



# Impact of Indira Gandhi Canal Irrigation on Land Use Changes and Cropping Pattern

Dr. Rahul

Assistant Professor, Department of Geography, Dr. Bhim Rao Ambedkar Government College, Sri Ganganagar, Rajasthan, India

**ABSTRACT:** Indira Gandhi canal is situated on the broader side of Pakistan. Its local name is the Rajasthan canal which began in 1983. The Indira Gandhi canal project was renamed in honour of Prime Minister Indira Gandhi. The Indira Gandhi canal project was constructed in 1983 and finished in 2010 when Manmohan Singh was prime minister in India. Indira Gandhi canal's length is 445 km and Indira Gandhi canal has been constructed for starting agricultural activities in the Rajasthan fields. Indira Gandhi canal is built on Sutlej and Beas rivers and Indira Gandhi canal's length is connected with Rajasthan and Punjab

**KEYWORDS:** Indira, Gandhi, canal, land, cropping, irrigation

## I. INTRODUCTION

Indira Gandhi canal was constructed to develop agricultural activities in the desperation of Rajasthan. The Indira Gandhi canal length is 445 km and now additionally 204 km is extended for enhancing the transportation system in the state. The Indira Gandhi canal length is now 650 km which makes a connection with Rajasthan to Punjab. [1,2] Indira Gandhi canal has a water barrage system where 18000 cusec water has been released per day. As per agriculture, the crisis has been seen in the 'Thar' desert. The Indian government has decided to build a canal on the Sutlej and Beas so that farmers can get water to harvest different kinds of crops for food. This is the largest canal in Rajasthan that is started from Haryana in Punjab to Lohgarh district in Rajasthan. The canal water has flown with seven districts of Rajasthan that include Churu, Jaisalmer, Jodhpur, Barmer, Bikaner and Sri Ganganagar. The Indira Gandhi canal has provided great opportunities to the farmers for increasing their source of income and developing the economic growth of both states, Rajasthan and Punjab. Harike barrage is the main portion of the canal where a huge amount of cusec water has been stored in this barrage. Different kinds of drinking companies have grown up in this place where they use this water for making their products. The Indira Gandhi canal has provided huge benefits to the Rajasthan regions to their drinking water crisis. [3,5]

The Indira Gandhi canal project had been started in 1952 but it was banned due to the different kinds of political issues in India. In 1983, Honourable Prime Minister Indira Gandhi gave them permission to start the canal with both rivers Sutlej and Beas. The Indira Gandhi canal project is majorly responsible for the rising economic growth of both states in India. Different kinds of agriculture and crops have been harvested with the help of canal water. The Indira Gandhi canal project has several benefits that have positive effects on the Rajasthan region. The canal has 5, 28000 hectares in area. [7,8] The estimated value of the Indira Gandhi canal project was 64 crore, which was a huge amount at that time. K. N. Sen was the chairman of the project and directed the project. The feeder of the canal is 204 km where 34 km is from Rajasthan, 19 km is in Haryana and 51 km length is in Punjab. There are nine branches that have been distributed on the Indira Gandhi canal project. To construct this project, the Indian government has taken a loan from the World Bank and the central shipping commission has included this project to measure the length. Dr Radhakrishnan first started this project in 1961 on October 11 to flow the water from narungadeashar distributary to the rataeshwa branch.

Conclusively, the Indira Gandhi Canal is one of the most famous canals in India that has the longest length. The canal has its origin in the state of Punjab and it ends in the state of Rajasthan. The older name of this canal is known as Rajasthan Canal and it was renamed in the year 1984. This Canal has a profound value in the agricultural development of the states that are included in its way. This Canal also helps to supply water to the desert cities and places like Bikaner, and Jaisalmer that are upgrading the lives of citizens that are living in these deserts. [9]



## II. DISCUSSION

The introduction of Indira Gandhi Canal Project in the barren and thirsty climatic land of Western Rajasthan is bound to have a profound influence on the ecosystem. The irrigation facilities provided by the Indira Gandhi Canal, the conservation of arid land into cultivable field and the tremendous increase in population will have a great influence on the ecosystem. The IGCCA could be classified into various major landforms. These landforms had been created by endogenic and climatically controlled by exogenic processes. The fluvial process created vast alluvial plains under prolonged wet phase. The sand dunes and sandy plains were formed by Aeolian process during the prolonged dry phase. Fluvial and aeolian landforms due to significant variations in the morphopedological characteristics have different production potentials. Before the introduction of irrigation facilities, these landforms by and large were used for growing rainfed crops and for grazing purpose. The introduction of Indira Gandhi canal had resulted into the good and ill effects on the biophysical potential of different ecosystem.

The major positive impact of canal irrigation has been as follows: A. The aeolian activities which were responsible for sand drifting and degrading large acreage of agricultural land are minimised and acreages under degraded land has decreased particularly in Hanumangarh, Bikaner and Western parts of Jaisalmer districts command areas. The sandy hummocks and low dunes have been levelled and reclaimed for growing cereals, pulses, some cash crops like cotton, groundnut and vegetables. B. The irrigation in hot arid land of Western Rajasthan through Indira Gandhi Canal, particularly in the districts Ganganagar, Hanumangarh, Bikaner, Jaisalmer and Barmer has improving the micro-climatic conditions. It has resulted in minimising the dedicating effects of temperature and strong winds on biomass production and settlements. In other words, the harsh and inhospitable climate of these region has become milder and favourable for growth of plants and raising of habitation. C. The 649 km long Indira Gandhi Canal project is to cover the Western Rajasthan districts such as Ganganagar, Hanumangarh, Churu, Bikaner, Jodhpur, Jaisalmer, Barmer to irrigate more than 9.8 million ha. of parched but extremely fertile and virgin land. The moisture regime within the soil, after the irrigation has improved and their erodability has decreased. These tremendous changes have also influenced the fertility status of the soil particularly in Bikaner, Hanumangarh and Jaisalmer districts command area, the compactness and moisture retention capacity of the sandy soil has also improved. D. Massive afforestation along the canal, roads and newly settled areas has been done with the water supply by canal leading in reducing the intensity and impact of blown sand. Pastureland development and sand dunes stabilization works have been carried out so that the supply of fodder can be made available to the livestock in the adjoining villages as well as to the migrating flocks of the animals [8,9]

E. To obtain fuel wood, plantation of trees has been carried out so as to meet the daily energy needs of the rural folk. Forestry, pastureland development and sand dunes stabilization have been taken on thousand and thousand hectares of land under first and second phase of the project. F. The agricultural production and productivity per hectare is steadily increasing and the average in dry farming of pearl millet and sorghum in progressively declining from 90% of the total sown area. The sown area under cotton, sugarcane, wheat, rice, pulses, peanuts, vegetables and fruits has increased in recent years. According to the field survey (2017) conducting in 30 villages across different locations, more than 42% of them are using hybrid seeds, 57% chemicals fertilizers and more than 55% spray pesticides as plant protection measures

G. The Indira Gandhi Canal is a major step in reclaiming the Thar Desert and checking desertification of fertile areas. There is a planting programme for greening the desert in canal command area of Indira Gandhi was started in 1965. The tree species being used for planting are *Dalbergia sissoo*, *Eucalyptus tereticornis*, *Eucalyptus camaldulensis*, *Morus alba*, *Tecomella undulata*, *Acacia tortilis*, *Azadirachta indica*, *Albizia lebbek*, *Cassia fistula*, *Populus ciliata*, *Melia ozedarach* and *Vachellia nilotica* etc. The other benefits of Indira Gandhi Canal project in Western Rajasthan are grouped under the following headings: H. Rise in ground water table at the rate of 0.8 meters/year. I. Elimination of drought conditions. J. The canal water is also used for domestic needs. K. With the plantation along canal and roads, changes the vegetation of the area. L. Improving the household income and expenditure structure. M. Rapid rise in the population, increase in the number of villages, new colonies and mandies. N. Changing the attitude and life style of people resulting in greater urge for education and rise in mobility and communication.

## III. RESULTS

Irrigation has been crucial to Indian agriculture since prehistoric times. The prosperous plains of the Ganges and Indus rivers gave rise to the Harappan and Aryan civilizations, who built canals and irrigation systems to water their fields. Nowadays, India has one of the largest networks of canals, reservoirs, and dams in the world, enabling farmers to cultivate crops in otherwise dry places. [5,7]

#### Irrigation:

Irrigation provides water to crops in order to assist their maintenance and growth. Irrigation is vital in areas where rainfall is scant or unreliable because it allows farmers to cultivate crops in otherwise arid areas.

Irrigation systems can be divided into two categories: surface irrigation and pressurised irrigation.

Surface irrigation involves applying water to the top layer of soil, whereas pressurised irrigation employs sprinklers, drip irrigation, or other tools to transport water straight to plant roots.

#### Canal:

A canal is a man-made waterway created for drainage, transportation, or irrigation. Canals are often built into the earth to divert water from a river or other water source for the purpose of irrigating land or delivering water for other uses. There are many different sizes of canals, with little irrigation canals and large shipping canals being just two examples.

Canals can be used for flood control, freight and passenger transportation, and hydroelectric power generation in addition to irrigation.

#### Dam:

A dam is a building placed across a river or other body of water to control the water's flow.[3,5] Dams are commonly built for flood control, irrigation, or the generation of hydroelectric power. Dams come in a wide variety of designs, including rockfill, embankment, concrete gravity, and arch dams. Moreover, dams can be used to create habitats for fish and other aquatic animals as well as for leisure pursuits like boating and fishing.

#### Indira Gandhi Canal – the Largest Irrigation Canal in India

The Indira Gandhi Canal, also known as the Rajasthan Canal, is the largest irrigation canal in India. It is located in Rajasthan's arid Thar Desert and was completed in 1987. The 649 km canal, which extends into Jaisalmer, Rajasthan, has its starting and terminus at the Harike Barrage in Punjab. At a flow rate of 1133 cubic metres per second, the canal can irrigate 1.8 million hectares of land.

The Indira Gandhi Canal Project, one of the largest canal construction projects in the world, has brought a green revolution to Rajasthan's dry desert region. A number of the canal's branches supply water to the regions close to Bikaner, Jaisalmer, Jodhpur, Barmer, and Nagaur. Once the canal transformed the barren, bleak terrain into rich fields, farmers started cultivating crops like wheat, cotton, mustard, and vegetables. The Indira Gandhi Canal Project has made potable water available to the locals, who previously struggled with a lack of water.

By providing farmers and other agricultural workers with a means of livelihood, the canal has aided the local economy. Also, it has promoted the expansion of the region's agro-based businesses.

#### Construction

- Sir Ganga Ram originally suggested the Indira Gandhi Canal, commonly referred to as the Rajasthan Canal, in 1920.
- The Rajasthan Canal Project was the name given to the undertaking by the Indian government in the 1950s.
- The Rajasthan Canal Construction Department started work on the project in 1958.
- Almost 125 million cubic metres of earth had to be removed for the project, and various distributaries, barrages, and other water-controlling structures had to be built.[2,3]
- Workers had to use dynamite to blast the rocks in order to unearth the ground due to the difficult topography of the Thar desert.
- The project encountered numerous difficulties, such as delays and cost overruns, but was eventually finished in 1987 and given the new name Indira Gandhi Canal Project in memory of the late Indian Prime Minister.
- The barren areas of Rajasthan have been converted into rich fields thanks to the Indira Gandhi Canal, one of the world's largest irrigation canals.
- Millions of farmers and agricultural labourers now have a means of subsistence thanks to the canal, which has also helped the region's agro-based industries grow. The undertaking stands as an example of human tenacity and endurance in the face of difficulty.

#### Features of the Indira Gandhi Canal:

- Length: 649 km
- Capacity: 1133 cubic meters per second
- Irrigates: 1.8 million hectares of land
- Starts from: Harike Barrage in Punjab
- Terminates at: Jaisalmer, Rajasthan
- Brings water to the regions of Bikaner, Jaisalmer, Jodhpur, Barmer, and Nagaur
- Has many branches and distributaries to supply water to different areas

- Supports agriculture, fisheries, and livestock farming
- Provides drinking water to the people of the region
- Boosts the local economy by creating job opportunities and supporting agro-based industries
- Offers opportunities for tourism with several tourist attractions located along its route

Impact of the Indira Gandhi Canal:

- Turned the dry, arid soil into productive fields
- Supported the growth of fisheries, agriculture, and cattle farming
- Provided the region's residents with drinking water after they had previously experienced water scarcity
- Facilitated the growth of agro-based enterprises and provided employment opportunities.
- Raised the region's population's standard of living
- Promoted tourism and increased agricultural output to strengthen the local economy.

Benefits of the Indira Gandhi Canal:[1,2]

- Delivers water for drinking, agriculture, and other uses.
- Promotes the growth of fisheries, agriculture, and cattle farming
- Provides employment opportunities and encourages the growth of agro-based industries
- Raises the region's population's standard of living
- Enhances the region's economy by boosting agricultural productivity and fostering tourism
- Through the production of hydropower, offers a source of green energy.

Drawbacks of the Indira Gandhi Canal:

- Requires a lot of water, which could cause water shortages and environmental damage.
- Due to the building of salts in the soil, it may induce soil salinization, which in some regions may result in waterlogging and soil erosion.
- Maintains the canal and related structures in excellent shape will cost a lot of money.
- May have adverse impacts on the ecology of the region due to changes in water availability and quality[5,7]

In conclusion, the Indira Gandhi Canal has had a substantial impact on the development of Rajasthan's dry regions. The parched, desolate terrain was transformed into lush fields by the canal, which provided water for irrigation, drinking, and other needs. The canal has boosted the local economy by creating new job possibilities and encouraging the expansion of agro-based businesses. However, the canal has some serious problems, including soil salinization, water depletion, and high maintenance costs. Ultimately, the Indira Gandhi Canal is still a remarkable feat of engineering and a representation of how resilient people can be in the face of adversity.[8]

#### IV. CONCLUSION

The western part of India is hot desert, which is known as Thar Desert. The largest extent of this desert is spread over Rajasthan state. In order to increase agriculture potential of desertic soil Indira Gandhi Canal Project (IGCP) was introduced. The development of IGCP project has brought changes in the land use pattern in terms of increase in area under the agriculture. The increase in area under agriculture and under irrigation network has brought fluctuations in the groundwater level. This fluctuation in groundwater level is result of the seepage of water through the excessive irrigation and the seepage from the canal network. Thus the human impact in form of land-use pattern of a land is an important determinant of rise and fall in groundwater level. The spatial and temporal variation in groundwater level has been analysed Inverse Distance Weightage technique across different pentards for 128 observation wells of the Anupgarh, Vijayanagar and Suratgarh tehsil of Sriganganagar district of Rajasthan, which lies in the northwestern part of IGCP Stage I[9]

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