

Assessing the Impact of Climate Change on Tuwar Dal Yields and Its Role in Driving Food Inflation in India

Shrutika Ruchit Thakkar*

Assistant Professor, GSFC University, Gujarat, India.

*Corresponding Author: shrutikathakkar0209@gmail.com

ABSTRACT

Tuwar Dal (Pigeon Pea) is a key source of protein in Indian diets and plays an important role in the country's agriculture and food economy. In recent years, farmers are facing number of challenges due to unpredictable weather and changing climate conditions. This study aims to assess how climate change is affecting the production of Tuwar Dal (Pigeon Pea) in India and how these changes are linked to rising food prices. The study also examines how drops in yield impact market supply and lead to food inflation. Data will be collected from government sources. The goal is to understand the climate disturbances hereby affecting the produce quality and resulting in food inflation.

Keywords: Climate Change, Inflation, Agriculture, Food Economy, Farmers.

Introduction

Tuwar Dal, also known as Arhar or Pigeon Pea, is one of the most consumed pulses in India. It is mainly grown in states like Maharashtra, Karnataka, Madhya Pradesh, and Uttar Pradesh. Pulses like Tuwar Dal are highly sensitive to climate conditions, especially rainfall and temperature. In recent years, changes in climate patterns have led to uneven monsoons, delayed sowing, pest attacks, and lower yields. These disturbances not only affect farmers' income but also reduce the supply of pulses in the market, which pushes up prices and leads to food inflation.

Review of Literature

Singh and Kumar (2017), in their paper "*Impact of Climate Change on Pulse Production in India*", studied rainfall variation and its effect on pulse yields. They found that unseasonal rainfall negatively impacted Tuwar Dal productivity in Maharashtra.

Reddy (2019), in "*Agricultural Output and Climate Variability in India*", analyzed crop production data and showed a direct relation between extreme weather events and reduced yield in pulses.

Das (2020), in "*Climate-Induced Food Inflation in Rural India*", focused on inflation trends in rural areas due to declining agricultural output. He concluded that food prices, especially of pulses, rose sharply after poor monsoons.

Mehta and Sharma (2021), in "*Effects of Climate Shocks on Small Farmers*", conducted field research in Madhya Pradesh and found that sudden temperature changes led to pest attacks and loss in Tuwar Dal yield.

Patel et al. (2022), in "*Pulses Production under Changing Climate: A Case Study of Gujarat*", found that inconsistent rainfall and increased temperatures caused production drops and farmer distress.

Objectives of the Study

- To study the effects of climate change on Tuwar Dal production in India.
- To examine the link between reduced yields and food inflation.

Research Methodology

Secondary data will be collected from government reports such as those by the Indian Meteorological Department (IMD), Ministry of Agriculture, and Reserve Bank of India (RBI). The study will look at climate data (rainfall, temperature) from 2010 to 2023 and compare it with Tuwar Dal production and price trends during the same period.

Climate Change and Tuwar Dal Production

Tuwar Dal is usually sown during the kharif season and harvested in winter. It needs moderate rainfall and stable temperatures. However, erratic monsoons, droughts, and floods have caused a sharp decline in yields. For example, Maharashtra, one of the largest producers, reported a 20% drop in Tuwar Dal production in 2022 due to late rains (Ministry of Agriculture, 2022). According to the Economic Survey 2024–25, overall Tur Dal production declined by 13.6% in 2022–23 and by 10.8% in 2023–24 compared to the five-year average (Economic Survey, 2025). Temperature rise and untimely rains have also increased pest attacks and crop diseases, further reducing output.

India has experienced a 1.1°C rise in average temperature between 1901 and 2020. 2023 was the fifth warmest year since 1901. This warming affects critical stages of the crop such as flowering and pod formation (IMD, 2024). Rainfall patterns have also changed. The 2023 monsoon was 6% below normal, with regions like Marathwada facing a deficit of over 25%. These changes led to drought conditions and poor soil moisture, which further delayed sowing and reduced crop growth. Additionally, India saw over 240 extreme weather events in 2022, such as heatwaves and floods, which have now become four times more frequent than two decades ago (CEEW, IMD 2024). A delayed monsoon in June 2023 and record heatwaves in 2022 stressed crops during early stages. Remote sensing data also showed soil moisture deficits in major Tuwar-growing states, affecting plant health.

Climate Change and Food Inflation

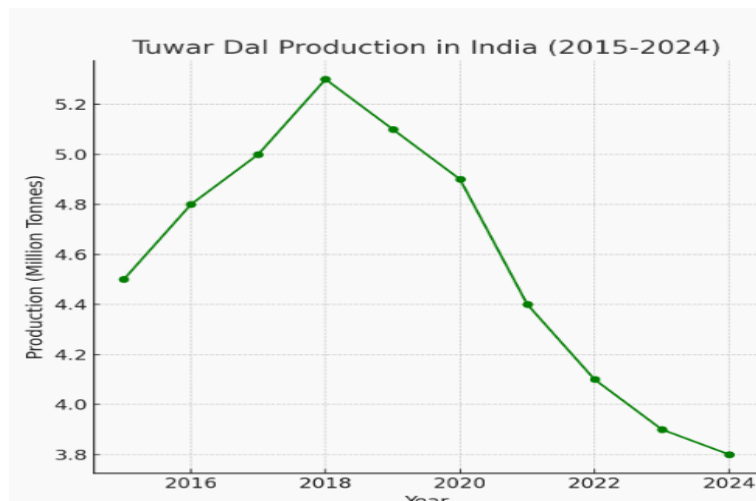
Reduced production leads to supply shortages. When supply falls and demand remains high, prices rise. This is what has been happening with Tuwar Dal. Data from the Department of Consumer Affairs show that retail prices of pulses, especially Tuwar Dal, increased by over 30% during poor harvest years (Department of Consumer Affairs, 2023). The Economic Survey 2024–25 reported that food inflation rose to 8.4% in FY25 (April–December), with pulses and vegetables contributing 32.3% to the overall food inflation (Economic Survey, 2025).

Regional Disparities

The impact of climate change on Tuwar Dal production varies across states. In Karnataka, prolonged dry spells have led to water stress, while in Madhya Pradesh, excessive rains have damaged crops. These regional differences show the need for location-specific solutions.

Graphical Analysis and Interpretation

- **Tuwar Dal Production in India**

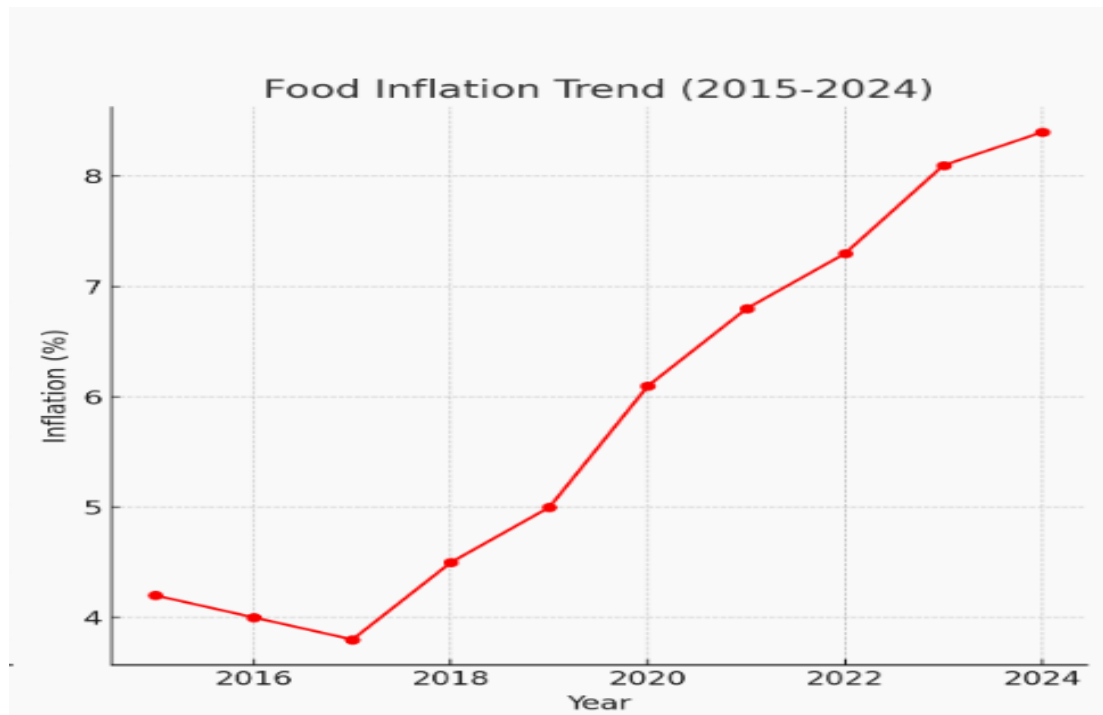


Source: Ministry of Agriculture. (2022). *Annual Report 2021–22*. Government of India.
Economic Survey. (2025). *Economic Survey 2024*

Interpretation

The graph depicting Tuwar Dal production in India from 2015 to 2024 shows a gradual decline over the years. Production peaked at 5.3 million tonnes in 2017 but began to decrease after that. By 2024, production had fallen to 3.8 million tonnes. The most significant drops occurred between 2020 and 2021, where production declined sharply. This trend indicates the negative impact of climate disturbances such as irregular rainfall, droughts, and higher temperatures, which have led to reduced yields and crop losses in major production states.

- **Food Inflation Trend**



Source: Ministry of Agriculture. (2022). *Annual Report 2021–22*. Government of India.
Economic Survey. (2025). *Economic Survey 2024*

Interpretation

The graph illustrating food inflation from 2015 to 2024 shows an upward trend, particularly after 2020. Food inflation rose sharply during periods of poor harvests, with a notable increase in inflation during 2023 and 2024. The rise in inflation is largely driven by the decreased supply of Tuwar Dal, among other factors, leading to higher prices. This inflationary trend correlates with the decline in Tuwar Dal production, highlighting the relationship between reduced agricultural output due to climate change and the increase in food prices, especially pulses.

This visual analysis confirms that when production of Tuwar Dal falls, it contributes significantly to an increase in food inflation, reinforcing the findings from government data and literature.

Climate Disturbances during Kharif season, hereby affecting Tuwar Dal production

- **Rising Average Temperatures**
 - India has experienced 1.1°C rise in average temperature between 1901 and 2020.
 - 2023 was the fifth warmest year in India since 1901. (IMD, 2024)
 - This temperature rise has direct effects on crop stages like flowering and pod formation in Tuwar Dal.

Source: Indian Meteorological Department (IMD). (2024). *Climate of India Report 2023*.

- **Rainfall Variability**

- In 2023, the southwest monsoon was 6% below normal, and rainfall was unevenly distributed.
- Marathwada region (Maharashtra) recorded a deficit of over 25% rainfall, affecting Kharif pulses including Tuwar Dal.

Source: IMD Monsoon Report (2023); Ministry of Agriculture (2024)

- **Increase in Extreme Weather Events**

- India saw over 240 extreme weather events in 2022, including heatwaves, unseasonal rains, and floods.
- These events have quadrupled in frequency over the past two decades, according to CEEW and IMD.

Source: Centre for Science and Environment (2023); IMD (2024)

- **Delayed Monsoon & Heatwaves**

- In June 2023, monsoon onset was delayed by 8–10 days in key Tuwar-producing regions.
- A record-breaking heatwave in April–May 2022 in Central India stressed early sown Tuwar Dal crops, reducing germination rates.

Source: IMD Early Warning Bulletins (2022–2023); Economic Survey (2025)

- **Soil Moisture Deficit**

- Remote sensing data from ISRO and IMD shows significant soil moisture deficit in drought-prone regions of Maharashtra and Karnataka during 2023 Kharif season.
- Poor soil moisture delayed sowing and reduced plant vigor in early growth stages.

Source: ISRO Bhuvan Portal (2023); IMD Agromet Bulletin (2023)

Findings

This study finds that climate change is a serious and ongoing threat to Tuwar Dal production in India. Rising temperatures, irregular monsoons, and frequent extreme weather events have significantly reduced yields. The most notable declines in production occurred during years with delayed rainfall and intense heatwaves. This fall in output directly impacts the supply chain, leading to increased food inflation. Retail prices of Tuwar Dal have shown sharp spikes during poor harvest years, contributing to overall consumer price rise. The production trend from 2015 to 2024 shows a gradual decline, while food inflation continues to rise. The findings highlight the strong link between agricultural production shocks caused by climate change and food inflation.

Conclusion

Climate change is a serious threat to Tuwar Dal production in India. Its effects are clearly linked to rising food prices and inflation. Through timely interventions and climate-smart agriculture, the government and farmers can work together to reduce risks. Ensuring steady production will help control prices and support food security in the country.

References

1. Ministry of Agriculture. (2022). Annual Report 2021-22. Government of India.
2. Department of Consumer Affairs. (2023). Price Monitoring Cell Reports. Government of India.
3. Indian Meteorological Department (IMD). (2023). Climate Data Archives. Government of India.
4. Indian Meteorological Department (IMD). (2024). Climate of India Report 2023. Government of India.
5. Reserve Bank of India. (2023). Report on Currency and Finance. RBI.
6. Economic Survey. (2025). Economic Survey 2024–25. Ministry of Finance, Government of India. <https://www.asianage.com/nation/economic-survey-2025-vegetables-amp-pulses-contributed-323-to-cpi-in-fy25-1858005>
7. New Indian Express. (2025). India needs to develop climate-resilient crop varieties: Economic Survey 2024–25. <https://www.newindianexpress.com/business/2025/Jan/31/india-needs-to-develop-climate-resilient-crop-varieties-economic-survey-2024-25>
8. Centre for Science and Environment. (2023). State of India's Environment Report. New Delhi.

9. ISRO Bhuvan Portal. (2023). Soil Moisture Maps. Indian Space Research Organisation.
10. IMD Monsoon Report. (2023). India Meteorological Department.
11. Singh, R., & Kumar, N. (2017). Impact of Climate Change on Pulse Production in India. *Indian Journal of Agricultural Economics*, 72(4).
12. Reddy, M. (2019). Agricultural Output and Climate Variability in India. *Journal of Climate and Agriculture*, 8(2).
13. Das, A. (2020). Climate-Induced Food Inflation in Rural India. *Rural Economy and Development Review*, 5(1).
14. Mehta, S., & Sharma, P. (2021). Effects of Climate Shocks on Small Farmers. *Indian Journal of Rural Studies*, 6(3).
15. Patel, R., Joshi, D., & Shah, H. (2022). Pulses Production under Changing Climate: A Case Study of Gujarat. *Journal of Environmental and Agricultural Research*, 9(2).

