



Development of Irrigation Facilities and Changing Cropping Pattern in Rewari District, Haryana (1990–2021)

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Abstract: This study analyses the impact of irrigation development on the changing cropping patterns in Rewari district, Haryana, from 1990 to 2021. Located in the semi-arid zone of southern Haryana, the district has undergone a significant shift from traditional dryland crops to irrigated and commercial crops, driven by groundwater expansion and mechanisation. Data reveal that wheat production increased from 129 ('000 t) in 1990–91 to 166 ('000 t) in 2020–21, while mustard and bajra showed remarkable growth of 181% and 314% respectively. In contrast, barley and pulses declined by more than 90%, indicating a shift by farmers towards more remunerative crops. The dominance of tube wells and submersible pumps has replaced canal irrigation, covering nearly 90% of the cultivated area. Although irrigation expansion enhanced productivity and crop diversification, it also led to excessive groundwater extraction and declining soil fertility. The study concludes that sustainable water management, adoption of micro-irrigation, and balanced crop diversification are essential for ensuring long-term agricultural sustainability in Rewari District.

Keywords: Cropping Pattern, Irrigation, Agriculture, Sustainability, Rewari District

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INTRODUCTION

Agriculture forms the foundation of the Indian economy, particularly in states like Haryana, where a significant portion of the population relies on farming for their livelihood (Singh & Hooda, 2019). Haryana plays a vital role in India's food grain production, especially in the cultivation of wheat and rice (Directorate of Economics & Statistics, 2020). Since the Green Revolution of the 1960s, the state's cropping pattern has increasingly focused on these two crops, driven by the introduction of high-yield varieties, enhanced use of fertilisers, mechanisation, and reliable irrigation systems (Kumar, 2018). However, this shift has brought both benefits and challenges, impacting agricultural sustainability and resource management in the region (Chaudhary & Singh, 2020).

Rewari district is located in the semi-arid region of southern Haryana, sharing borders with Rajasthan. Agriculture is the primary occupation of the rural population. The district lies in the Aravalli foothills, with undulating topography and sandy loam soils (District Census Handbook, Rewari, 2011; CGWB, 2020). Rainfall is low and erratic (average 500–600 mm), making irrigation a critical factor for agriculture. During the 1990s, the cropping pattern was dominated by bajra, gram, and mustard, which are drought-tolerant crops suited to local conditions (Singh & Yadav, 2018). However, after 2000, a gradual transformation occurred. Farmers increasingly adopted wheat, paddy, and fodder crops due to irrigation expansion, availability of HYV seeds, and market demand (Kumar, 2019). Tube wells and submersible pumps

replaced canals as the main irrigation source (Irrigation and Water Resources Department, Haryana, 2020).

These changes have improved productivity but also led to groundwater depletion, soil degradation, and monocropping, posing long-term sustainability challenges.

OBJECTIVES OF THE STUDY

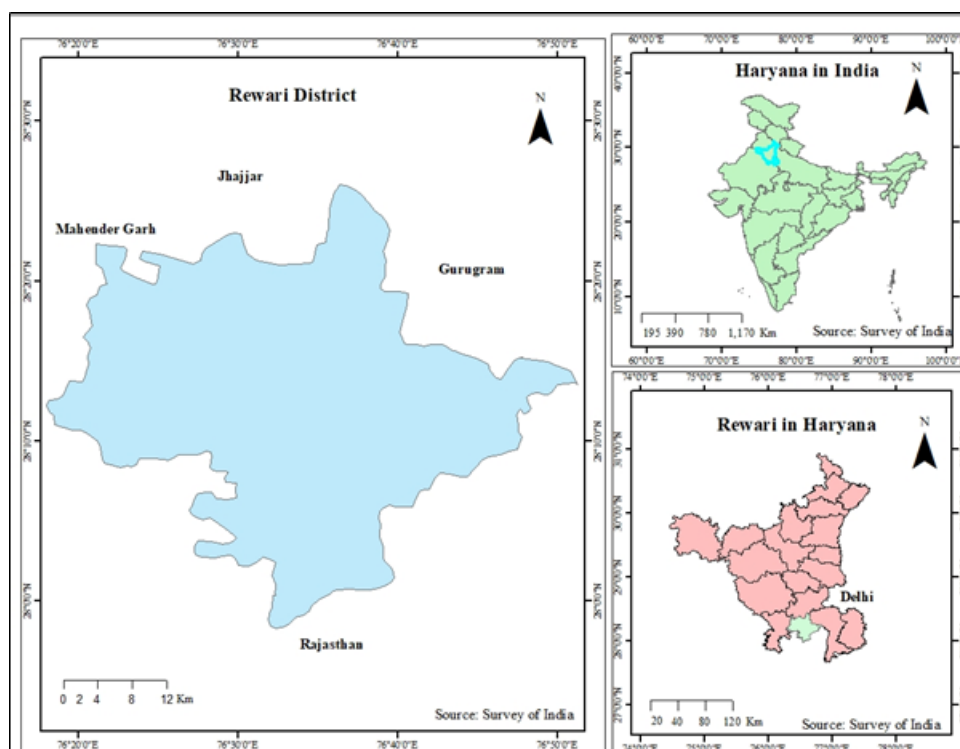
1. To study the development and transformation of irrigation systems.
2. To examine the changing trends in cropping patterns in the Rewari district from 1990 to 2021.
3. To suggest strategies for promoting sustainable farming in the district.

METHODOLOGY

The study is based on secondary data obtained from the Statistical Abstracts of Haryana (1990–2021), District Statistical Handbook (Rewari), Agricultural Department Reports, PMKSY District Irrigation Plan (Rewari), and research publications. Time-series data have been analysed using descriptive and trend analysis methods.

OVERVIEW OF REWARI DISTRICT

Rewari district, which comprises the blocks of Rewari, Bawal, and Kosli, spans approximately 1,559 square kilometres. About 70% of people living in rural areas work in agricultural and related fields, making the district's economy largely based on agriculture. Principal crops include barley, mustard, wheat, bajra, barley, and fodder. Loam types range from sandy to clay. Summers are hot and winters are cool in this semi-arid climate. Rainfall: 500–600 mm, primarily from July to September. Canals (JLN Feeder, Gurgaon Canal branch), tube wells, and submersible pumps are sources of irrigation.



Source: Survey of India

Irrigation Development In Rewari District

Pre-1990 Scenario

- Similar to many parts of Haryana, Rewari initially depended largely on canal systems for irrigation, but canals were underutilised due to the district's geography and water distribution limitations.
- Tube wells existed, but their use was limited by infrastructural constraints such as erratic electricity supply and low groundwater extraction capacity.
- The Krishnawati River and several small nalas provide some surface water, but a majority of irrigation depended on traditional methods and rainfall.

Expansion of Tube Wells (1990–2010)

- With the rising demand for irrigation water driven by crop intensification, farmers increasingly adopted shallow and later deep tube wells.
- Government subsidies, cheap or free electricity, and improved pump technology facilitated this shift.
- By 2010, over 70% of irrigation in the district was groundwater-based, mainly via wells and tube wells.
- The blocks of Bawal, Jatusana, and Nahar show extensive irrigation, with about 72% of the district's cropped area being irrigated.
- Jatusana block notably has canal irrigation contributing 9.67% of the irrigated land, while other blocks rely mostly on wells and tube wells.

Present Scenario (2021)

- Currently, deep tube wells dominate irrigation efforts in the Rewari district, with canal irrigation playing a minor role.
- Over-dependence on groundwater has caused concerns of depletion and water quality deterioration in several parts of the district.
- Farmers predominantly grow water-intensive crops like wheat, mustard, and bajra, which put further stress on groundwater resources.
- Efforts toward water-saving practices like drip and sprinkler irrigation are emerging but still minimal.

Period	Major Irrigation Source	Characteristics
Pre-1990	Canal irrigation	Limited irrigation intensity, low canal dependency, reliance on rainfall and traditional methods

1990–2010	Shallow tube wells	Expansion supported by subsidies and cheap/free electricity; increased use of HYVs; shift to crops like wheat and mustard
2010–2021	Submersible/deep tube wells	Over-extraction of groundwater, declining water tables, and rising cost of irrigation inputs
Post-2021 (Goal)	Water-saving technologies	Policy focuses on sustainability, promotion of micro-irrigation methods such as drip and sprinkler irrigation

Changes in Cropping Pattern (1990–2021)

(a) 1990s – Traditional Period

- Crops: Bajra, Gram, Mustard, Barley, and limited Wheat.
- Irrigation: Mostly rain-fed and canal-based; low irrigation intensity (~30–35%).

(b) 2000–2010 – Transitional Phase

- Increase in Wheat and Mustard area.
- Start of submersible pump usage.
- Decline in Bajra and Gram cultivation due to assured wheat markets.

(c) 2010–2021 – Present Trend

- Wheat and Mustard dominate; Fodder crops increased due to dairy expansion.
- Paddy was introduced in irrigated patches near the Bawal and Rewari blocks.
- Pulses and coarse grains nearly vanished.
- Irrigation intensity >90%.

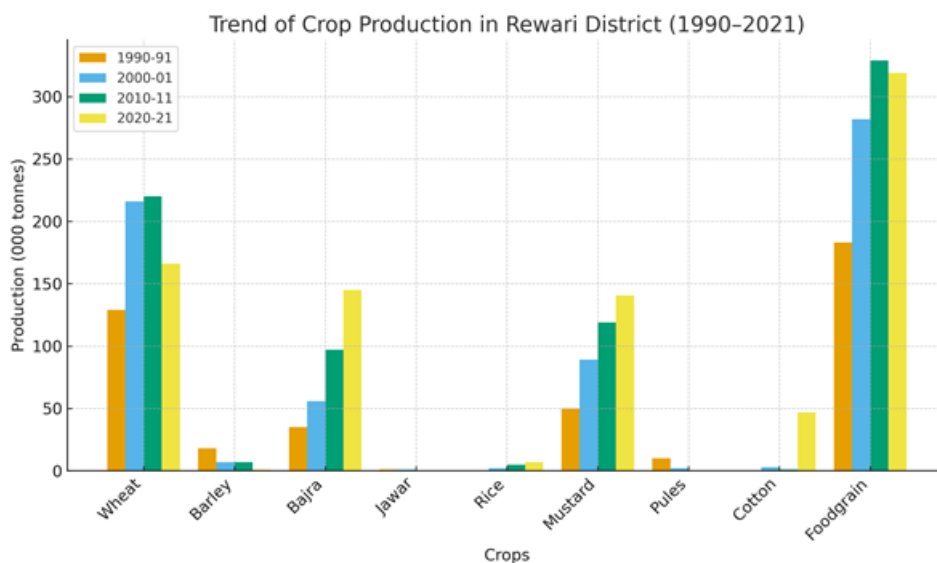
Changes in Cropping Pattern – Rewari District (1990–2021)

Crops	1990-91(000 t)	2000-01(000 t)	Growth %	2010-11(000 t)	Growth %	2020-21(000 t)	Growth %	Overall Growth %
Wheat	129	216	67.44	220	1.85	166	-24.54	28.68
Barley	18	7	-61.11	7	0	1	-85.71	-94.44
Bajra	35	56	60	97	73.21	145	49.48	314.28
Jawar	1	1	0	-	0	@	0	0
Rice	-	2	0	5	150	7	40	250
Mustard	50	89	78	119	33.70	140.7	18.23	181.4
Pules	10	2.1	-79	0.4	-80.95	0	0	0
Cotton	-	3	0	1	-66.66	47	4600	1466.66
Foodgrain	183	282	54.09	329	16.66	319	-3.03	74.31

Source: Statistical Abstract of Haryana.

@ Less than 500 hectares/tonnes

Production in '000' tonnes,



Trend

Between 1990–91 and 2020–21, the cropping structure of Rewari district shows a remarkable shift from traditional food crops to more commercial and input-intensive crops. The trend indicates how agricultural modernisation, irrigation expansion, and market orientation have gradually reshaped the district's agrarian base.

Wheat remains the principal rabi crop, but its production trend is fluctuating. The output rose sharply by about 67% between 1990–91 and 2000–01 due to the spread of high-yielding varieties and better irrigation facilities. However, in the later decade, wheat production declined (–24.5% during 2010–21), suggesting

yield stagnation and growing competition from other remunerative crops.

Barley and pulses exhibit a consistent downward trend throughout the study period. Barley production reduced by more than 90%, and pulses nearly vanished from the cropping system. This decline reflects farmers' preference for more profitable and irrigation-compatible crops over traditional dryland crops.

In contrast, bajra (pearl millet) experienced a substantial increase of more than threefold (over 314%), demonstrating its adaptability to semi-arid conditions and its dual use as both food and fodder. Similarly, mustard maintained a dominant position among oilseed crops, expanding by 181% overall, supported by its suitability to local agro-climatic conditions and rising market demand.

A significant structural change is visible with the introduction and rapid growth of cotton, which emerged as a major cash crop after 2000. Cotton production increased dramatically—from a negligible level to 47 thousand tonnes by 2020–21—indicating a strong diversification towards commercial crops, facilitated by irrigation development and better market accessibility.

Rice, which was previously almost absent, also appeared as a minor irrigated crop in certain canal-fed or tube-well areas, indicating diversification under assured water conditions.

The combined foodgrain output shows an overall rise of 74%, but its share in total agricultural production has relatively declined due to the faster growth of cash and oilseed crops. This pattern clearly reflects a transition from subsistence farming towards a market-oriented and irrigation-supported agricultural economy in the Rewari district.

FACTORS INFLUENCING CHANGES

- **Government policies** emphasising MSP for wheat and mustard encouraged cropping pattern shifts aligning with available irrigation.
- **Market access** and assured procurement drove farmers to adopt more commercial crops.
- **Technology improvements** in pump sets, machinery, and high-yield seeds promoted intensified cultivation.
- **Climate variability** pushed farmers to rely more on assured irrigation sources.
- **Social change and extension programs** helped spread irrigation technologies and modern farming practices.

IMPACT OF CHANGES

The changes in agricultural practices and irrigation in Rewari district from 1990 to 2021 have yielded a combination of beneficial outcomes and significant challenges. On the positive side, increased irrigation access, modernisation of farming methods, and higher crop production have improved livelihoods for many farmers in the short term. However, these advancements have also raised notable concerns regarding environmental, economic, and social sustainability that must be addressed.

A major negative impact has been the over-extraction of groundwater resources. As dependence on canal

irrigation diminished and farmers shifted towards water-intensive crops such as wheat, mustard, and bajra, the use of tube wells and deep submersible pumps increased substantially. Subsidised or free electricity allowed unfettered groundwater withdrawal, leading to drastic declines in the groundwater table in many parts of Rewari. This depletion forces farmers to invest in deeper borewells, increasing farming costs and threatening future water availability.

The excessive groundwater exploitation has led to several specific issues:

- **Water Resources:** The aggressive extraction of groundwater has resulted in falling water tables, raising irrigation and energy costs and putting water security at risk.
- **Soil Health:** Monoculture farming, heavy usage of chemical fertilisers, and lack of crop rotation have degraded soil quality, with nutrient depletion and rising soil salinity observed in some areas.
- **Biodiversity:** Loss of crop diversity from intensive monoculture practices has disrupted agro-ecological balances, affecting pollinators and natural pest control mechanisms.
- **Farmers' Income:** While initial benefits included higher yields and better prices, over time, input costs have increased, leading to stagnating incomes, with small and marginal farmers being the most vulnerable.
- Extensive groundwater extraction has caused falling water tables and increased irrigation costs.
- Soil health is affected due to monoculture, heavy fertiliser use, and less crop rotation.
- Biodiversity loss and agro-ecological imbalance are emerging concerns.
- While yields and income increased initially, rising input costs challenge small farmers' sustainability.

CONCLUSION

Rewari district's irrigation has evolved from limited canal use to near-total reliance on groundwater extraction via wells and tube wells. This shift facilitated agricultural intensification and increased productivity but raised sustainability concerns tied to groundwater depletion and environmental health. Sustainable water management, crop diversification, and modern, efficient irrigation technologies are needed to maintain long-term agricultural viability in Rewari.

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