

# Economic analysis of Impact of Technological Advancements on Indian Dairy Industry

Dr. Simmi Choyal

Assistant Professor, Department of EAFM,  
Mahaveer College of Commerce, C-Scheme, Jaipur

## Abstract

The Indian dairy industry is one of the largest and fastest growing sectors in India. It contributes significantly to the country's GDP and provides employment to millions of people. The industry has been continuously evolving with technological advancements, which have had a major impact on its economic performance. This article aims to provide an economic analysis of the impact of technological advancements on the Indian dairy industry.

**Keywords:** Technological advancements, Dairy industry, Economic analysis, Indian economy, Milk production, Supply chain management, Cost-benefit analysis, Productivity, Employment, Infrastructure, Innovation, Market competitiveness, Government policies, Industry trends, Sustainable development, Value addition, Milk processing, Quality assurance, Export potential, Consumer demand

## Introduction:

The Indian Dairy Industry has been experiencing significant technological advancements over the past few years. These technological developments have brought in numerous benefits to the industry, including increased efficiency, reduced production costs, improved quality control, and better animal health management.

Technological advancements have enabled the dairy industry to become more efficient and productive. Automation has allowed for faster processing, packaging, and distribution of milk products. Modern milking machines enable farmers to increase their production without having to invest in additional labour or equipment. Computerized systems allow for better management and tracking of milk production, as well as improved quality control measures. Additionally, advanced refrigeration systems have enabled milk products to be stored for longer periods without spoiling, thus increasing their shelf life and reducing wastage.

The adoption of technology has also facilitated the development of e-commerce platforms, enabling dairy farmers to reach out to a broader customer base. The use of online platforms has made it easier for farmers to sell their products directly to consumers, reducing intermediaries' dependence and increasing their profits.

The use of technology has also made it possible to monitor the health and well-being of dairy animals. The use of wearable technology, such as electronic ear tags, allows farmers to monitor the vital signs of their animals, including body temperature and heart rate. This has led to the early detection of health problems and timely treatment, reducing the risk of disease outbreaks and improving animal welfare.

## Economic Impact of technological advancements on the Indian dairy industry:

The economic impact of technological advancements on the Indian dairy industry can be seen in terms of increased production and efficiency gains. Automation has led to higher yields per cow as well as lower costs associated with labour and equipment. This has resulted in higher profits for farmers, which in turn has led to increased investment in the sector. Furthermore, improved quality control measures have enabled producers to meet international standards for milk products, thus increasing their export potential and profitability. In addition, increased storage capacity due to advanced refrigeration systems has enabled producers to store large quantities of milk products for extended periods without spoilage or wastage.

The impact of these technological advancements on the Indian dairy industry has been significant.

This growth has had a positive impact on the economy as a whole. The dairy industry is an important source of income for millions of rural households in India. It is estimated that the industry provides direct employment to over 8 million people and indirect employment to another 16 million people.

The growth of the Indian dairy industry has also had a positive impact on the country's trade balance. India is now the world's largest producer of milk, accounting for around 20% of global production. This has helped to reduce the country's dependence on imports of dairy products.

Here are some of the significant changes in the Indian dairy industry due to adoption of technological advancements:

### **1. Increased productivity and efficiency**

One of the most significant impacts of technological advancements on the Indian dairy industry is increased productivity and efficiency. The use of advanced technology in the dairy industry has led to an increase in milk production and processing. Modern technologies such as automated milking systems, advanced cooling systems, and computerized feeding systems have increased the productivity of dairy farms. This increased productivity has enabled dairy farmers to produce more milk at a lower cost, which has resulted in higher profits.

### **2. Improved quality of dairy products**

Another significant impact of technological advancements on the Indian dairy industry is the improvement in the quality of dairy products. Advanced technologies such as ultra-high-temperature (UHT) treatment, membrane filtration, and aseptic packaging have made it possible to produce high-quality dairy products that have a longer shelf life. This has not only increased the profitability of dairy farmers but also improved the availability of high-quality dairy products to consumers.

### **3. Reduced wastage and costs**

The use of technology in the Indian dairy industry has also led to a significant reduction in wastage and costs. Technologies such as automated milking systems, computerized feeding systems, and advanced cooling systems have reduced wastage of feed and water. This reduction in wastage has led to a decrease in the cost of production, resulting in higher profits for dairy farmers.

### **4. Enhanced distribution and marketing**

Technological advancements have also impacted the distribution and marketing of dairy products in India. The use of technology in transportation and logistics has made it possible to transport dairy products quickly and efficiently to different parts of the country. This has improved the availability of dairy products in different parts of the country, which has resulted in increased demand and higher profits for dairy farmers.

### **5. Improved Cattle Breeding Techniques**

The dairy industry relies heavily on the quality of cattle, and breeding better cows has been a top priority for the industry. Technological advancements have made it possible to identify the best genes, traits, and characteristics in cows, and breed them to produce high-quality milk. The use of Artificial Insemination (AI) and embryo transfer technologies has revolutionized cattle breeding, enabling farmers to produce superior breeds of cows that are resistant to diseases, produce more milk, and are better suited to local climatic conditions.

### **6. Automation of Dairy Operations**

Automation of dairy operations has been a game-changer for the Indian dairy industry, improving efficiency, reducing labour costs, and increasing productivity. Technological advancements have made it possible to automate processes such as milking, feeding, and cleaning of cattle, thereby reducing the dependence on manual labour. The use of milking machines has also improved milk quality and reduced the risk of contamination, making it safer for consumption.

### **7. Adoption of Precision Farming**

Precision farming involves the use of technology to manage agricultural practices such as crop rotation, fertilization, and irrigation, to improve productivity and reduce costs. In the dairy industry, precision farming has been used to grow better-quality feed for cattle, resulting in improved milk quality and

increased milk yield. By adopting precision farming techniques, farmers can also reduce water and fertilizer usage, resulting in a more sustainable and eco-friendly dairy industry.

#### 8. Advanced Milk Processing Techniques

Technological advancements have also revolutionized the milk processing industry in India. Advanced milk processing techniques such as ultra-high-temperature (UHT) processing and aseptic packaging have extended the shelf life of milk, making it easier to transport and store. These techniques have also enabled the production of a wider variety of dairy products such as cheese, butter, and yogurt, which have higher market value and are in high demand.

#### 9. Improved Supply Chain Management

Efficient supply chain management is critical to the success of the dairy industry, and technological advancements have made it easier to manage the entire supply chain, from production to distribution. The use of GPS-enabled vehicles, RFID tags, and advanced tracking systems has improved the efficiency of the supply chain, reducing wastage, and ensuring timely delivery of products.

#### 10. Reduction in post-harvest losses

The use of technology has helped reduce post-harvest losses in the Indian dairy industry. Advanced storage and transportation systems have helped prevent spoilage and wastage of milk products, thereby increasing the overall profitability of the industry.

**Table 1: Impact of technology adoption on the Indian dairy industry**

Technology	Impact on Indian Dairy Industry
Automation	Increased efficiency and cost savings, improved safety, and reduced labour costs
Data Analytics	Improved traceability, better forecasting of demand, better pricing strategies, and more accurate predictions of future trends.
Artificial Intelligence (AI) & Machine Learning (ML)	Automated decision making, improved quality control and risk management, enhanced customer experience.
Blockchain Technology	Improved transparency, traceability & trust in the supply chain; improved data security; faster transactions.

According to a report by the National Dairy Development Board (NDDB), the annual growth rate of milk production in India increased from 2.2% in the pre-Operation Flood period (1961-69) to 4.2% during the Operation Flood period (1970-96), primarily due to the adoption of new technologies.

**Table 2: Milk Production in India (million tonnes)**

Year	Milk Production
2016	155.5
2017	165.4
2018	176.3
2019	187.7

Source: Ministry of Agriculture and Farmers Welfare, Government of India

According to a report by the National Dairy Development Board (NDDB), the industry has grown at a compound annual growth rate (CAGR) of 6.7% over the past decade. Milk production has increased from 122 million tonnes in 2010-11 to 187.7 million tonnes in 2018-19.

**Table 3: Technology Adoption in the Indian Dairy Industry**

Technology	Adoption Rate
Artificial insemination	60%
Use of high-yielding breeds	40%
Improved feed and nutrition	50%
Health management practices	70%

Source: National Dairy Development Board (NDDB)

The increased milk production has not only led to higher incomes for farmers but also contributed to the growth of the Indian economy. The dairy industry is a major contributor to the rural economy, providing employment opportunities and generating income for millions of households.

**Table 4: Contribution of Dairy Industry to Indian Economy (2018-19)**

Parameter	Value (in INR billion)
Gross value of output	9765.13
Net value added	3000.21
Employment (million)	99.03
Milk procurement (million tonnes)	57.72

Source: National Dairy Development Board (NDDB)

**Table 5: Comparison of traditional dairy farming and modern dairy farming**

Factors	Traditional dairy farming	Modern dairy farming
Housing	Open sheds	Closed sheds
Feeding	Natural grazing	TMR (Total Mixed Ration)
Milking	Hand milking	Machine milking
Breeding	Natural breeding	Artificial insemination
Health management	Home remedies	Veterinary care
Productivity	Low	High
Production cost	High	Low
Quality of products	Low	High

Technological advancements in dairy farming have led to an increase in milk production per cow. In traditional dairy farming, the average milk production per cow is around 2-3 litres per day, while in modern dairy farming, the average milk production per cow is around 8-10 litres per day. The use of TMR (Total Mixed Ration) in modern dairy farming has resulted in improved milk quality and higher milk yields.

### Challenges faced by the Indian dairy industry

Despite the significant growth and impact of technological advancements on the Indian dairy industry, there are still challenges that need to be addressed. Some of the significant challenges faced by the Indian dairy industry are:

1. **Low productivity of dairy animals:** According to the NDDB report, the average milk yield per animal in India is around 4.6 litres per day, which is significantly lower than the yields in developed countries.
2. **Lack of access to advanced technologies for small-scale dairy farmers:** Many small-scale dairy farmers in India are unable to afford the high cost of modern technologies, which limits their productivity and profitability.
3. **Lack of proper infrastructure for the transportation and storage of dairy products:** Lack of infrastructure results in significant losses due to spoilage and wastage of dairy products.

To address these challenges, there is a need for continued investment in research and development to develop new breeds of dairy animals that are better adapted to Indian conditions. There is also a need for investment in education and training programs to help farmers adopt modern dairy farming practices.

### Conclusion:

It is clear that technological advancements have had a significant impact on the Indian dairy industry's economic performance. Automation has led to higher yields per cow as well as lower costs associated with labour and equipment. Improved quality control measures have also enabled producers to meet international standards for milk products, thus increasing their export potential and profitability. The adoption of modern technology has led to increased efficiency, reduced production costs, improved quality control, and better animal health management. The use of technology has also facilitated the development of e-commerce platforms and enabled the establishment of a traceability system for milk and milk products. Finally, advanced refrigeration systems have enabled producers to store large quantities of milk products for extended periods without spoilage or wastage. All these factors have contributed towards making the Indian dairy industry one of the most profitable sectors in India today.

It is important to note that the impact of technology adoption on profitability can vary depending on the individual farm's circumstances and management practices. Additionally, while technology adoption can improve profitability, it can also involve significant upfront costs and ongoing maintenance expenses. However, the industry still faces several challenges, including the lack of access to advanced technologies and inadequate infrastructure.

To fully realize the benefits of technological advancements, policymakers and industry stakeholders must work together to address these challenges and create a more favourable environment for the growth and development of the Indian dairy industry. As the Indian Dairy Industry continues to grow, it is essential to embrace technological advancements to ensure sustained growth and development. Overall, adopting technology in dairy farming can lead to significant cost savings and revenue increases, which can result in higher profitability for farmers.

#### References:

1. Gopalakrishnan, P., Kumar, P., & Singh, A. K. (2018). Impact of technology adoption on dairy farming in India: A review. *Indian Journal of Animal Sciences*, 88(2), 206-213.
2. Mishra, S. K., & Tripathi, G. (2018). Impact of technology adoption on milk production and income of dairy farmers in India. *Agricultural Economics Research Review*, 31(2), 209-216.
3. Kumar, R., Kumar, S., & Singh, J. (2018). Technology adoption and its impact on milk production in Uttar Pradesh, India. *Indian Journal of Animal Sciences*, 88(9), 1044-1048.
4. Yadav, A. K., Chauhan, V. S., & Sahoo, A. K. (2018). Impact of technology adoption on dairy farming in India: An empirical analysis. *Indian Journal of Agricultural Economics*, 73(4), 490-503.
5. Dang, H. A., & Rao, D. S. P. (2018). Technology adoption and its impact on dairy farm productivity: A study of India. *Journal of the Asia Pacific Economy*, 23(4), 566-581.
6. Sahu, S. K., & Ponnusamy, K. (2018). Impact of technology adoption on the productivity and profitability of dairy farming in India. *Agricultural Economics Research Review*, 31(1), 115-122.

