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Assessing the impact of Geopolitical Disturbances on India's agricultural trade performance

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ABSTRACT: Agricultural trade plays an important role in India's economic development by contributing to foreign exchange earnings, employment generation, and food security. In recent years, global conflicts such as the Afghanistan War, Iraq War, Arab Spring, Global Financial Crisis, COVID-19 pandemic, and Russia-Ukraine conflict have significantly influenced international trade flows, commodity prices, transportation costs, and supply chain stability. The study looks at how India's agricultural commerce was affected by major international conflicts between 2001-2024. Secondary data is the basis of the analysis whereas multiple linear regression, trend analysis and descriptive statistics were used to evaluate the connection between India's agricultural exports and geopolitical tensions. The results show that during the study period, India's agricultural trade significantly increased. Agricultural exports increased from USD 6.3 billion in 2001 to over USD 52 billion in 2024, while imports also recorded steady growth. To sustain long-term growth and reduce vulnerability to future global shocks, policymakers, should prioritize fertilizer security, diversify export markets, strengthen logistics and supply chain infrastructure, reduce dependence on critical agricultural imports and enhance trade intelligence and risk management systems. These measures will improve the stability and competitiveness of India's agricultural trade in an increasingly uncertain global environment.

Keywords: Agricultural trade, Conflicts, Exports, Geopolitical events, Trade performance, Trend analysis

Agriculture plays a crucial role in the socioeconomic development of the country. Indian agriculture is highly diverse and extensive sector involving a large number of stakeholders. Since independence, the sector has witnessed remarkable progress, particularly due to the adoption of Green Revolution technologies, which helped India achieve food self-sufficiency and improved rural livelihoods (Borthakur and Singh, 2020; Chand, 2022; Kaur and Oberoi, 2025).

India is the world's seventh largest country covering an area of 328 million hectares (mha). Nearly half of this land (156.4mha) is arable (FAO, 2018), and only 42.6 percent of the total geographical area (about 140mha) is actually cultivated (as of 2015-16). India's irrigation cover is 48.7 percent of the country's cultivated area while its agriculture output is valued at USD 524.7 billion in 2017 (Gulati and Gupta, 2019). In addition, the agricultural sector has witnessed significant changes over the years, in terms of area under cultivation, land holding and cropping patterns, cropping intensity and productivity, among other things (Gulati and Juneja, 2021). Agricultural

trade is regulated and supported by several international organizations such as the World Trade Organization (WTO), Food and Agriculture Organization (FAO), International Monetary Fund (IMF), World Bank, United Nations Conference on Trade and Development (UNCTAD), International Trade Centre (ITC), Codex Alimentarius Commission, and World Customs Organization (WCO). At the national level, organizations such as the Directorate General of Foreign Trade (DGFT), Agricultural and Processed Food Products Export Development Authority (APEDA), Marine Products Export Development Authority (MPEDA), Spices Board of India, Export Inspection Council (EIC), Food Safety and Standards Authority of India (FSSAI), National Bank for Agriculture and Rural Development (NABARD), Export-Import Bank of India (EXIM Bank), and Farmer Producer Organizations (FPOs) play an important role in promoting agricultural exports, maintaining quality standards, and facilitating market development.

Strong agricultural commercial ties are maintained between India and the US, the UAE, Saudi Arabia,

Bangladesh, China and Vietnam for exports. Similarly, significant suppliers of agricultural inputs and imports include nations like Indonesia, Malaysia, Russia, Ukraine, Canada and Australia (Kulkarni *et al.*, 2023; Kumar *et al.*, 2024).

Events including wars, trade disputes, international disputes, border tensions, economic tensions, economic sanctions and political instability are referred to as geopolitical disruptions. Previous research indicates that rivalry for resources, strategic interests, ideological disagreements and national policy goals are frequently the causes of these disruptions. These occurrences cause supply chains to be disrupted, transaction costs to rise and uncertainty to be created, all of which have a detrimental impact on investment and global economic cooperation. (Verma *et al.*, 2025; Raghuwanshi, 2024; Koubi 2019).

International trade flows have been profoundly altered by significant events such as the wars in Afghanistan (2001), Iraq (2003), the global financial crisis (2008-2009), the Arab Spring (2011), the annexation of Crimea (2014), the COVID-19 pandemic (2020), the conflict between Russia and Ukraine (2022) and ongoing geopolitical tensions in the Middle East. Due to its reliance on reliable supply chains, energy availability, transportation infrastructure and access to global markets, agricultural trade is extremely vulnerable to geopolitical unrest. (UNCTAD, 2022). Reduced exports and higher commodity and fertilizer prices are the results of geopolitical unrest. Geopolitical upheavals also have a significant impact on logistics and transportation. Disruptions in international commerce routes typically result in higher shipping, freight and fuel expenses. (UNCTAD, 2023; FAO, 2022; FAO, 2023; OECD-FAO, 2019).

MATERIALS AND METHODS

This study employed an ex-post facto research design to investigate the influence of geopolitical disturbances on India's agricultural trade and export performance over the period 2001-2024. Since geopolitical conflicts cannot be manipulated

experimentally, the study relied on historical data to examine their relationship with agricultural trade outcomes. Annual time-series data covering twenty-four years were collected from reliable secondary sources, including FAOSTAT, the World Bank, the World Trade Organization (WTO), the Ministry of Commerce and Industry and the Agricultural and Processed Food Products Export Development Authority (APEDA) (FAO, 2018; World Bank, 2023; World Trade Organization, 2023).

The study focuses on major geopolitical events that significantly affected global economic and trade conditions, namely the Afghanistan War (2001), Iraq War (2003), Arab Spring (2011), Crimea conflict (2014), COVID-19 pandemic (2020), Russia-Ukraine (2022) and Israel-Hamas conflict (2023). These events disrupted international transportation, increased commodity prices, altered global demand and supply conditions and affected agricultural trade through multiple transmission channels. To capture the occurrences of these disturbances, a dummy variable approach was adopted, assigning a value of one to conflict years zero to non-conflict years (FAO, 2022; Kumar *et al.*, 2021; Raghuwanshi, 2024).

Agricultural exports were considered the dependent variable, while time (year) and the geopolitical conflict dummy served as the explanatory variables. Initially, descriptive statistics, and trend analysis were employed to examine changes in agricultural exports, imports, trade balance and the share of agriculture in India's total trade over the study period. The analysis identified times linked to significant geopolitical disruptions and offered a summary of long-term trade performance. The following specification was used to construct a multiple linear regression model in order to evaluate the impact of geopolitical disruptions on export performance (Atkin and Khandelwal, 2020; Azmi *et al.*, 2024):

$$\text{Agricultural Exports} = \beta_0 + \beta_1 (\text{Year}) + \beta_2 (\text{Geopolitical conflict Dummy}) + \varepsilon$$

The underlying long-term growth trend in

agricultural exports brought by structural developments such market diversification, regulatory reforms, technical advancement, and rising global demand was reflected by the year variable. The conflict dummy assessed if geopolitical upheavals had an impact on export performance that went beyond the long-term pattern (Kumar *et al.*, 2024; Balogh and Jambor, 2020; Kastner *et al.*, 2021).

RESULTS AND DISCUSSION

Despite several periods of geopolitical upheaval, the empirical analysis showed that India's agricultural commerce increased significantly between 2001 and 2004. According to Table 1, agricultural exports grew by more than eight times over the study period, from USD 6,329 million in 2001 to USD 52,255 million in 2024. Imports of agricultural products also showed a consistent increase, rising from USD 4,513 million to USD 45,662. India was able to maintain a positive agricultural trade balance for the duration of the research because, despite a significant increase in imports, agricultural exports continuously outpaced imports. This result shows that Indian agricultural products are becoming more competitive in foreign markets and that the industry is resilient to shocks to the world economy (World Bank, 2023; International Monetary Fund, 2023; Kumar *et al.*, 2024).

According to the long-term trend analysis shown in Table 2, India's agricultural export performance may be roughly categorized into three stages. Trade liberalization, increased agricultural production, rising foreign demand, and favorable global commodity prices all contributed to the first phase's rapid expansion (2001-2013). Agricultural exports grew despite the wars in Afghanistan and Iraq because India's export basket got more diverse and the world's food demand remained comparatively stable. This expansion was greatly aided by export revenue from commodities like rice, spices, marine products, tea, cotton and cereals (Atkin and Khandelwal, 2020; OECD-FAO, 2019; Kulkarni *et al.*, 2023).

The second phase (2014-2020) had more year-to-year variations along with somewhat slower export growth. Export performance was impacted by the drop in international commodity prices, slower global economic development, exchange rate volatility and geopolitical tensions in the region. International logistics, labor availability and shipping activities were severely hampered by the COVID-19 epidemic (International Monetary Fund, 2023; World Bank, 2023; Kumar *et al.*, 2021).

The last stage, which runs from 2021 to 2024, is a time of robust recovery and revitalized growth. India's agricultural exports for the first time exceeded USD 50 billion when pandemic related restrictions were relaxed. Due to the disruption of supplies of grains, edible oils and fertilizers from two of the biggest Russia and Ukraine profoundly changed international agricultural trade. India now has more export options as a result of these interruptions, which also raised food costs internationally and prompted several importing

Table 1: Export, Import and Balance of Trade for Agricultural Goods in India (Million US dollars)

Year	Agri Exports	Agri Imports Trade	Balance for Agricultural Goods
2001	6329	4513	1816
2002	6911	4954	1957
2003	7205	6167	1038
2004	8799	6822	1977
2005	10274	7520	2754
2006	12452	7976	4476
2007	16301	10659	5642
2008	21251	12005	9246
2009	16384	14224	2160
2010	23106	17864	5242
2011	34491	22551	11940
2012	42395	25668	16727
2013	46954	24418	22536
2014	42897	27316	15581
2015	34643	27718	6925
2016	33064	29029	4035
2017	38833	32991	5842
2018	38927	28246	10681
2019	37371	27931	9440
2020	38872	26188	12684
2021	50490	38206	12284
2022	54685	46454	8231
2023	51061	41157	9904
2024	52255	45662	6593

nations to diversify their sourcing tactics. Indian agricultural exports benefitted from excellent market circumstances and growing demand across multiple countries, notwithstanding the continued high level of global uncertainty (FAO, 2022; FAO, 2023; OECD-FAO, 2019).

In Table 3, the regression results offer more proof of the connection between export performance and geopolitical unrest. After taking into consideration the number of explanatory variables, the modified R^2 value of 0.857 verified the robustness of the model, while the estimated model explained about 86.9% of the variation agricultural exports ($R^2 = 0.869$). Additionally, the total regression model was statistically significant ($F=69.718$, $p<0.001$), suggesting that a considerable amount of the observed changes in agricultural exports could be explained by the chosen explanatory factors together (Kumar *et al.*, 2024; Yang *et al.*, 2025; Goel and Mittal, 2025).

The temporal trend showed a positive and very significant coefficient ($\beta=2144.659$, $p<0.001$) among the explanatory variables. This finding suggests that agricultural exports have grown steadily over the long run, regardless of transient geopolitical developments. Improvements in

agricultural output, the development of export-oriented infrastructure, market diversification, policy assistance, technical advancement and a deeper integration of Indian agriculture into international value chains are all major contributors to the ongoing rise in exports (Chand, 2022; Gulati and Juneja, 2021; Azmi *et al.*, 2024).

The geopolitical conflict dummy variable, on the other hand, generated a positive coefficient but was statistically insignificant ($\beta = 2144.659$, $p=0.485$). This result implies that India's agricultural export performance was not directly and consistently impacted by geopolitical disturbances during the study period. Rather, their effects seem to have spread indirectly through increased freight costs, supply-chain disruptions, inflationary pressures, variations in exchange rates and increased volatility in the world's food markets. In number of cases, geopolitical conflicts mitigate some of the negative effects of global uncertainty by concurrently creating export possibilities by decreasing supplies from rival exporting nations (Ai *et al.*, 2025; Yang *et al.*, 2025; Goel and Mittal, 2025).

CONCLUSION

The current study examines the changes in agricultural imports and exports from 2001 to 2024 and evaluates the effects of geopolitical conflicts on India's agricultural commerce. In addition to offering a thorough analysis of how significant geopolitical events have affected India's agricultural trade over the past 20 years, the study discovered that geopolitical events have affected India's agricultural trade over the past 20 years, the study discovered that geopolitical conflicts and global economic disruptions had an impact on agricultural trade through changes in commodity prices, transportation costs, supply chain disruptions and uncertainty in international markets (Raghuwanshi, 2024; Verma *et al.*, 2025; FAO, 2022).

Table 2: Agricultural Exports vs Agricultural Import trend

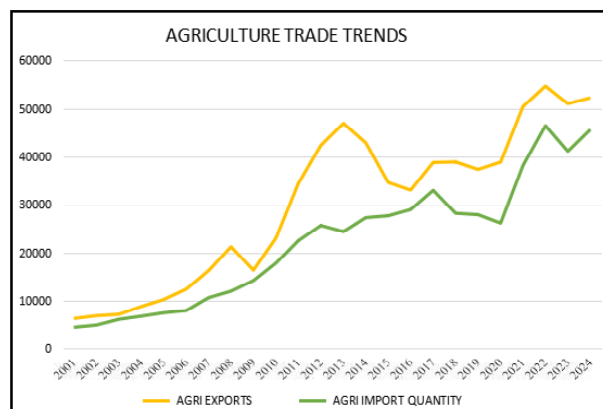


Table 3: Multiple linear regression analysis of agricultural exports

Model	R	Rsquare	Adjusted R square	Std. Error of the estimate	Rsquare change	Fchange	df 1	df 2	Sig. F change	Durbin-Watson
1	0.936	0.869	0.857	6202.715	0.869	69.718	2	21	<0.001	0.708

Regression study shows that while geopolitical disruptions did not have a statistically significant direct effect, the long-term growth pattern had a substantial impact on agricultural export performance. Indian agricultural products were able to adjust to shifting global trade dynamics as a result of new market prospects brought about by disruptions in exports from key producing nations (Kumar *et al.*, 2024; Atkin and Khandelwal, 2020; Balogh and Jambor, 2020).

Overall, the study comes to the conclusion that structural advancements in agricultural production, export diversification, favorable government policies, and increased integration with international markets—rather than just geopolitical events—have been the main drivers of India's agricultural export growth. Nonetheless, the need for proactive policy actions is highlighted by the growing uncertainties in the global trading climate. The resilience and long-term sustainability of India's agricultural trade will be increased by boosting domestic production of essential agricultural inputs, enhancing trade intelligence systems, diversifying export destinations, strengthening logistics and port infrastructure, and lowering reliance on import-sensitive commodities. By taking these steps, India would strengthen its position as a dependable supplier to international agricultural markets and be better equipped to resist future geopolitical shocks (Kastner *et al.*, 2021; Kaur and Oberoi, 2025; Chand, 2022).

REFERENCES

- Ai, J., Li, M., Zhang, T. and Zhang, W. (2025). The impacts of the 2025 trade wars on global agricultural markets and US agricultural trade. *International Food and Agribusiness Management Review*, 1: 1-30.
- Atkin, D. and Khandelwal, A. K. (2020). How distortions alter the impacts of international trade in developing countries. *Annual Review of Economics*, 12(1):213–238.
- Azmi, S. N., Khan, K. H. and Koch, H. (2024). Assessing the effect of INSTC on India's trade with Eurasia: An application of gravity model. *Cogent Economics and Finance*, 12(1): 2313899.
- Balogh, J. M. and Jám bor, A. (2020). The environmental impacts of agricultural trade: A systematic literature review. *Sustainability*, 12(3): 1152.
- Borthakur, A. and Singh, P. (2020). Agricultural research in India: An exploratory study. *International Journal of Social Science and Interdisciplinary Research*, 11(1): 291–295.
- Chand, R. (2022). Indian agriculture towards 2030—Need for a transformative vision. In *Indian agriculture towards 2030: Pathways for enhancing farmers' income, nutritional security and sustainable food and farm systems*, Springer Nature Singapore, Pp. 1-7.
- Food and Agriculture Organization. (2018). FAOSTAT statistical database. FAO. <https://www.fao.org/faostat/>
- Food and Agriculture Organization. (2022). The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict. FAO.
- Food and Agriculture Organization. (2023). Global food trade and market report. FAO.
- Goel, P. and Mittal, F. (2025, November). US Trade Wars: Drivers, Global Economic Realignments, and Consequences for India. In: *International Conference on Policies, Processes and Practices for transforming Underdeveloped Economies into Developed Economies (PPP-UD 2025)*, Atlantis Press, Pp. 136-145.
- Gulati, A. and Gupta, P. (2019). *Indian Agriculture and Policy Reforms*. Indian Council for Research on International Economic Relations.
- Gulati, A. and Juneja, R. (2021). Transforming Indian agriculture. In *Indian Agriculture Towards 2030: Pathways for Enhancing Farmers' Income, Nutritional Security and Sustainable Food and Farm Systems*, Springer Nature Singapore, Pp. 9–37.
- International Monetary Fund. (2023). *World economic outlook*. IMF.

- Kastner, T., Chaudhary, A., Gingrich, S., Marques, A., Persson, U. M., Bidoglio, G., ... and Schwarzmüller, F. (2021). Global agricultural trade and land system sustainability: Implications for ecosystem carbon storage, biodiversity, and human nutrition. *One Earth*, 4(10): 1425-1443.
- Kaur, K. and Oberoi, R. (2025). Agricultural transformation in India and Farmers challenges in the post-Green Revolution era. *International Journal of Applied Social Science*, 12(3and4):269-277.
- Koubi, V. (2019). Climate change and conflict. *Annual Review of Political Science*, 22(1): 343-360.
- Kulkarni, S., Dave, R., Bhatia, U. and Kumar, R. (2023). Tracing spatiotemporal changes in agricultural and non-agricultural trade networks of India. *Plos one*, 18(9): e0286725.
- Kumar, A., Singh, N. and Patel, R. (2024). Determinants of India's agricultural exports: A panel data analysis. *Agricultural Economics Research Review*, 37(1): 59–73.
- Kumar, P., Singh, S. S., Pandey, A. K., Singh, R. K., Srivastava, P. K., Kumar, M., ... and Drews, M. (2021). Multi-level impacts of the COVID-19 lockdown on agricultural systems in India: The case of Uttar Pradesh. *Agricultural Systems*, 187:103027.
- Organisation for Economic Co-operation and Development/Food and Agriculture Organization. (2019). *OECD-FAO agricultural outlook 2019–2028*. OECD Publishing.
- Raghuwanshi, P. (2024). Geopolitical conflicts and global trade restructuring. *International Journal of Political Economy*, 18(3): 201–219.
- United Nations Conference on Trade and Development. (2023). *Impact of geopolitical tensions on global trade*. UNCTAD.
- Verma, S., Gupta, A. and Mehta, R. (2025). Impact of geopolitical disturbances on Indian international trade. *Journal of International Business and Economics*, 13(1): 91–110.
- World Bank. (2023). *Commodity markets outlook*. World Bank.
- World Trade Organization. (2023). *World trade report 2023*. WTO.
- Yang, T., Lau, W. Y. and Bahri, E. N. A. (2025). The impact of US–China trade war on China's exports: Evidence from difference-in-differences model. *Sage Open*, 15(2): 21582440251328482.

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