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# Dynamics of Tezpur litchi cultivation in Sonitpur district of Assam

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**Abstract**

Litchi is an important sub-tropical fruit crop and is considered as the queen of fruits in India. Litchi reached India through Burma during the 18th century. Presently, India and China accounts for 90 percent of total litchi production in the world. India ranks second to China both in terms of area and production of litchi.Litchi is a popular fruit on the fruit platters of Indian households, with domestic consumption alone accounting for 98 to 99 percent of the litchi production in the country. Within India, among all the litchi growing states like West Bengal, Jharkhand, Assam, Chhattisgarh, Punjab, *etc*. Bihar alone contributed 41.79 percent of country's total litchi production for the year 2021-22. While Assam stands at sixth position in terms of area and fourth in terms of production for the year 2021-22.

The present study revolves around the status of GI tagged Tezpur Litchi that is exclusively found in the Sonitpur district of Assam. Compound growth rate, coefficient of variation and decomposition analysis were used to analyse the growth, stability and effect of area and yield on production of litchi crop in the study area. The study revealed that during the period from 2002-03 to 2021-22, the area, production and productivity of litchi in the state increased significantly with compound growth rate of 1.92 percent, 5.59 percent and 3.59 percent respectively. In terms of variability, production showed highest variation with 29.60 percent, followed by productivity with 20.44 percent and then area with 11.29 percent. The study revealed that during the study period, the greatest effect on litchi production was from the cultivated area, contributing 51.91 percent, followed by interaction effects at 25.70 percent, and yield at 22.35 percent.

**Keywords:** Litchi, GI, CGR, CV, stability, decomposition

## Introduction

Litchi (*Litchi chinensis*) is an important subtropical fruit from the Sapindaceae family. It originated in China, where its systematic cultivation began since 1500 BC. In India, it is recognised as the "Queen of fruits". Litchi reached India by the 18th century via Burma and spread across the country, especially in Bengal and Assam. Due to specific climatic requirements, litchi is grown in only a few tropical and subtropical countries. Asia produces over 95% of the world's litchi, with China, India, Thailand, Taiwan, and Vietnam being the top producers (Nath*et al.,* 2022) [5]. India ranks second globally in both litchi production and area after China. It is also grown in countries like South Africa, Australia, and parts of the Americas. During the year 2021-22, Indian litchi export was 193.85 MT with a value accounting for around 77.46 lakh Indian rupees (GoI, 2024) [4].

Assam with its variety of agro climatic conditions supports the growth of a wide range of horticulture crops including litchi. In 2021-22, Assam had 6.13 thousand hectares under litchi cultivation, producing 60.58 thousand MT with a yield of 9.88 MT/ha contributing 8.22 percent of India's total production and ranking sixth in area and fourth in production within the country (GoI, 2023) [3]. During 2015-16, Sonitpur district led Assam in litchi cultivation, covering an area of 675 ha, producing 9,259 MT, with a yield of 13.72 MT/ha. It accounted for 12.23 percent of the state's litchi area and 18.67 percent of production (GoA, 2024) [1].

GI tagged Tezpur Litchi, grown in Sonitpur district of Assam, received its Geographical Indication (GI) tag on March 27, 2015 with GI No. 438 under Class 31. Historical records indicate that between 1922 and 1924, Late Padmanath Gohain Boruah, former chairman of the Tezpur Municipal Board, bought several litchi layers from Kolkata and Mumbai and planted them along the banks of LichuPukhuri, formerly known as PaltanPukhuri, covering an area of about 5 bighas. This effort laid the foundation for Tezpur's renowned litchi cultivation. The Special quality and unique characteristics of Tezpur Litchi are attributed to the micro agro-climatic conditions near this region, thus enhancing the regional significance (GoI, 2014) [2].

In response its high quality and market value, a systematic

analysis of Tezpur Litchi's cultivation trends, stability and factors influencing its production is essential to retain and attract the grower's interest towards Tezpur Litchi cultivation. Thus, the present study has been conducted to understand the status of litchi cultivation in Sonitpur district in comparison to the overall state of Assam, under the following objectives:

1) Study the growth and stability in area, production and yield of litchi in Sonitpur district vis-à-vis Assam
2) Study the influence of area and yield on litchi production in Sonitpur district vis-à-vis Assam

**Methodology**

Time series secondary data on the area, production and yield of litchi cultivation in Sonitpur district and Assam has been collected from various published sources like statistical handbook published by Directorate of Economics and Statistics; Indian Horticulture Database; Department of Agriculture, Government of Assam, etc. for the period of 2003-04 to 2015-16 in case of Sonitpur district and 2002-03 to 2021-22 in case of Assam, which has been divided into two periods *i.e.* 2002-03 to 2011-12 as period I and 2012-13 to 2021-22 as period II.

To estimate the growth in area, production and yield of litchi in Sonitpur district and Assam, compound growth rate (CGR) technique has been used. The Cobb- Douglas production function was used for CGR computation (Singh *et al.*, 2022) [7], which is given by-

$$Y = ab^t$$

$$\text{Ln } Y = \ln a + t \ln b$$

$$\text{CGR (\%)} = [\text{Antilog } b - 1] \times 100$$

To analyse the measure of variation in the time series data, the coefficient of variation (CV) has been used(Singh *et al.*, 2022) [7], which is given by-

$$\text{CV (\%)} = \frac{Standard Deviation}{Mean} \times 100$$

To estimate the influence of area and yield on production of litchi, decomposition analysis technique has been adopted (Saikia *et al.*, 2025) [6], which is given by-

$$\Delta P = (Y_n - Y_o)A_o + (A_n - A_o)Y_o + \Delta A \Delta Y$$

Where,

$\Delta P$ = Change in production

$[(Y_n - Y_o)A_o] / \Delta P$ = Yield effect

$[(A_n - A_o)Y_o] / \Delta P$ = Area effect

$[\Delta A \Delta Y] / \Delta P$ = Interaction effect

**Results and Discussion**

**Status of litchi production in Assam**

In this section, attempt has been made to examine the growth in area, production and yield of litchi in the state of Assam as well as in the Sonitpur district of Assam. The compound growth rate, coefficient of variation and decomposition analysis were used to analyse the growth and stability in the litchi crop and the effect of area and yield on production of litchi crop.

To evaluate the growth in area, production, and yield of litchi in Assam, time series data from 2002-03 to 2021-22 has been analysed and the results were shown in Table 4.1. For the period I from 2002-03 to 2011-12, it was observed that over the years the area has increased steadily from 4.10 thousand hectares to 8.40 thousand hectares with compound growth rate showing significant growth in area with 2.79 percent while variation being 8.40 percent. Similarly, in the same period the production was also observed to increase from 18.80 thousand MT to 41.44 thousand MT that resulted in a significant compound growth rate of 9.58 percent and high variation with coefficient of variation being 26.74 percent. Moreover, a similar result was obtained in case of yield, showing significant growth from 4.60 MT/ha to 20.02 MT/ha with compound growth rate of 6.57 percent. This growth also resulted in high variation with coefficient of variation of 20.02 percent.

For period II from 2012-13 to 2021-22, it was observed that the compound growth rate for area showed significant growth with 1.66 percent and variability was 5.38 percent. Similar trend was seen for production as compound growth rate showed significant growth with 5.59 percent and coefficient of variation showed 9.96 percent variability. While in terms of yield, compound growth rate was significant with 1.28 percent and coefficient of variation being 4.49 percent.

Hence, the overall compound growth rate in area, production and yield from 2002-03 to 2021-22 period showed significant growth with highest growth reported in production at 5.59 percent, followed by yield at 3.59 percent and then area at 1.92 percent. A similar trend was also observed for coefficient of variation, with highest variation reported in production with 29.60 percent, followed by yield with 20.44 percent and then area with 11.29 percent.

The present study also examined the growth in area, production and yield of litchi in Sonitpur district of Assam for the period 2003-04 to 2015-16 and the results were shown in Table 4. 2.It was observed that over these years, the compound growth rate in area was insignificant with 0.03 percent and coefficient of variation was 15.12 percent. However, the area under litchi in Sonitpur district showed growth in years like 2004-05, 2011-12 and 2015-16 due to implementation of litchi area expansion programmes in the district. The production of litchi in the district showed significant growth from 3038 MT in 2003-04 to 9259 MT in 2015-16. This has resulted in a compound growth rate of 6.00 percent and variation of 33.19 percent. Similarly, for yield also, over these years, yield increased from 5.56 MT/ha to 13.72 MT/ha with a significant compound growth rate of 5.97 percent and coefficient of variation of 28.64 percent.

**Table 1:** Growth in area, production and yield of litchi in Assam

| Years | Area ('000 Ha) | Production | Yield (MT/Ha) |
|---|---|---|---|
| **Period- I (2002-03 to 2011-12)** | | | |
| 2002-03 | 4.10 | 18.80 | 4.60 |
| 2003-04 | 4.16 | 19.76 | 4.76 |
| 2004-05 | 4.49 | 22.48 | 5.01 |
| 2005-06 | 4.69 | 34.89 | 7.44 |
| 2006-07 | 4.74 | 33.35 | 7.03 |
| 2007-08 | 4.80 | 34.64 | 7.22 |
| 2008-09 | 4.88 | 36.33 | 7.44 |
| 2009-10 | 5.10 | 39.25 | 7.69 |
| 2010-11 | 5.20 | 40.54 | 7.79 |
| 2011-12 | 5.24 | 41.44 | 7.91 |
| C.V. (%) | 8.40 | 26.74 | 20.02 |
| CGR (%) | 2.79*** | 9.58*** | 6.57*** |
| **Period- II (2012-13 to 2021-22)** | | | |
| 2012-13 | 5.33 | 47.53 | 8.92 |
| 2013-14 | 5.38 | 48.08 | 8.93 |
| 2014-15 | 5.44 | 48.73 | 8.97 |
| 2015-16 | 5.52 | 49.60 | 8.98 |
| 2016-17 | 5.54 | 49.83 | 8.99 |
| 2017-18 | 5.57 | 50.24 | 9.02 |
| 2018-19 | 5.62 | 51.28 | 9.13 |
| 2019-20 | 6.04 | 58.91 | 9.76 |
| 2020-21 | 6.10 | 60.19 | 9.87 |
| 2021-22 | 6.13 | 60.58 | 9.89 |
| C.V. (%) | 5.38 | 9.96 | 4.49 |
| CGR (%) | 1.66*** | 2.96*** | 1.28*** |
| **Overall Period (2002-03 to 2021-22)** | | | |
| C.V. (%) | 11.29 | 29.60 | 20.44 |
| CGR (%) | 1.92*** | 5.59*** | 3.59*** |

**Note:** *** denotes 1 percent level of significance
**Source:** Department of Agriculture and Farmers Welfare, Govt. of India.
Directorate of Horticulture and Food Processing, Govt. of Assam.

**Table 2:** Growth in area, production and yield of litchi in Sonitpur district of Assam

| Years | Area ('000 Ha) | Production | Yield (MT/Ha) |
|---|---|---|---|
| 2003-04 | 546 | 3038 | *5.56* |
| 2004-05 | 667 | 4778 | 7.16 |
| 2005-06 | 519 | 4800 | 9.25 |
| 2006-07 | 521 | 4619 | 8.87 |
| 2007-08 | 454 | 3525 | 7.76 |
| 2008-09 | 457 | 3598 | 7.87 |
| 2009-10 | 494 | 3947 | 7.99 |
| 2010-11 | 596 | 4593 | 7.71 |
| 2011-12 | 601 | 4643 | 7.73 |
| 2012-13 | 415 | 5628 | 13.56 |
| 2013-14 | 568 | 7166 | 12.62 |
| 2014-15 | 473 | 5754 | 12.16 |
| 2015-16 | 675 | 9259 | 13.72 |
| C.V. (%) | 15.12 | 33.19 | 28.64 |
| CGR (%) | 0.03 | 6.00** | 5.97*** |

**Note:** ** and *** denote 5 percent and 1 percent level of significance
**Source:** Directorate of Economics and Statistics, Govt. of Assam.
Directorate of Horticulture and Food Processing, Govt. of Assam.

**Decomposition analysis**

Decomposition analysis was calculated to identify the area effect, yield effect and interaction effect in production of litchi in the state of Assam from 2002-03 to 2021-22 and the results were shown in Table 4.3. The result reflected that during the period I (2002-03 to 2011-12) highest effect to production was from area at 59.94 percent, followed by yield at 23.16 percent and then interaction effect at 16.67 percent. However a different trend was seen in period II (2012-13 to 2021-22) with highest effect observed from yield at 54.68 percent, followed by area at 39.62 percent and then interaction effect at 5.95 percent. While looking into the overall period from 2002-3 to 2021-22, the highest effect was from area with 51.91 percent, then interaction with 25.70 percent and lastly by yield with 22.35 percent.

The decomposition analysis of litchi in the district for the period 2003-04 to 2015-16 was presented in Table 4.4.It was observed that highest effect to the production of litchi was from area with 71.56 percent, followed by interaction with 16.91 percent and tl1en yield with 11.54 percent. This overall trend in effect from area, yield and interaction on production was observed to be similar with that of the state level.

**Area under litchi in top five districts of Assam during 2015-16**

Table 4.5 showed the top five district of Assam with highest area under litchi during 2015-16. From the table, it was observed that Sonitpur district had the highest area under litchi fruit with 675 ha accounting for 12.23 percent of total litchi area in the state. Following Sonitpur district, it was Karbi Anglong district which had the second highest area under litchi with 303 ha accounting for 5.62 percent of total litchi area. The third place was obtained by Goalpara district, then Nalbari district and finally at fifth place was Barpeta district with 303 ha, 265 ha and 247 ha area

respectively accounting to 5.49 percent, 4.80 percent and 4.47 percent of total area under litchi cultivation in Assam.

**Production of litchi in top five districts of Assam during 2015-16**

Table 4.6 reflected the top five district in terms of production of litchi in Assam for the year 2015-16. It was observed that highest production of litchi was in Sonitpur district with 9259 MT accounting for 18.67 percent of total litchi production in the state. At second place was Goalpara district with production of 3903 MT accounting for 7.87 percent of total litchi production in Assam. Following Goalpara district, there was Nalbari district, then Nagaon district and finally at fifth place was Barpeta district with production being 2639 MT, 2499 MT and 2357 MT respectively accounting to 5.32 percent, 5.04 percent and 4.75 percent of total litchi production in Assam.

**Yield of litchi in top five districts of Assam during 2015-16**

Table 4.7 presented the top five district in Assam in terms of yield of litchi for the year 2015-16. From the tab1e, it was observed that the Sonitpur district had the highest yield of litchi with 13.72 MT/ha. The index number analysis reflected that Sonitpur district's yield was 52.78 percent higher than the yield at state level. Following Sonitpur district, there was Goalpara district with yield of 12.88 MT/ha which was 43.34 percent higher than the state level. After Goalpara district, there was Kamrup (M) district with yield of 10.85 MT/ha which was 20.82 percent higher than state level. At fourth place was Nagaon district with yield of 10.73 MT/ha which was 19.49 percent higher than state level. Finally, at fifth place was Golaghat district with yield of 9.99 MT/ha which was 11.25 percent higher than the yield at state level.

**Table 3:** Decomposition analysis of litchi in Assam

| Particulars | Period-I (2002-03 to 2011-12) | Period-II (2012-13 to 2021-22) | Overall Period (2002-03 to 2021-22) |
|---|---|---|---|
| | Percent | Percent | Percent |
| Area effect | 59.94 | 39.62 | 51.91 |
| Yield effect | 23.16 | 54.68 | 22.35 |
| Interaction effect | 16.67 | 5.95 | 25.70 |

**Table 4:** Decomposition analysis of litchi in Sonitpur district of Assam

| Particulars | From 2003-04 to 2015-16 |
|---|---|
| | Percent |
| Area effect | 71.56 |
| Yield effect | 11.54 |
| Interaction effect | 16.91 |

**Table 5:** Area under litchi in top five districts of Assam during 2015-16

| District | Area (Ha) | % to total of Assam |
|---|---|---|
| Sonitpur | 675 | 12.23 |
| KarbiAnglong | 310 | 5.62 |
| Goalpara | 303 | 5.49 |
| Nalbari | 265 | 4.80 |
| Barpeta | 247 | 4.47 |
| Assam | 5520 | 100 |

**Source:** Directorate of Horticulture and Food Processing, Govt. of Assam.

**Table 6:** Production of litchi in top five districts of Assam during 2015-16

| District | Area (Ha) | % to total of Assam |
|---|---|---|
| Sonitpur | 9259 | 18.67 |
| Goalpara | 3903 | 7.87 |
| Nalbari | 2639 | 5.32 |
| Nagaon | 2499 | 5.04 |
| Barpeta | 2357 | 4.75 |
| Assam | 49597 | 100 |

**Source:** Directorate of Horticulture and Food Processing, Govt. of Assam.

**Table 7:** Yield of litchi in top five districts of Assam during 2015-16

| District | Area (Ha) | % to total of Assam |
|---|---|---|
| Sonitpur | 13.72 | 152.78 |
| Goalpara | 12.88 | 143.43 |
| Kamrup(M) | 10.85 | 120.82 |
| Nagaon | 10.73 | 119.49 |
| Golaghat | 9.99 | 111.25 |
| Assam· | 8.98 | 100 |

**Source:** Directorate of Horticulture and Food Processing, Govt. of Assam.

## Conclusion

The present study reflected the current status of litchi crop in Assam and in Sonitpur district of Assam. The study revealed significant growth and variability in area, production, and yield in Assam over the study periods. Assam experienced substantial overall growth, with production largely influenced by area effect, while interaction effect and yield effect played a secondary role. Sonitpur district exhibited significant growth in production and yield, though the growth in cultivation area remained minimal. The decomposition analysis showed that in Sonitpur, area effect contributed more significantly to the increase in production than interaction and yield effects.

## Policy recommendations

The trend in area, production and productivity of litchi in Assam and the selected district has indicated that there is lot of potential in increasing the litchi production in the state through area expansion. In this regard the support of government is essential for implementation of schemes and programmers related to litchi cultivation.

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