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|  | <div>ORIGINAL RESEARCH PAPER</div> <div>POST-COVID TRANSFORMATIONS IN ASSAM'S TEA INDUSTRY: THE ROLE OF SMALL TEA GROWERS, TECHNOLOGY ADOPTION, AND GLOBAL MARKET REALIGNMENT</div> | <div>Geography</div> <div>KEY WORDS: Assam Tea Industry, Small Tea Growers, COVID-19 Impact, Technology Adoption, Global Market Realignment.</div> |
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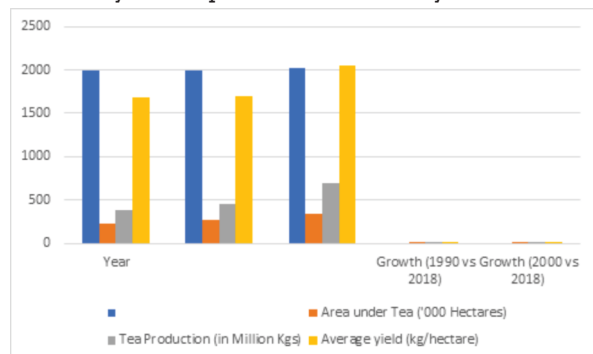
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| <div>ABSTRACT</div> | <p>Assam's tea industry, rooted in nearly two centuries of history, remains a cornerstone of India's agricultural economy and global trade. This paper examines the post-COVID transformations reshaping the sector, focusing on the growing role of small tea growers, technology adoption, and the need for global market realignment. Drawing on historical trajectories, production data, and pandemic-era disruptions, the study highlights how efficiency gains rather than land expansion have driven long-term growth, underscoring the importance of improved farming practices and high-yield varieties. The COVID-19 pandemic exposed structural vulnerabilities, including heavy dependence on labour, fragile supply chains, and reliance on traditional export destinations, resulting in unprecedented production losses in early 2020. At the same time, the crisis accelerated opportunities for diversification, with emerging markets in East Asia and the Middle East offering new avenues for exports. The analysis emphasises the necessity of realigning product mixes between Orthodox and CTC varieties, strengthening institutional support for small growers, and adopting mechanisation and digital platforms to enhance resilience. By integrating sustainability measures such as climate-resilient practices and eco-friendly cultivation, Assam's tea industry can recover from pandemic-induced setbacks while securing a stronger position in global markets. Ultimately, the paper argues that balancing tradition with innovation will be critical to ensuring the sector's long-term competitiveness and cultural significance.</p> |
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| <div>INTRODUCTION</div> <p>Tea has a long and complex history in India, shaped by both indigenous traditions and colonial enterprise. Indigenous communities in Assam, such as the Singphos, consumed tea brewed from wild plants long before commercial cultivation began. The British East India Company initiated systematic experiments with tea in the late 18th century, importing seeds from China in 1774 and later attempting cultivation in Calcutta in 1780 (Tea Board of India, n.d.). The decisive breakthrough came in 1823 when Robert Bruce identified native tea plants in Assam's Brahmaputra Valley, which proved highly suitable for large-scale production. By 1838, the first consignment of Assam tea was shipped to England, marking the beginning of India's organised tea industry. Over the following decades, plantations expanded to Darjeeling, Nilgiri, and other regions, supported by colonial policies and the establishment of the Assam Company in 1839 (Times of India, 2023). By the mid-19th century, India had emerged as one of the world's leading tea producers, a position it continues to hold today. After independence in 1947, the Tea Board of India was established to regulate and promote the industry, ensuring quality standards and supporting exports. Building on this historical foundation, tea has become the second most consumed beverage in the world after water, playing a vital role in global trade and cultural life. Countries such as Turkey, India, and China rank among the highest consumers and producers, with demand shaped not only by price and income but also by demographic factors, cultural traditions, and growing awareness of its health benefits. International prices are influenced by consumption trends, market access, and production challenges such as pests and diseases. Globally, tea production reached 5.90 million tonnes in 2018, with China and India together accounting for more than half of the total output, and exports valued at US\$7.76 billion led by Kenya, China, Sri Lanka, and India. Imports, meanwhile, amounted to 2 million tonnes, with Pakistan, Russia, the UK, and the U.S. among the largest buyers. Within this global context, Assam's tea industry holds a distinctive position as both a major contributor to India's exports and a source of livelihood for millions of workers, whose conditions have been deeply affected by the disruptions of the COVID-19 pandemic (Government of Assam, Department of Industry and Commerce, 2020).</p> <div>India's Tea Production Overview</div> <p>India is the second-largest producer of tea in the world after China and, as of 2011, the largest consumer of the beverage, accounting for nearly 30 percent of global tea consumption</p> | <p>(Aggarwal, 2008). Despite its high domestic demand, India also ranks among the leading exporters of tea globally, behind China and Sri Lanka (Das, 2018). Tea in India is broadly categorised into three types: Assam tea, which has the highest cultivation; Darjeeling tea, renowned for its superior quality; and Nilgiri tea, known for its subtle and gentle flavors (Roy, 2020). While Assam and Darjeeling teas dominate international recognition, Ayurvedic traditions have enriched India's tea culture with herbal blends incorporating holy basil, cardamom, pepper, and mint, often consumed with milk and sugar to balance strong flavors (Singh, 2019). Due to soil and climatic requirements, tea cultivation is concentrated in Assam, West Bengal, Tamil Nadu, and Kerala, with Assam and West Bengal together accounting for nearly 80 percent of total harvest (Lobell et al., 2011). Ownership patterns in the sector are fragmented: large plantations represent about 20 percent of producers, while nearly 80 percent are small growers with less than 8 hectares. The contribution of small tea growers has risen significantly, increasing from 34 percent of India's production in 2014–15 to 47 percent in 2017–18 (Government of Assam, Department of Industry and Commerce, 2020). On the export front, India's tea exports were valued at over USD 58 billion in 2019, with Russia as the largest importer by volume (38 thousand metric tons), followed by Iran and the UAE. In financial year 2019, India exported tea worth nearly eleven billion rupees to Iran, while Russia remained the largest importer in terms of volume (Government of Assam, Department of Industry and Commerce, 2020). Despite challenges such as climate variability, labor unrest, and fluctuating international prices, India's tea sector continues to thrive, supported by strong geographical indications such as Assam and Darjeeling tea, government subsidies, and expanding global demand (FAO, 2008; IPCC, 2014).</p> <div>Tea: The State Drink of Assam – Contribution to the State's Economy</div> <p>The tea industry in Assam has a history spanning nearly two centuries, beginning in 1823 when officials of the British East India Company discovered tea plants in the upper Brahmaputra Valley. In 1833, the Government of Assam established a tea garden in Lakhimpur district, producing fine-quality tea by 1838. The commercial potential of Assam tea soon attracted attention in London, leading to the formation of the Assam Company in 1839, the first enterprise in India to undertake organised commercial tea production. The industry advanced further with the establishment of the Tocklai Experimental Station in Jorhat in 1911 (later renamed</p> |
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the Tocklai Tea Research Institute), which became a center for research on tea cultivation and manufacturing. A major milestone was achieved in 1970 with the launch of the Guwahati Tea Auction Centre, which revolutionised marketing and addressed challenges such as transport bottlenecks and entry taxes imposed by West Bengal. Finally, in 2012, the Government of Assam officially declared tea as the State Drink of Assam, recognising its cultural and economic significance. Today, the tea industry contributes nearly 8% of Assam's Gross State Domestic Product (GSDP), plays a vital role in both the state and national economy, and enjoys an international reputation with a significant share in the global tea market. Notably, Assam Orthodox Tea has also been registered under the Geographical Indication (GI) tag, further strengthening its identity and global recognition significance (Government of Assam, Department of Industry and Commerce, 2020).

### Transformational Changes in the Assam Tea Sector

Tea production has long been a cornerstone of agricultural economies, particularly in regions like Northeast India where it supports livelihoods and contributes significantly to exports. Understanding its trajectory over time requires examining not just the total output but also the underlying factors such as land under cultivation and yield efficiency. The dataset presented here offers a comparative view of tea production across different years, highlighting both structural changes and growth trends. By analysing the interplay between cultivated area, total production, and average yield, we can better appreciate how technological improvements, farming practices, and resource management have shaped the industry's development and sustainability.



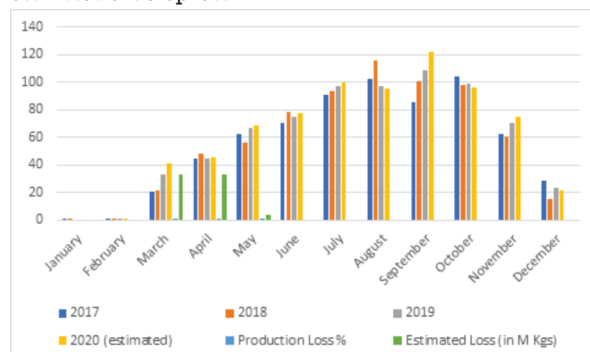
Source: Tea Board of India

The dataset highlights that tea production growth over the years has been driven more by efficiency than by expansion of cultivated land. While the area under tea cultivation shows only modest increases from 1990 to 2018, overall production has risen steadily, with a sharper rise between 2000 and 2018. The most striking trend is the significant increase in average yield per hectare, which consistently outpaces other metrics and underscores the role of improved farming practices, technology, and high-yield varieties. Comparisons of growth between 1990 and 2018, and between 2000 and 2018, confirm that yield improvements are the primary driver of production gains, suggesting that the tea sector's sustainability lies in enhancing productivity rather than expanding land use.

### Impact of COVID-19 on the Tea Industry of Assam

Assam's tea industry has been severely impacted by the COVID-19-induced lockdown, with both supply and production suffering significant setbacks. On the supply side, tea gardens were forced to halt operations from March 22 to April 14, and although the Government of India permitted reopening with 50% of the workforce, the prolonged closure led to overgrown tea leaves, requiring nearly one-third of the crop to be skiffed. Skiffing itself demands 14–21 days and considerable labor costs, further straining resources. Given the seasonal nature of the industry, plucking usually begins by mid-March; however, in 2020, gardens managed only 5–7

days of plucking, resulting in an estimated 80% crop loss for March. With operations resuming from April 15 under workforce restrictions and the added burden of skiffing, losses for April were calculated at approximately 72.5%. By May, although production began to stabilize, portions of the gardens remained under skiffing, and with reduced efficiency during the initial days, the industry still faced an estimated 5% crop loss.



Source: Government of Assam, Department of Industry and Commerce

The graph highlights the sharp disruption in Assam's tea production during 2020 compared to previous years, with losses concentrated in the early months of the pandemic. While production in 2017–2019 followed a typical seasonal cycle, low in January–February, peaking between May and October, and tapering off toward December, the 2020 estimates show dramatic declines in March and April, where losses exceeded 70% due to lockdowns and skiffing requirements. May also reflects reduced output, though losses narrowed to around 5% as operations resumed with partial workforce capacity. By mid-year, production began to recover but remained below historical averages, underscoring the lingering impact of supply chain disruptions and labour shortages. Overall, the chart illustrates how COVID-19 created unprecedented volatility in Assam's tea industry, with early-season losses cascading into reduced annual output.

### Need for Realigning Export Destinations and Product Mix

In 2018–19, Assam's tea gardens exported tea worth approximately US\$214 million, underscoring their importance in the global market. Major consumers of Assam tea include Iran, Russia, the UAE, the UK, China, the USA, Germany, and Japan. However, the ongoing pandemic has disrupted this trade, as several key destinations such as Russia, the USA, the UK, Germany, and Iran remain under lockdown, leading to supply chain interruptions and a decline in out-of-home consumption. At the same time, countries like China, Japan, the UAE, Kazakhstan, and other parts of the Middle East have begun reopening economic activities, offering potential opportunities for market diversification. In this evolving scenario, the tea industry must remain cautious and adaptive, realigning its export strategies to focus on regions where consumption is expected to rise. Such strategies should also consider adjustments in the product mix—particularly between Orthodox and CTC varieties—based on the preferences and consumption patterns of these emerging markets.

### Cost of Production of Large Tea Gardens

Tea is a highly labour-intensive industry, with cultivation costs dominated by wages about 65% of total expenditure, while the remaining 35% is spent on plant upkeep and management, including fertilisers, pesticides, and other inputs. On the manufacturing side, the major cost heads are fuel (26%), power (16%), salaries and labour (22%), selling expenses (13.7%), and bank interest (8%). A significant portion of the working capital in tea gardens is absorbed by fixed costs, particularly wages and salaries, contract demand

charges for power and gas, and interest payments to banks, leaving limited flexibility for operational adjustments (Government of Assam, Department of Industry and Commerce, 2020).

### Immediate Challenges Faced by the Assam Tea Industry

The Assam tea industry is currently grappling with immediate challenges that threaten its stability and growth. One of the foremost issues is the shortage of working capital, which arises due to the seasonal nature of tea production. From December to February, plucking halts, yet the industry continues to bear fixed costs such as wages, salaries, bank interest, and power charges. This financial strain is compounded by the long-term weakening of large tea gardens, making them more vulnerable to liquidity crises. Another pressing challenge lies in supply chain management. Although the nationwide COVID-19 lockdown has been relaxed, the transport sector remains sluggish, delaying recovery. Key markets for Assam tea—such as Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, and Delhi—are still reeling under pandemic impacts, leading to disruptions in logistics and distribution. Together, these factors create a precarious situation where tea gardens face both immediate financial stress and uncertain market access, demanding urgent interventions to sustain the industry (ibid).

### Impact of COVID-19 on the Community Involved in Tea Value Chains

The value chain of the Assam tea industry is experiencing varied levels of impact due to current challenges, with some stages more vulnerable than others. At the plantation stage, the effect remains low since tea bush planting is minimal in the forthcoming months. However, plucking and pruning activities are highly impacted, as overgrown tea must be cleared before fresh plucking begins, and this period coincides with peak production, when about 65% of the workforce is engaged. Fortunately, the spacing of tea bushes naturally ensures social distancing, reducing health risks. Processing encounters medium impact because restrictions on transportation and worker availability hinder the movement of leaves from small tea growers to larger estates and bought-leaf factories. During peak season, factories usually run round-the-clock, but COVID-19 restrictions may force them to operate at limited hours. Packaging, largely mechanised and requiring fewer workers, has a low impact, while distribution shows low direct community impact but is constrained by vehicle movement restrictions and worker shortages, preventing private companies from transporting tea from warehouses to markets. Together, these disruptions highlight how the industry's value chain is unevenly affected, with plucking and processing emerging as the most critical pressure points (ibid).

### SUGGESTION AND CONCLUSION

To strengthen Assam's tea industry in the post-COVID era, it is essential to adopt a multi-pronged strategy that addresses both immediate challenges and long-term sustainability. Export destinations should be diversified toward regions where consumption is recovering, such as China, Japan, the UAE, and parts of the Middle East, while reducing reliance on traditional markets still affected by lockdowns. At the same time, the product mix must be realigned, balancing Orthodox and CTC varieties to suit consumer preferences in different regions. Institutional support for small tea growers who now contribute nearly half of India's tea output should be expanded through credit facilities, cooperative marketing, and training programs. Greater emphasis on technology adoption, including mechanisation in plucking and processing as well as digital platforms for auctions and exports, can reduce labour dependency and improve efficiency. Finally, sustainability measures such as climate-resilient practices, high-yield varieties, and eco-friendly cultivation methods, combined with targeted financial interventions to ease working capital shortages, will be

critical in ensuring resilience and competitiveness in global markets.

Consequently, Assam's tea industry, with its deep historical roots and global reputation, continues to be a vital pillar of India's agricultural economy and cultural identity. The COVID-19 pandemic exposed significant vulnerabilities in the sector, including its dependence on labour, fragile supply chains, and reliance on traditional export markets. Yet, these challenges have also created opportunities for transformation. The growing role of small tea growers, the adoption of modern technologies, and the potential for export diversification highlight pathways toward resilience and sustainability. By realigning product mixes to suit evolving consumer preferences, embracing climate-resilient practices, and strengthening institutional support, Assam's tea industry can not only recover from pandemic-induced setbacks but also secure a stronger position in global markets. Ultimately, the future of Assam's tea lies in balancing tradition with innovation, ensuring that it remains both an economic driver and a cultural symbol for generations to come.

### RERERENCES

1. Aggarwal, P.K. (2008). Impact of climate change on Indian agriculture. *Journal of Agricultural Science*, 146(5), 1–13.
2. Das, P. (2018). Climate variability and agricultural vulnerability in Assam. *Economic and Political Weekly*, 53(12), 46–52.
3. Food and Agriculture Organization of the United Nations. (2008). An introduction to the basic concepts of food security. FAO.
4. Government of Assam, Department of Industry and Commerce. (2020). Report on tea industry of Assam. Government of Assam. <https://industries.assam.gov.in>
5. Government of Assam, Department of Industry and Commerce. (2020). Tea industry report. Guwahati: Government of Assam.
6. Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: Impacts, adaptation, and vulnerability*. Cambridge University Press.
7. Lobell, D. B., Schlenker, W., & Costa-Roberts, J. (2011). Climate trends and global crop production since 1980. *Science*, 333(6042), 616–620.
8. Roy, S. (2020). Agriculture and livelihoods in Northeast India: Challenges and prospects. *Journal of Development Studies*, 56(7), 1123–1138.
9. Singh, K. (2019). Climate change and shifting cultivation in Nagaland. *International Journal of Agricultural Sustainability*, 17(2), 98–110.
10. Tea Board of India. (n.d.). History of Indian tea. Retrieved February 8, 2026, from <https://www.indiatea.org>.
11. Times of India. (2023, January 6). Everything you need to know about the 175-year-old history of tea in India. The Times of India. Retrieved from <https://timesofindia.indiatimes.com>.