rate in area (6.69 per cent) in Karnataka state between 1980 and 2000 was substantially higher than all the other major banana growing states and all India average .

Shivanand [5] studied the growth rate in area, production and productivity of banana in north Karnataka and Karnataka state as a whole. The growth rates in area (6.69%) in Karnataka state between 1980 and 2000 were substantially higher than all other major banana growing states and all India average.

Varghese [6] conducted a study on trend analysis in area production and productivity and price behaviour of cardamom in Kerala. He reported that the percentage annual trend growth rate of area production and productivity of cardamom are -1.216, 414 and 5.512 respectively .

Saraswat and Rane [7] conducted a study on production and marketing of peach fruit : a case study of Rajgarh area of district Sirimour in Himachal Pradesh 50 farmers were randomly selected for the detailed study. The compound growth rate with respect to area and production shows that the area under peach increased at the rate of 4.31 per cent per annum. The highest area under peach was recorded in Sirmour district, whereas district Mandi registered the highest rate of production growth in the state i.e., 9.32 per cent per annum. The district wise production scenario indicate that there are variations out of 12 district only 4 district have registered a positive growth in production i.e., Solan (22.55%) followed by Una Bilarpur and Mandi.

Kareemulla *et al.* [8] conducted a study on production and marketing of Indian Gooseberry – AONLA (*Emblic officinalis* Gaertn.) in Pratapgarh district of Uttar Pradesh. He reported that the area occupied by amla based farming system grew at a growth rate of 4.02 per cent during the period 1995-2005. The production of aonla has increased from 47329 to 82690 tonnes in the reference period at a growth rate of 5.2 per cent and the average productivity increased from 5.7 to 6.5 t per ha.

### 3. MATERIALS AND METHODS

#### 3.1 Description of the Study Area

Gujarat is one of the largest state in India with an area of 190 lakh ha. It is situated between 11.5° & 19.0° N latitude and between 74° and 78° E longitude in the southern plateau. The State receives the average annual rainfall of about 1139 mm both from southwest and north-east monsoon. The important crops grown in the state are rice, maize, bajra and wheat among cereals; redgram, greengram, tur among pulses; groundnut, sunflower and castor among oilseed crops and cotton, sugarcane and tobacco among commercial crops. Gujarat comprises 26 districts, of which 5 districts are located in Northern parts of the state, two districts namely Valsad and Navsari districts from North Gujarat are chosen for study purposively due to higher concentration of area under sapota .

##### 3.1.1 Valsad district

The district is lies between 20.07° and 21.05° N latitude, 72.73° and 73° E longitudes. It is bounded on the north by Navsari district and in

west Daman, Gulf of Khambat and Arabian Sea. On the east it is bounded by Dang, Tapi and Maharashtra border and on the South by Maharashtra border. The total geographical area of the district is 2939 sq.km.

The average annual rainfall distribution is 2000 mm. It comes under Zone III. Temperature ranges 10° Centigrade (Minimum) and 40° Centigrade (Maximum). Among the commercial crops Rice, cotton and sugarcane are more popular. Major horticulture crops being produced in the district are mango, cucurbits, sapota, banana etc.

##### 3.1.2 Navsari district

Navsari district falls in the north part of Gujarat state It is lies between the North latitudes of 20.07° to 21.00° and East longitudes of 72.43° to 73.00°. It is bound on the North by Surat district, while on the South by Valsad district, on the East by Dang, Tapi district and on the West by Gulf of Khambhat and Arabian Sea. Area of Navsari district about 2,196 sq. km; and average rainfall is 2000 mm. It comes under Zone III.



Fig. 1. Study location



Fig. 2. Navsari district

Temperature ranges 10° Centigrade (Minimum) and 40° Centigrade (Maximum). The total geographical area of the district is 2196 sq.km. Navsari is the largest producer of sapota contributing 20 % to total State production and second largest producer of mango with a share of 17% in State production. Among the commercial crops Rice, cotton and sugarcane are more popular. Major fruit crops grown in this area are cucurbits, banana, guava, papaya, etc.

### 3.2 Sampling Procedure

North Gujarat was purposively selected for undertaking the study in Gujarat state. A multistage purposive sampling procedure was adopted for the purpose of selection of representative districts, taluks and villages. Which are detailed below:

#### 3.2.1 Selection of the study area

Sapota has been cultivated in 5 districts of North Gujarat. However, the large -scale cultivation of

Sapota is concentrated primarily in Valsad and Navsari districts. These two districts together (9200 ha) accounted for 21.72 per cent area in the North Gujarat. These districts are agro - climatically almost homogeneous. Hence, these two districts were specifically selected for the study .

#### 3.2.2 Selection of the sample taluks

Sapota is cultivated in all taluks of Valsad and Navsari districts. However, the large -scale cultivation of sapota is concentrated in Valsad and Pardi in Valsad district; Gandevi and Navsari taluks in Navsari district. Hence, these taluks were selected for the study .

#### 3.2.3 Selection of the sample villages

From the selected sample taluks of Valsad and Navsari districts a list of villages having more area under sapota is prepared in consultation with the Assistant horticulture officers of the selected taluks.

**Table 1. District wise Area, Production and Productivity of Sapota in South Gujarat during 2011-12**

Sr. No.	District	Area (Hectare)	Production (Tonne's)	Productivity (Tonne/Ha)
1.	Navsari	6200	74400	12.00
2.	Valsad	3000	29150	9.72
3.	Surat	2076	20797	10.02
4.	Bharuch	545	4294	7.88
5.	Tapi	72	869	12.07
6.	Narmada	22	183	8.32

Source: Directorate of Agriculture, Gandhinagar. (Government of Gujarat), 2010 to 2012

**Table 2. Village wise selection of sample farmers for the study area**

Sr. No.	Districts	Taluks	Villages	No. of Farmers
1	Navsari	Gandevi	Gandevi	10
			Ancheli	10
			Amalsad	10
			Kachholi	10
			Devdha	10
			Ajrai	10
2	Valsad	Valsad	Valsad	10
			Kosamba	10
			Bhagal	10
			Atakpardi	10
			Atul	10
Total	2 District	2 Taluks	Tithal	10
			12 Villages	120

### 3.2.4 Selection of the sample respondents

The list of sapota cultivators was obtained from the revenue records maintained at the selected villages. A proportionate sample cultivators from each village was selected randomly. In all 120 sapota cultivators were selected from 12 villages of 2 taluks for the detailed study. From each district 60 sample farmers were selected randomly thus forming a total sample size of 120 farmers.

### 3.2.5 Selection of wholesale cum commission agent and retailers

In the study area as a whole, 10 commission agents cum wholesale traders and 10 retailers were selected at random for the study .

## 3.3 Nature and Sources of Data

### 3.3.1 Primary data

The data needed for the study were collected from the respondents by personal interview method using pre-tested schedule. The data pertained to the agriculture year 2011- 12. Majority of the respondents did not maintain records of the expenditure and income from sapota cultivation. Hence, data collected was based on the memory of the respondents. At the time of interviews, personal bias of the sample farmers was minimized by convincing them about the genuinity of the purpose for which the data were collected. The data collected were to fulfill the objectives of the study from the selected respondents. Data were based on the entire operations in establishing and maintaining the Sapota orchards and the consequent costs and returns including marketing. Similarly, the data on marketing aspects from wholesaler -cum -commission agents and retailers were collected by personal interview method with help of structured schedule. Similarly the problems in production and marketing were collected through opinion survey.

### 3.3.2 Secondary data

The secondary data on area, production and productivity of Sapota at district wise in Gujarat were collected for a period of 10 years from 1999 -00 to 2011-12 from Directorate of Horticulture, Gandhinagar, Gujarat.

## 3.4 Analytical Tools and Techniques

To fulfill the specific objectives of the study, based on the nature and extent of availability of

data, the following analytical tools and techniques have been adopted.

1. Tabular analysis
2. Growth rate analysis
3. Financial analysis

### Tabular analysis:

Tabular analysis was adopted to compile the general characteristics of the sample farmers, determine the resource structure, cost structure, returns, profits and opinion of farmers regarding the problems in production and marketing. Simple statistical tools like averages and percentages were used to compare, contrast and interpret results properly.

## 4. RESULTS

### 4.1 To Analysis Growth Rate in Area, Production and Productivity of Sapota in Gujarat

In this section, area, production and productivity of sapota in the major sapota growing districts of the Gujarat state (2011-12) has been presented in Table 3. In this table the area wise ranking are given. The Navsari is the 1st position in area followed by Junagadh, Valsad, Bhavnagar, Surat are on 2nd, 3rd, 4th and 5th position respectively. Area and Production of Sapota are more in south Gujarat than other region. Navsari's Productivity is more than total Gujarat Productivity.

Growth rates of area, production and productivity of sapota in the major sapota growing districts of the state and for the state as a whole has been presented in the Table 4. Acreage under sapota crop in the state increased at a compound rate of 2.01 per cent per annum during the study period.

The growth rate in area and production in important districts as in Navsari, Junagadh, Valsad, Bhavnagar and Surat was 1.59 and 2.30, 2.19 and 2.46, 0.20 and 0.73, 1.83 and 3.36 and 1.13 and 0.61 respectively. It revealed that in higher cultivated area, the growth rate in Area and Production was stagnated at certain extent.

The estimates of growth rates revealed that Sapota production increased in the state at a compound rate of 2.55 per cent per annum. Among the selected districts, production of sapota increased by 0.58 to 11.34 per cent per

annum but the increase in production has been at a pronounced rate only in Dahod district.

Productivity of sapota crop was 0.53 per cent per annum in the state. Among the selected

districts, productivity increased significantly only in Dahod district. In nutshell, there has been decline in productivity of sapota crop in most of the districts of the state.

**Table 3. Area, production and productivity of south in major producing districts of Gujarat during 2011-12 (A in Ha., Prodn in M.T./Ha., Prody in M.T./Ha.)**

Sr. No.	Name of District	Rank (Area)	Area	Production	Productivity
1	Navsari	1	6200	74400	12.00
2	Junagadh	2	4890	45376	9.28
3	Valsad	3	3000	29150	9.72
4	Bhavnagar	4	2805	39355	14.03
5	Surat	5	2076	20797	10.02
6	Kutch	6	1741	21240	12.20
7	Sabarkantha	7	1340	14020	10.46
8	Mehsana	8	1115	9153	8.21
9	Gandhinagar	9	922	11565	12.54
10	Baroda	10	823	8325	10.12
11	Amreli	11	575	4476	7.78
12	Bharuch	12	545	4294	7.88
13	Anand	13	435	3490	8.02
14	Kheda	14	395	3950	10.00
15	Banaskantha	15	389	4099	10.54
16	Jamnagar	16	246	2755	11.20
17	Rajkot	17	245	2954	12.06
18	Surendranagar	18	226	1699	7.52
19	Panchmahal	19	215	1535	7.14
<b>Total</b>			<b>28183</b>	<b>302633</b>	<b>10.74</b>

**Table 4. Growth rate of area, production and productivity of sapota in the study area (1999-00 to 2011-12)**

Sr. No.	Districts	Area	Production	Productivity
1	Amreli	1.32	2.28*	0.95**
2	Banaskantha	6.30	6.27	-0.03**
3	Bharuch	4.22	4.97	0.71
4	Bhavnagar	1.83	3.36	1.51
5	Gandhinagar	2.66	5.19	2.46**
6	Jamnagar	2.52	3.65	1.10**
7	Junagadh	2.19	2.46	0.26**
8	Kutch	3.13	3.26	0.13**
9	Kheda	7.81	7.81	0.00**
10	Anand	7.00	5.93	-1.01**
11	Mehsana	2.79	4.60	1.76**
12	Panchmahal	6.83	5.96	-0.82**
13	Dahod	7.79	11.34	3.29*
14	Rajkot	1.47	2.37	0.89**
15	Surat	1.13	0.61*	-0.52**
16	Surendranagar	3.37	3.61	0.23**
17	Baroda	4.63	4.53	-0.09**
18	Valsad	0.20	0.73**	0.54**
19	Navsari	1.59	2.30	0.70**
	South Gujarat	1.11	1.51	0.40
	Gujarat	2.01	2.55	0.53

Note: Figures in parentheses are standard errors. \*\* = Significant at one per cent level of significance.

\* = Significant at five per cent level of significance

## 5. DISCUSSION

### 5.1 To Analysis Growth Rate in Area, Production and Productivity of Sapota in Gujarat

The area, production and productivity of sapota presented in Table 3 are discussed below .

It could be seen from Table 3 that South Gujarat is more sapota producing region than other region in Gujarat. Navsari, Junagadh, Valsad, Bhavnagar and Surat are the highest producer districts in Gujarat.

The growth rate of area, production and productivity of sapota presented in Table 4 are discussed below .

From the Table 4 that a positive and significant growth in area of sapota crop was observed in all district and state as a whole except Anand, Panchmahal, Surat and Baroda. This high growth rate in area is because of the drastic increase in the area under the sapota cultivation. This clearly indicated the increasing popularity of this crop in the study area especially in Navsari district. Whereas the production is concerned, the growth rate is also positive in all the districts and state as a whole, because of increases in the yield.

Further it could be seen from the table that the growth rate for state as a whole was considered indicated the positive growth rate in area, production and productivity.

## 6. CONCLUSION

### 6.1 Findings

#### 6.1.1 To estimate growth and status of area, production and productivity of sapota in Gujarat

The growth rate analysis for area, production and productivity of sapota in Valsad, Navsari and state as a whole revealed that there was a positive growth rate in area in Valsad district. And positive in Navsari district. The production and productivity was also positive in both the district. And state as a whole there was positive growth rate with respect to area, production and productivity .

In South Gujarat the higher area production and productivity of sapota than other region and Navsari, Junagadh and Valsad highest producer of sapota the productivity of them 12.00, 9.28 and 9.72 per cent respectively.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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