



Cover Page



TECHNOLOGICAL CHANGE IN INDIAN AGRICULTURE AND EMERGING FOREIGN TRADE TRENDS: IMPLICATIONS FOR ECONOMIC GROWTH

Dr. Shyamu Ganta

Assistant Professor of Economics, KGC Hanumakonda, Hanumakonda, Telangana State, India

Abstract

Technology advancement becomes one of the key factors that promote agricultural development, productivity, market integration and foreign trade in India. The current research work focuses on studying technological change in Indian agriculture and the linkages between technological change and agricultural performance and trends in foreign trade with special focus on their impacts on economic growth in India. The research design is of descriptive and analytical nature using secondary data with the help of percentage and graphical analyses through three broad dimensions namely: technological change, agricultural performance and agricultural foreign trade. It is observed that improved seeds exhibit the highest adoption of technology (50.0%), followed by modern irrigation (40.0%), digital agricultural information (39.0%), mechanization (38.0%) and precision farming (18.0%). It is seen that agricultural performance indicators reveal the highest level of change in farm mechanization (30.0%), followed by improved seed adoption (28.0%), market participation (26.0%), crop productivity (24.0%) and irrigated land (21.0%). In case of foreign trade, value-added exports witness the highest level of change (41.0%), followed by processed food exports (38.0%), rice and cereal exports (35.0%), diversification of export destinations (34.0%) and agricultural exports (32.0%). It is concluded that technology advancements help to improve agricultural productivity, value additions, market participation and export competitiveness making possible for Indian agriculture to play its role in the overall economic growth in India.

Keywords: Technological Change; Indian Agriculture; Agricultural Productivity; Foreign Trade; Export Competitiveness; Economic Growth.

1. INTRODUCTION

In this way, agriculture is still significant in the economy of India through rural incomes, food security, employment generation, and agro-industrial activities. However, varying climatic factors, increased cost of inputs, small land holdings, inadequate resources, and increasing competition in the market have resulted in the necessity of technological revolution in the agricultural sector. Introduction of improved seeds, machinery, better irrigation techniques, agricultural information through digital technologies, and precision farming are some of the ways that have been influencing the agricultural productivity and efficiency of resource use. Mobile-based advisory services, remote sensing, artificial intelligence, and digital market places are other forms of technologies that have been providing new means to farmers for receiving agricultural information, inputs, financial support, and market linkages. In this regard, technological change has emerged as one of the essential elements of enhancing agricultural performance and strengthening the competitiveness of agriculture in India.

Technological revolution is also connected with the changing dynamics of agricultural foreign trade of India. Enhanced production, processing, preservation, packaging, quality assurance, and logistics have facilitated Indian exports of high-value added agricultural and food products. India has entered into the international market for export of commodities like rice, cereals, marine products, fruits, vegetables, and processed foods, whereas diversification of export markets has provided further scope for trade. In this way, understanding the connection between technological change, agricultural performance, and emerging foreign trade trends will be vital to know about their economic implications. This paper attempts to understand the adoption of technologies, changes in agricultural performance, and emerging trends of agricultural foreign trade in India.



Cover Page



2. LITERATURE REVIEW

Nugroho et al. (2021) have explored the effects of economic globalisation on agricultural value added in developing countries. Specifically, it was determined how increasing economic integration affected agricultural performance and value added in agriculture. According to the study findings, economic globalisation could play an important role in agricultural value added in developing countries due to increased involvement in international trade and investments, technology transfer, and market integration. In other words, the authors stressed that more active involvement in global economic relations could be beneficial for agricultural development and performance of developing countries. This research has proved that globalisation and agricultural transformation were related and that agricultural value added could promote economic development.

Fuglie et al. (2019) have examined the role of technology and productivity growth in agricultural development in their study *Harvesting Prosperity: Technology and Productivity Growth in Agriculture*. Specifically, technological progress was considered as a main driver of agricultural productivity, resource efficiency, and economic growth. As it has been shown in this study, technological innovations have been used in order to improve efficiency of land, labour, capital, and other agricultural resources. Moreover, the authors have emphasised that the sustainability of productivity growth depends on research and development, technologies, infrastructure, and institutions. In this way, the study has shown that technological innovations were important in order to meet the rising food demands and support agricultural income.

Byres (2019) has explored the political economy of technological innovation in Indian agriculture and has considered the interrelation between technological change, agricultural transformation, and institutions and socio-economic conditions. It has been shown in the study that the process of technological innovation in Indian agriculture has not been isolated from broader socio-economic and political context. The adoption and effect of technological innovations on Indian agriculture were related to such factors as land ownership, resource availability, state policy, class relations, and distribution of economic benefits. It has been shown that technological innovations could be effective in order to increase agricultural productivity.

3. RESEARCH METHODOLOGY

Secondary data and descriptive-analytical methods were employed to investigate technology adoption, agricultural performance, and international trade. The percentage method and graphs were applied to analyze the effects on economic development.

3.1 Research Design

Research design that was used in this research was analytical and descriptive in order to analyze the phenomenon of technological change in Indian agriculture and its connection to foreign trade. Analysis of this problem was conducted in three aspects – adoption of technology in agriculture, improvement in performance of agriculture, and foreign trade in agriculture.

3.2 Data Sources

The study is mainly dependent upon secondary data that was collected from various publications by the government, agriculture statistics, research papers, etc. All the data regarding technology adoption, agricultural efficiency, and international trade was then analyzed to present a comparison of the evolving agriculture picture in India.

3.3 Variables and Indicators

There were three classes of indicators under consideration for the purpose of analysis. The first class comprised of technological adoption and included improved seeds, agricultural mechanization, modern irrigation techniques, information technology for agriculture and precision agriculture. The second class was related to the assessment of



Cover Page



agricultural efficiency and involved crop yields, irrigated land area, agricultural mechanization, improved seeds and marketing. The third class was related to agricultural foreign trade.

3.4 Data Analysis

The gathered data was arranged in tables with percentages and shown through graphics for easy comparisons. The descriptive percentage analysis approach was adopted to determine the relative degree of technology adoption and the change that had occurred in agricultural performance and international trade. Tables and figures were used to show the differences between the chosen indicators. The results were analyzed to interpret the effects of technology advancement on agriculture and foreign trade.

4. RESULTS

Adoption levels of some of the selected agricultural technologies are shown in Table 1. These include improved seeds, mechanization, irrigation, information technology in agriculture, and precision agriculture. Figure 1 illustrates these adoption levels graphically, making it possible to compare how well each technology has been adopted in agriculture.

Table 1: Adoption of Agricultural Technologies

Technology	Adoption (%)
Improved Seeds	50.0
Mechanization	38.0
Modern Irrigation	40.0
Digital Information	39.0
Precision Farming	18.0

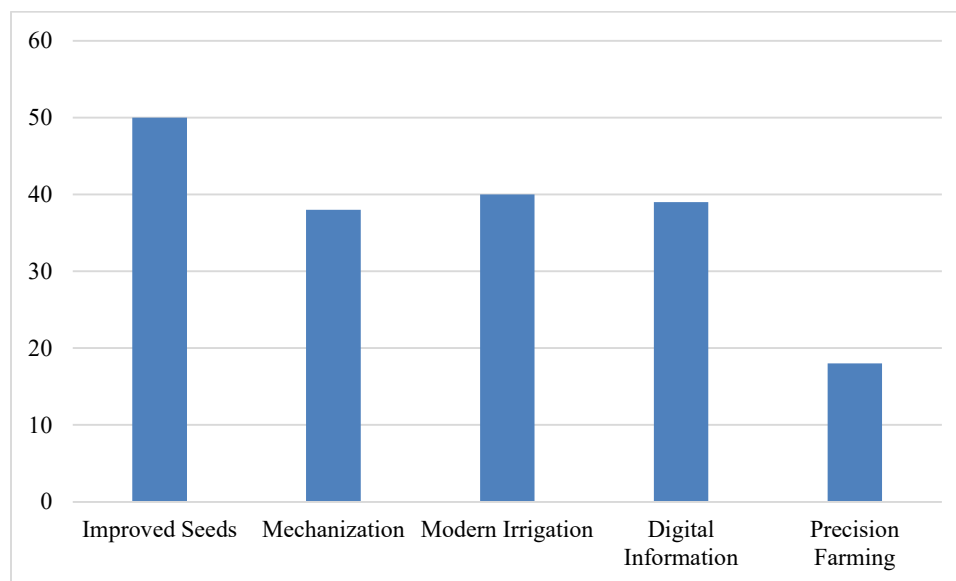


Figure 1: Graphical Representation of Adoption of Agricultural Technologies

From the results, it can be noted that the adoption level is higher for better seeds (50.0%) followed by modern irrigation (40.0%), digital information (39.0%) and farm mechanization (38.0%). The technology which has registered the least



Cover Page



adoption is that of precision farming at (18.0%). From these results, it can be seen that the adoption is higher in relatively available and established technologies.

Table 2 shows the percentage change in agricultural performance indicators such as crop yield, irrigated land, farm mechanization, better seeds and participation in market. Figure 2 shows the graphical illustration of these percentages.

Table 2: Change in Agricultural Performance

Indicator	Change (%)
Crop Productivity	24.0
Irrigated Area	21.0
Farm Mechanization	30.0
Improved Seed Use	28.0
Market Participation	26.0

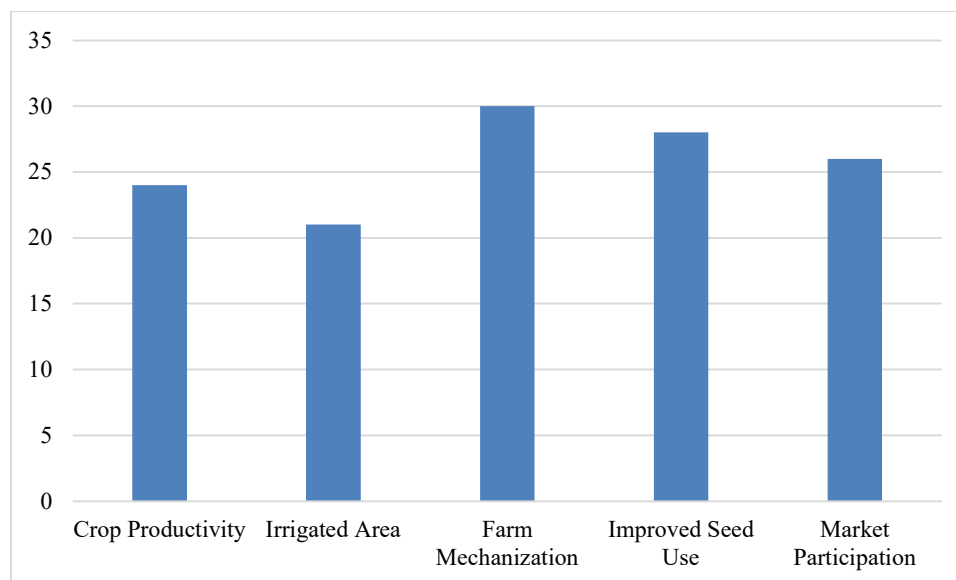


Figure 2: Graphical Representation of Change in Agricultural Performance

The analysis shows that farm mechanization had the highest percentage change (30.0%), followed by the use of improved seeds (28.0%) and market involvement (26.0%). The crop productivity had a 24.0% change while the change in irrigated area was 21.0%. This means that there have been positive impacts of technological advancement, specifically farm mechanization and use of improved seeds on agriculture, while there have also been positive impacts of irrigation and market involvement on agriculture.

Table 3 displays the percentage change in selected indicators of India's emerging foreign trade trends in agriculture. The indicators include agricultural exports, processed food exports, rice and cereals exports, value added exports, and diversification of export markets. Figure 3 depicts the graphs for the selected indicators of trade.



Cover Page



Table 3: Emerging Agricultural Trade Trends

Trade Indicator	Change (%)
Agricultural Exports	32.0
Processed Food Exports	38.0
Rice & Cereal Exports	35.0
Value-added Exports	41.0
Export Destination Diversification	34.0

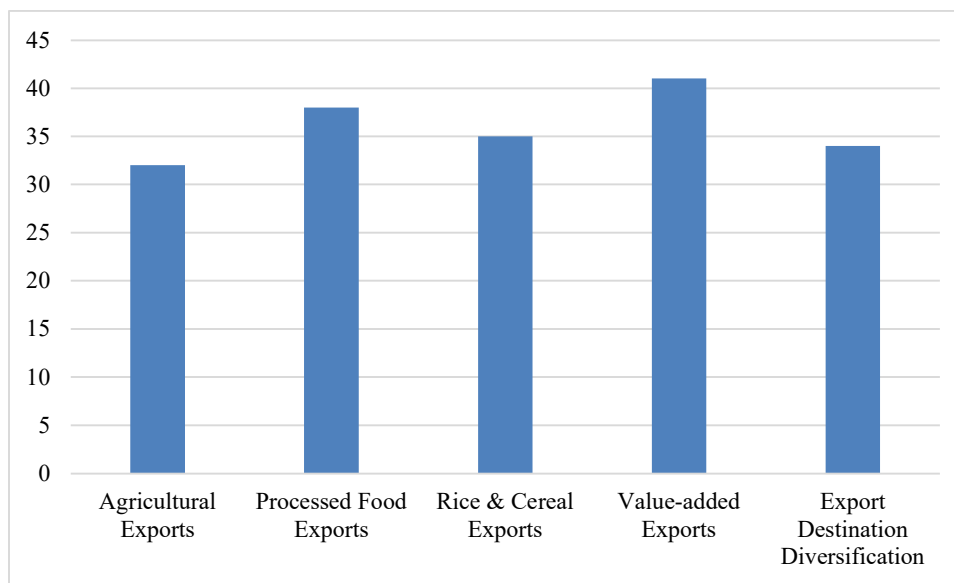


Figure 3: Graphical Representation of Emerging Agricultural Trade Trends

The data reveals that the value added exports had the maximum change of 41.0%, followed by processed food exports of 38.0%, and rice and cereal exports of 35.0%. Export destination diversification was seen to have a change of 34.0%, whereas total agricultural exports had a change of 32.0%. This clearly shows the increasing focus on value addition and processed agriculture commodities in international markets, making diversification and value addition key elements in India's new agriculture trade policy.

5. DISCUSSION

The results reveal that technological advancement has helped immensely in transforming and improving the performance of agriculture in India. Improved seeds had the highest adoption level (50.0%), followed by modern irrigation (40.0%), digital information (39.0%), and mechanization (38.0%), while precision farming was adopted at a relatively lower level (18.0%), which implies that there are constraints with regard to technology adoption. In relation to the performance of agriculture, farm mechanization had the highest change level (30.0%), followed by improved seed utilization (28.0%) and market participation (26.0%), which implies an improvement in production and market access. The same holds true for new agricultural trade practices, where the highest change was registered in value-added exports (41.0%), followed by processed food exports (38.0%) and rice and cereals exports (35.0%).



Cover Page



6. CONCLUSION

The study reveals that technological advancement is an important factor which helps to improve the performance of Indian agriculture and its integration into international business environment. It has been found that improved seeds have the maximum rate of adoption (50.0%), but the adoption of precision farming is relatively lower (18.0%). This implies that the technologies which are traditional and easier to adopt have higher rate of adoption compared to advanced technologies. Agricultural performance has the highest change in farm mechanization (30.0%), improved seeds (28.0%) and participation in market (26.0%) which depicts improvement in production and market participation. Value added exports, processed food exports and rice and cereal exports are the factors related to international trade which have the highest change (41.0%, 38.0% and 35.0% respectively). It depicts the growing significance of value addition and diversification in agricultural exports. Therefore, the results reveal that technological advancement is helpful in increasing the productivity, market participation, value addition and export competitiveness and hence, there is opportunity for agriculture sector to contribute to economic growth. Improving availability of advanced technologies, digitization, precision farming, irrigation and value addition is expected to increase the productivity and competitiveness of Indian agriculture.

References

1. Nugroho, A. D., Bhagat, P. R., Magda, R., & Lakner, Z. (2021). The impacts of economic globalization on agricultural value added in developing countries. *PloS one*, 16(11), e0260043.
2. Fuglie, K., Gautam, M., Goyal, A., & Maloney, W. F. (2019). *Harvesting prosperity: Technology and productivity growth in agriculture*. World Bank Publications.
3. Byres, T. J. (2019). The political economy of technological innovation in Indian agriculture. In *Science, Politics, and the Agricultural Revolution in Asia* (pp. 19-75). Routledge.
4. Martin, W. (2019). Economic growth, convergence, and agricultural economics. *Agricultural Economics*, 50, 7-27.
5. Orhan, A., Adebayo, T. S., Genç, S. Y., & Kirikkaleli, D. (2021). Investigating the linkage between economic growth and environmental sustainability in India: do agriculture and trade openness matter?. *Sustainability*, 13(9), 4753.
6. Wang, S., He, Y., & Song, M. (2021). Global value chains, technological progress, and environmental pollution: Inequality towards developing countries. *Journal of Environmental Management*, 277, 110999.
7. Sethi, P., Chakrabarti, D., & Bhattacharjee, S. (2020). Globalization, financial development and economic growth: Perils on the environmental sustainability of an emerging economy. *Journal of Policy Modeling*, 42(3), 520-535.
8. Zameer, H., Yasmeen, H., Zafar, M. W., Waheed, A., & Sinha, A. (2020). Analyzing the association between innovation, economic growth, and environment: divulging the importance of FDI and trade openness in India. *Environmental Science and Pollution Research*, 27(23), 29539-29553.
9. Khan, A., Bibi, S., Lorenzo, A., Lyu, J., & Babar, Z. U. (2020). Tourism and development in developing economies: A policy implication perspective. *Sustainability*, 12(4), 1618.
10. Hulme, P. E. (2021). Unwelcome exchange: International trade as a direct and indirect driver of biological invasions worldwide. *One Earth*, 4(5), 666-679.