



**Research Paper**

# Growth and decomposition analysis of mango and sapota in South Gujarat

■ **D. J. CHAUDHARI AND NARENDRA SINGH**

See end of the paper for authors' affiliations

Correspondence to :

**D.J. CHAUDHARI**

Department of  
Agricultural Economics,  
ASPEE College of  
Horticulture and Forestry,  
Navsari Agricultural  
University, NAVSARI  
(GUJARAT) INDIA  
Email: [djecon16@gmail.com](mailto:djecon16@gmail.com)

**Paper History :**

Received : 01.05.2017;

Revised : 05.08.2017;

Accepted : 12.08.2017

**ABSTRACT :** Mango and sapota are the main fruit crops having a major share in socio-economic development of South Gujarat. During last few decade the production of mango and sapota in the state has increased. To know the performance of these crops the present investigation undertaken study the growth and instability in area, production and productivity and the major sources or factors affecting on production of mango and sapota in South Gujarat. The growth was worked out with help of CAGR while instability was studied by co-efficient of variation. The decomposition was worked out with conventional decomposition method. The results of investigation showed that area and production mango and sapota significantly raised during study period in majority of districts of South Gujarat. The yield of mango significantly increased in Dang district while yield of sapota increased in all the districts except Tapi and Valsad district. The variability was observed in South Gujarat in respect of area, production and yield of mango and sapota. Yield was the major factor responsible for production of mango while area was dominant factor for production of sapota in most of districts of South Gujarat.

**KEY WORDS:** Growth, Decomposition, Mango sapota, Area effect, Yield effect

**HOW TO CITE THIS PAPER :** Chaudhari, D.J. and Singh, Narendra (2017). Growth and decomposition analysis of mango and sapota in South Gujarat. *Internat. Res. J. Agric. Eco. & Stat.*, **8** (2) : 336-341, DOI : 10.15740/HAS/IRJAES/8.2/336-341.

## INTRODUCTION :

Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of economy. Horticulture covers a wide variety of fruits, vegetables, tuber crops, flower crops, medicinal and aromatic plants, plantation crops and spices. The climatic condition of South Gujarat is favourable for the mango and sapota, therefore, these are the major fruit crops cultivated on large scale in South Gujarat. During the year 2005-06 the area and production of mango in South Gujarat was 50.60 thousand ha and 4.49 lakh MT, respectively, which increased to 86.89 thousand ha and

7.76 lakh MT, respectively during 2015-16 whereas the area and production of sapota during 2005-06 was 10.76 thousand ha and 1.006 lakh MT, which was increased to 13.53 thousand ha and 1.60 lakh MT during 2015-16, respectively. The share of South Gujarat in total area and production of mango in the state is 57 per cent and 62 per cent, respectively while for sapota it is 45.78 per cent and 49.26 per cent, respectively.

During last few decade the production of mango and sapota in the state has increased. The spectacular performance of agriculture sector primarily is determined by the generation and sustenance of growth in production of crops. An analysis of the behaviour of crop production

in the past and estimates of its growth rates can provide a basis for future projection of agricultural output. For this purpose the information regarding the changes, trends and growth in area, production and productivity and also contribution of different elements to the growth of major crops output is essential. An agriculture sector being unstable in nature may substantially impede the economic growth of country. Therefore, apart from increasing production, its stability would also become an important aspect of planning of agriculture development. Mango and sapota are the main crops having a major share in socio-economic development of South Gujarat. These crops have inherent advantage of providing higher productivity per unit of land compared to other crops, resulting in higher income and higher employment generation in rural areas of South Gujarat.

Production could logically be expanded either by putting more area under the crops or by improving the productivity of the crop or both. Various literatures also evidenced that the change in value of the crop output over time have been attributed to change in area, yield, price and their interactions. Putting more area under crops enable increase in the production of crops at either farm or national levels. Expansion of production could also be possible by developing high yielding farmer preferred crop variety (ies) through Horticultural research. Normally the cumulative effect of both area and productivity is also expected to bring substantial increment in production over time. Hence, quantification of the contribution of area, productivity and their integration in numerical terms is of paramount importance for researchers, planners, policy makers, teachers, extension personnel and farmers.

Taking above points in consideration the present investigation has been conducted with following objectives:

- To study the growth in area, production and productivity of mango and sapota
- To study the variability in area, production and productivity of mango and sapota
- To study the major factors affecting on production of mango and sapota in South Gujarat.

## MATERIALS AND METHODS :

South Gujarat region of Gujarat state was selected purposively for study purpose. South Gujarat region involve seven districts viz., Bharuch, Dang, Narmada, Navsari, Surat, Tapi and Valsad district. Among the major

fruits grown in South Gujarat, mango and sapota was selected for study purpose as it has the largest contributor in total fruit production of the region and state. The present study is based on secondary data pertaining to area, production and productivity of mango and sapota collected for the last decade *i.e.* from 2006-07 to 2015-16 from reports of Directorate of Economics and Statistics, Government of Gujarat. To study the growth of mango and sapota with respect of area, production and yield, exponential trend equation was fitted and the compound growth rate was worked out.

$$Y = ab^t$$

where, Y = Area/ production / productivity

a = Intercept, b = Regression co-efficient

t = Time variable in year

Annual compound growth rate (CGR) were worked by the formulae :

$$CGR = ( \text{antilog } b - 1 ) * 100$$

The significance of CGR was tested with help of by using 't' test.

To study the variability with respect of area, production and productivity of mango and sapota, coefficient of variation was worked out.

$$CV = \frac{\sigma}{\bar{X}} * 100$$

where,  $\sigma$  = Standard deviation,  $\bar{X}$  = Mean

In order to measure the relative contribution of area, yield and their interaction on production, the conventional decomposition technique has been used as under which was adopted by Kalamkar *et al.* (2002); Sharma (2007); Angeles and Sundar (2012); Dhakre and Bhattacharya (2013); Rai (2013); Sharma (2013); Agrawal *et al.* (2014); Swain *et al.* (2014); Singh *et al.* (2015); Agarwal *et al.* (2016) and Kamble and Wali (2016).

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

$$U = A_0 U_Y + Y_0 U_A + U_A U_Y$$

where,  $A_0$ ,  $P_0$  and  $Y_0$  are area, production and yield in base year and  $A_n$ ,  $P_n$  and  $Y_n$ , are area, production and yield in current year.  $\Delta A$ ,  $\Delta P$  and  $\Delta Y$  represent change in area, production and yield, respectively. Thus, the change in production ( $\Delta P$ ) from base period to terminal period is decomposed into area effect ( $Y_0 \Delta A$ ), yield effect ( $A_0 \Delta Y$ ) and interaction effect ( $\Delta A \Delta Y$ ).

Further, to know the percentage contribution of each of the factor the following formula were used :

$$\text{Area effect} \text{-----} > \frac{Y_0 \Delta A}{P} * 100$$

$$\text{Yield effect} \text{-----} > \frac{A_0 Y}{P} \times 100$$

$$\text{Interaction effect} \text{-----} > \frac{A Y}{P} \times 100$$

## RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Growth analysis :

From Table 1 it is observed that the area and production of mango increased significantly during the study period in South Gujarat. The per annum significant highest growth in area and production of mango was observed in Tapi district which was worked out to 10.32 per cent and 31.18 per cent, respectively, followed by Dang (9.19% and 16.77%, respectively) and Navsari district (7.62% and 11.77%, respectively). This indicated that the production of mango in these districts increased due to the increase in area under the crop. The yield of mango significantly raised in Dang district (6.94% per annum) whereas all the other districts of South Gujarat recorded non-significant positive growth in yield of mango. The whole South Gujarat region recorded significant positive growth in area (6.12% per annum) and production (11.10% per annum) of mango. Golappanavar (2012) studied the growth in area, production and productivity of mango in Dharwad district of Karnataka State. He found that the area and production of mango in the district was increased significantly by 7.45 per cent and 8.02 per cent, respectively during the period 1991-2010.

Among the districts of South Gujarat significant

positive growth in area under sapota was recorded in Bharuch, Dang, Navsari and Surat district whereas production of sapota increased significantly in South Gujarat except Tapi and Valsad district. In whole South Gujarat region the area, production and yield of sapota increased by 2.16 per cent per annum, 5.79 per cent per annum and 3.56 per cent per annum, respectively, which was significant at 1 per cent level of probability. The significant negative growth in area under sapota recorded in Valsad district (-1.36% per annum) implied that the area under sapota declined in Valsad district during the study period. Table 1 further depicted that significant positive growth in production of sapota in Baruch, Dang and Surat district was mainly due to significant increase in area whereas in Narmada and Navsari district it was due to significant raise in yield of sapota. Golappanavar (2012) found that the area under sapota in Dharwad district grew at the rate of 14.18 per cent per annum while production and productivity increased at the rate of 12.96 per cent per annum and 0.77 per cent per annum, respectively.

The significant growth in area and production of mango and sapota in South Gujarat might be due to the better irrigation facilities, use of improved production technology, increase in demand for fruits, better price and diversification towards high value crops like fruits. The Gujarat Horticulture Mission started during 2005-06 having major contribution in increasing area, production and yield of fruit crops in Gujarat state during study period. BIRTHAL *et al.* (2013) worked out the annual compound growth rate at real value of output for the western region of India was 6.1 per cent during 2000-2001 to 2009-10. Similar results were found by Pattnaik and Shah (2015); Sathyendra and Chandrashekhar (2015) and Agrawal *et al.* (2016).

**Table 1 : Growth in area, production and yield of mango and sapota in South Gujarat**

Districts	Mango			Sapota		
	A	P	Y	A	P	Y
Bharuch	2.72***	6.23	3.41	2.14***	3.08**	0.92
Dang	9.19***	16.77***	6.94*	8.95***	10.33***	1.27
Narmada	4.47***	10.52**	5.79	5.21	6.89***	1.59**
Navsari	7.62***	11.77**	3.86	4.05***	9.43***	5.17***
Surat	5.08***	9.59	4.29	1.73***	2.74***	0.99***
Tapi	10.32***	31.18*	18.91	2.68	3.65	0.94
Valsad	4.10***	9.64	5.32	-1.36***	0.62	2.01***
South Gujarat	6.12***	11.10*	4.70	2.16***	5.79***	3.56***

\*, \*\* and \*\*\* indicate significance of values at P=0.01, 0.05 and 0.1, respectively level of probability

A : Area, P: Production and Y: Yield

**Instability analysis :**

Table 2 showed that the highest variability in area under mango recorded in Dang (26.00%) followed by Tapi (25.81%) and Navsari (22.16%) district. The highest area variability in these districts attributed to highest growth in area under mango. The highest production variability of mango recorded in Tapi (57.32%) followed by dang (51.59%), Valsad (37.24%) and Navsari (35.71%) district. The variability in production of mango in all the district and South Gujarat region as whole was attributed to the variability in yield. The highest yield variability was found in Tapi district (49.60%) followed by Dang (33.15%) and Valsad (33.06%) district. The variability in yield of mango might be attributed to low temperature during winter season in some of the year during study period. Patil *et al.* (2015) found that the correlation co-efficient between minimum temperature and productivity of mango in India is very less (12.37%). The variability in area, production and yield of mango in whole South Gujarat was recorded to 17.61 per cent, 35.36 per cent and 27.82 per cent, respectively. Singh (2009) found that there was variability in respect of area, production and productivity of mango during the study

period which worked out to 45.96 per cent, 16.75 per cent and 30.14 per cent, respectively.

Table 2 further depicted that the highest area variability of sapota was recorded in Tapi district (79.35%) followed by Dang (27.65%) and Narmada (21.17%) district. The area variability in Bharuch, Dang, Navsari and Surat attributed to significant positive growth in area under sapota. The highest production variability of sapota found in Tapi district (71.96%) followed by Dang (31.04%) and Navsari (29.34%) district. The production variability of sapota in all the districts except Tapi and Valsad and South Gujarat region as whole attributed to significant positive growth in production of sapota. In case of yield of sapota the variability was highest in Navsari (17.37%) and Bharuch(10.87%) district while South Gujarat region as whole recorded yield variability 11.76 per cent. Other districts has shown less yield variability. South Gujarat region as a whole recorded 7.02 per cent, 18.24 per cent and 11.76 per cent variability in area, production and yield of Sapota, respectively. The results are in conformity with Bairwa *et al.* (2012) and Pattnaik and Shah (2015). Chand *et al.* (2011) also found the variability in respect of area,

**Table 2 : Instability in area, production and yield of mango and sapota in South Gujarat**

Districts	Mango			Sapota		
	A	P	Y	A	P	Y
Bharuch	8.34	27.29	26.28	6.88	12.75	10.87
Dang	26.00	51.59	33.15	27.65	31.04	7.43
Narmada	14.41	32.45	26.73	21.17	23.91	6.64
Navsari	22.16	35.71	25.20	13.26	29.34	17.37
Surat	15.86	33.13	29.59	6.32	9.01	3.86
Tapi	25.81	57.32	49.60	79.35	71.96	7.59
Valsad	12.10	37.24	33.06	5.24	4.27	7.13
South Gujarat	17.61	35.36	27.82	7.02	18.24	11.76

**Table 3 : Decomposition analysis of mango and sapota in South Gujarat**

Districts	Mango			Sapota		
	Area effect	Yield effect	Interaction effect	Area effect	Yield effect	Interaction effect
Bharuch	40.33	45.36	9.30	57.63	34.28	5.19
Dang	35.24	35.55	30.39	80.77	10.42	7.94
Narmada	32.49	48.06	15.68	69.40	21.86	9.14
Navsari	57.99	23.55	15.45	36.72	47.42	15.24
Surat	53.57	32.88	14.24	61.38	33.87	4.54
Tapi	26.62	38.95	32.32	142.63	-36.25	6.63
Valsad	42.44	41.77	13.16	-172.63	299.80	-27.30
South Gujarat	50.80	30.84	15.51	33.26	56.98	9.22

production and productivity of food grains in his study.

### Decomposition analysis :

Table 3 depicted that in case of mango yield was the most responsible factor in production in Bharuch (45.36%), Dang (35.55%), Narmada (48.06%) and Tapi (38.95%) district whereas contribution of area was 57.99 per cent, 53.57 per cent and 42.44 per cent in Navsari, Surat and Valsad district, respectively. At the South Gujarat region level increase in area (50.80%) was the most responsible factor in increase in production of mango followed by yield (30.84%). Pattnaik and Shah (2015) found that in both the phases yield has emerged as the single largest component of growth in the value of output of major crops in Gujarat state including fruits. Singh (2009) done the analysis of factors affecting the total production of fruits and found that the area effect was the maximum (437%) than the yield effect. Similar results found by Agrawal *et al.* (2016).

Table 3 further depicted that in most of districts area played a major role in production of sapota. The area effect worked out to 142.63 per cent, 80.77 per cent, 69.40 per cent, 61.38 per cent and 57.63 per cent in Tapi, Dang, Narmada, Surat and Bharuch district, respectively. In Valsad (299.80%) and Navsari (47.42%) district yield was more responsible factor for production of sapota. The yield (56.98%) was most contributing factor in production of sapota followed by area (33.26%) at South Gujarat region level. Swain *et al.* (2014) found that the yield effects also played a dominant role for the growth in production for fruits during period III (2000-01 to 2010-11).

### Conclusion :

It was concluded from the study that the area under mango increased significantly in all the districts and South Gujarat region as a whole. The significant positive growth was observed in production of mango in Tapi, Dang, Navsari and Narmada district and at South Gujarat region as a whole. The yield of mango recorded non-significant positive growth except Dang district. The highest variability in area under mango recorded in Dang followed by Tapi and Navsari district while the highest production variability recorded in Tapi followed by Dang, Valsad and Navsari district. Yield was the most responsible factor in production in Bharuch, Dang, Narmada and Tapi district whereas area effect was major contributing factor in production in Navsari, Surat and Valsad district.

Form the results for sapota it was concluded that the area showed significant positive growth in districts except Narmada and Tapi while Valsad district showed significant negative growth during study period. Significant positive growth in production of sapota was observed in all the districts except Tapi and Valsad district. The area, production and yield increased significantly in whole South Gujarat region. The area variability in Bharuch, Dang, Navsari and Surat attributed to significant positive growth in area under sapota. The production variability of sapota in all the districts except Tapi and Valsad and South Gujarat region as whole attributed to significant positive growth in production of sapota. In case of yield of sapota the variability was highest in Navsari and Bharuch district. The area was the major contributing factor in majority of districts while yield was the major factor responsible for production of sapota at regional level.

#### Authors' affiliations:

**NARENDRA SINGH**, Department of Agricultural Economics, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA  
Email: ns\_manohar@rediffmail.com

### LITERATURE CITED :

- Agrawal, P. K., Pandey, Divya and Singh, O.P. (2014). Trends of area, production and productivity of soyabean crop in Madhya Pradesh. *Agric. Situ. India*, **71**(3):15-20.
- Agarwal, P. K., Yadav, Pushpa, Kumar, Santosh and Pandey, Divya (2016). Horticultural crops in India- growth, instability and decomposition approach. *Agric. Situ. India.*, **73**(1): 26-30.
- Angeles, S. and Sundar, A. (2012). Variability and decomposition analysis of banana in India and Tamil Nadu in post green revolution Era. *Economic Affairs*, **57**(4): 389-393.
- Bairwa, K.C., Sharma, Rajesh and Kumar, Taresh (2012). Economics of growth and instability: Fruit crops of India. *Rajasthan J. Extn. Edu.*, **20**: 128-132.
- Birthal, P.S., Joshi, P. K., Negi, D.S. and Agrawal, Shaily (2013). *Changing sources of growth in Indian agriculture: Implications for regional priorities for accelerating agricultural growth*. Discussion Paper, IFPRI, NEW DELHI, INDIA.
- Chand, Ramesh, Raju, S.S., Garg, Sanjeev and Pandey, L.M. (2011). *Instability and regional variation in Indian agriculture*. Policy Paper, NCAP, NEW DELHI, INDIA.
- Dhakre, D. S. and Bhattacharya, D. (2013). Growth and instability analysis of vegetables in West Bengal, India. *Internat. J.*

- Bio-resource & Stress Mgmt.*, **4**(3): 456-459.
- Directorate of Economics and Statistics, GOI, Gujarat State (2012). Horticulture in Gujarat 2011-12 & 2012-13.
- Golappanavar, S. B. (2012). Performance of major fruit crops in Dharwad district of Northern Karnataka – An economic analysis. M.Sc. Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).
- Kalamkar, S.S., Atkare, V.G. and Shende, N.V. (2002). An analysis of growth trends of principle crops in India. *Agric. Sci. Digest.*, **22** (3): 153 – 156.
- Kamble, A.S. and Wali, V. B. (2016). Dynamics of horticultural crops in Karnataka an Hozels decomposition analysis. *Indian J. Appl. Res.*, **6** (8) : 119-122.
- Kumar, Sathyendra and Chandrashekhar, H.M. (2015). Production performance of selected horticultural commodities in Karnataka. *Internat. J. Mgmt. Res. & Rev.*, **5** (9) : 669-675.
- Patil, N. A., Yeldhalli, R.A., Patil, B. O. and Tirlapur, L. N. (2015). Impact of climate change on major fruits in India. *Asian J. Environ. Sci.*, **10**(1): 34-38.
- Pattnaik, Itishree and Shah, Amita (2015). Trends and decomposition of agricultural growth and crop output in Gujarat: recent evidence. *Indian J. Agric. Econ.*, **70** (2) :182-197.
- Rai, Srijana (2013). Production and growth of horticultural crops in West Bengal- A districtlevel analysis. *Indian Stream Res. J.*, **3** (9) : 1-9.
- Sharma, A. (2013). Trends of area, production and productivity of food grain in the north eastern states of India. *Indian J. Agric. Res.*, **47** (4) : 341 – 346.
- Sharma, Ravinder (2007). Vegetable cultivation in North West Himalayan region: A study of Indian state. *Internat. J. Agric. Biol.*, **9** (4): 602–605.
- Singh, H.P. (2009). Triggering agricultural development through horticultural crops. *Indian J. Agric. Econ.*, **64** (1) :15-39.
- Singh, N.U., Das, K.K., Roy, A. and Tripathy, A.K. (2015). Estimation of growth rate and decomposition of output components of oilseed: A comparative study among the states of North East. *Indian J. Hill Farm.*, **28**(2): 96-101.
- Swain, M., Kalamkar, S.S., Ojha, M.K. and Sharma, S. (2014). Agricultural diversification towards horticulture in Rajasthan prospects and challenges. *Agril.Situ. India*, **71** (3) : 5-13.

  
 ★★★★★ of Excellence ★★★★★