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IMPACT OF IRRIGATION ON CROP PRODUCTION AND CROP YIELD IN INDIA

Dr. Arvindbhai Kevalbhai Paramar**ABSTRACT**

Agriculture is one of the most important sectors of the Indian economy as it provides employment, ensures food security and supports the livelihood of millions of people. However, Indian agriculture is highly dependent on monsoon rainfall, which often creates uncertainty in agricultural production and productivity. Irrigation plays a crucial role in improving crop production, increasing crop yield and ensuring agricultural stability. The present study analyses the impact of irrigation on crop production and crop yield in India using secondary time-series data for the period 2000-2022. The study mainly focuses on irrigated area, crop production and crop yield. Data were collected from Agricultural Statistics at a Glance, FAOSTAT and other official government publications. Descriptive and analytical methods such as trend analysis, percentage analysis and comparative analysis were used to examine changes in irrigation and agricultural productivity over time. The findings of the study indicate that irrigated area increased from 121.05 million hectares in 2000 to 132.20 million hectares in 2022, recording an overall increase of approximately 9.21%. During the same period, crop production increased from 196.81 million tonnes to 329.69 million tonnes, showing a growth of nearly 67.52%, while crop yield increased from 1626 kg/hectare to 2494 kg/hectare, reflecting an increase of approximately 53.38%. The study concludes that irrigation has a positive impact on crop production and crop yield in India and plays an important role in improving agricultural productivity, food security and sustainable agricultural development.

KEYWORDS: Irrigated Area, Crop Production, Crop Yield, Agricultural Productivity and Indian Agriculture

1. INTRODUCTION

Agriculture has always been an important pillar of the Indian economy. A large section of India's population depends directly or indirectly on agriculture for livelihood and employment. Despite the growth of industrial and service sectors, agriculture continues to play a vital role in food security, rural development and economic stability. However, Indian agriculture is highly dependent on monsoon rainfall, which often leads to fluctuations in crop production due to droughts, irregular rainfall and climate uncertainty.

India possesses one of the largest irrigation networks in the world, yet a significant portion of agricultural land still depends on rainfall. Rapid population growth, increasing food demand, climate change and water scarcity have made efficient irrigation management more important than ever before. In recent years, the Government of India has introduced several irrigation-related schemes such as the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) to improve water-use efficiency and expand irrigation coverage across the country. Effective irrigation systems not only increase agricultural productivity but

also help ensure food security, rural income stability and sustainable agricultural development.

Irrigation is considered one of the most essential agricultural inputs because it ensures timely and adequate water supply to crops. Irrigation helps farmers increase crop yield, cultivate multiple crops in a year and reduce dependence on rainfall. The development of irrigation facilities contributed significantly to the success of the Green Revolution in India. Over time, India has expanded different sources of irrigation such as canals, tube wells, tanks, and modern micro-irrigation systems including drip and sprinkler irrigation.

The expansion of irrigation facilities has improved agricultural productivity and supported overall agricultural development in India. Therefore, studying the relationship between irrigation, crop production, and crop yield is important for understanding sustainable agricultural development and policy planning.

2. REVIEW OF LITERATURE

Several studies have examined the relationship between irrigation and agricultural productivity in India. Earlier research indicates that irrigation has a positive impact on crop yield, food grain production and rural income. Researchers observed that irrigated regions generally achieve higher agricultural productivity compared to rain-fed regions because irrigation provides a reliable water supply throughout the cultivation period.

Studies related to the Green Revolution highlighted that irrigation played a major role in increasing wheat and rice production in states such as Punjab, Haryana and Uttar Pradesh. Other studies found that irrigation expansion improved cropping intensity and reduced the risks associated with monsoon failure. Researchers also emphasized the importance of micro-irrigation systems for efficient water use and sustainable agriculture.

Although many studies discuss irrigation and agricultural productivity, recent studies focusing on irrigation, crop production, and crop yield together at the national level remain limited. Therefore, the present study attempts to analyse the impact of irrigation on crop production and crop yield in India

using updated secondary data.

Previous studies mainly focused on food grain production or regional irrigation analysis. Limited studies have examined the relationship between irrigation, crop production, and crop yield together using recent national-level data. Hence, the present study attempts to provide a broader understanding of irrigation and agricultural productivity in India.

3. OBJECTIVES OF THE STUDY

1. To examine the impact of irrigation on crop production in India.
2. To analyse the impact of irrigation on crop yield in India.

4. RESEARCH METHODOLOGY

The present study is based on secondary data collected from official government publications and international databases. The study uses annual Time-series secondary data for the period 2000-2022 have been used to examine the relationship between irrigation, crop production, and crop yield in India. The major variables included in the study are irrigated area, crop production, and crop yield. Irrigated area is measured in million hectares, crop production is measured in million tonnes, and crop yield is measured in kilograms per hectare. Data were collected from Agricultural Statistics at a Glance, FAOSTAT and other official government publications.

The study uses descriptive and analytical research methods. Statistical tools such as trend analysis, percentage analysis, and comparative analysis are used to examine changes in irrigation, crop production, and crop yield over time. The methodology helps in identifying the extent to which expansion of irrigation facilities contributes to higher agricultural productivity in India.

5. DATA INTERPRETATION

The following table presents trends in irrigated area, crop production and crop yield in India during the period 2000-2022.

Table 1: Trends in Irrigated Area, Crop Production and Crop Yield in India (2000–2022)

Year	Irrigated Area (Million Hectare)	Crop Production (Million Tonnes)	Yield (Kg./Hectare)
2000	121.05	196.81	1626
2001	122.78	212.85	1734
2002	113.86	174.77	1535
2003	123.45	213.19	1727
2004	120.08	198.36	1652
2005	121.60	208.60	1715
2006	123.71	217.28	1756
2007	124.07	230.78	1860
2008	122.83	234.47	1909
2009	121.31	218.09	1798
2010	126.67	244.48	1930
2011	124.75	259.29	2078
2012	120.78	257.12	2129
2013	125.05	265.05	2120
2014	124.30	252.03	2028
2015	123.22	251.54	2041
2016	129.23	275.11	2129
2017	127.52	285.01	2235
2018	124.77	285.21	2286
2019	126.99	297.50	2343
2020	129.80	310.74	2394
2021	130.17	315.62	2425
2022	132.20	329.69	2494

Source: Agricultural Statistics at a Glance (2024)

Table no. 1 shows a gradual increase in irrigated area, crop production, and crop yield in India during the period 2000-2022. Irrigated area increased from 121.05 million hectares in 2000 to 132.20 million hectares in 2022, recording an overall increase of approximately 9.21 %. The lowest irrigated area was observed in 2002 at 113.86 million hectares, mainly due to weak monsoon conditions, while the highest irrigated area was recorded in 2022 at 132.20 million hectares. Crop production increased significantly from 196.81 million tonnes in 2000 to 329.69 million tonnes in 2022, showing an increase of nearly 67.52 % during the study period. The lowest crop production was recorded in 2002 at 174.77 million tonnes, whereas the highest production was observed in 2022 at 329.69 million tonnes. Similarly, crop yield improved from 1626 kg/hectare in 2000 to 2494 kg/hectare in 2022, reflecting a growth of approximately 53.38 %. The lowest crop yield was recorded in 2002 at 1535 kg/hectare, while the highest yield was

observed in 2022 at 2494 kg/hectare.

The data indicate that expansion of irrigation facilities positively contributed to higher crop production and crop yield in India. Increased irrigation availability reduced dependence on rainfall and supported stable agricultural productivity over time.

6. FINDINGS OF THE STUDY

The study found that irrigation has played an important role in improving agricultural productivity in India during the period 2000-2022. Irrigated area increased from 121.05 million hectares in 2000 to 132.20 million hectares in 2022, recording an overall growth of approximately 9.21% during the study period. Crop production increased significantly from 196.81 million tonnes to 329.69 million tonnes, showing a substantial rise of nearly 67.52%. Similarly, crop yield improved from 1626 kg/hectare in 2000 to 2494 kg/hectare in 2022, reflecting an increase of approximately 53.38%. The study observed that years with higher irrigated area generally recorded higher crop production and better crop yield, indicating a positive relationship between irrigation and agricultural productivity in India. The lowest levels of irrigated area, crop production and crop yield were recorded in 2002 due to poor monsoon conditions and inadequate water availability, highlighting the importance of irrigation in maintaining agricultural stability. The findings further suggest that expansion of irrigation facilities reduced dependence on uncertain monsoon rainfall and contributed to improved food security, higher agricultural productivity and sustainable agricultural development in India.

7. POLICY IMPLICATIONS

The findings of the study suggest that the government should increase investment in irrigation infrastructure, particularly in drought-prone and rain-fed regions. Expansion of canals, reservoirs, tube wells, and water conservation systems can improve agricultural productivity and reduce regional disparities in irrigation access. The study also highlights the importance of promoting micro-irrigation systems such as drip and sprinkler irrigation to improve water-use efficiency and reduce wastage of water resources. Government irrigation schemes should focus on sustainable water management

and timely implementation of irrigation projects. Policies should encourage farmers to adopt modern farming techniques and efficient irrigation practices. Training and awareness programmes related to water conservation and irrigation management should also be strengthened to improve long-term agricultural sustainability in India.

8. LIMITATIONS OF THE STUDY

The present study is based entirely on secondary data collected from government publications and official databases. therefore, the accuracy of the study depends on the reliability of the published data sources. The study is limited to the period 2000-2022 due to availability of consistent data. The research mainly focuses on irrigated area, crop production and crop yield at the national level and does not include state-wise or regional analysis. Other important factors affecting agricultural productivity such as rainfall, fertilizer use, soil quality, technology and climate change have not been included in the study. The study also uses descriptive and comparative analysis.

9. CONCLUSION

The study concludes that irrigation has played a significant role in improving crop production and crop yield in India during the period 2000-2022. The findings reveal that expansion of irrigated area positively contributed to agricultural productivity and reduced dependence on uncertain monsoon rainfall. Irrigated area increased from 121.05 million hectares in 2000 to 132.20 million hectares in 2022, recording an overall growth of approximately 9.21 % during the study period. The study further observed substantial growth in crop production and crop yield. Crop production increased from 196.81 million tonnes in 2000 to 329.69 million tonnes in 2022, showing a significant rise of nearly 67.52 %. Similarly, crop yield improved from 1626 kg/hectare to 2494 kg/hectare, reflecting an increase of about 53.38 %. The lowest values of irrigated area, crop production and crop yield were observed in 2002 due to poor rainfall and weak monsoon conditions, highlighting the importance of irrigation in maintaining agricultural stability.

The overall results of the study indicate a strong positive relationship between irrigation and

agricultural productivity in India. Increased irrigation availability supported higher crop output, improved productivity, and enhanced food security. Therefore, the study concludes that expansion of irrigation infrastructure, promotion of efficient water management practices and adoption of modern irrigation techniques are essential for achieving sustainable agricultural development and long-term food security in India.

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