

Impact of Irrigation on Poverty Alleviation and Food Security in the Arid Region of Rajasthan- A Case Study of Indira Gandhi Canal Project Area

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Abstract

Irrigation is an age-old practice and in fact as old as man's first attempt at crop growing. The beginning of agriculture revolutionized the way of living of primitive man who was till then depended only on hunting and food gathering. Early agriculture involving mainly food production changed slowly to modern agriculture through continuous evolution of agricultural technologies. This transformation gave a strong structural and economic base to the human society for its existence and progress. Irrigation has dictated and decided largely the pace and the progress of agricultural development. Irrigation is the key input in crop production in the arid region of Rajasthan. It supports successful crop growing and stabilizes crop yields under proper management practices. It has resulted in economic prosperity and food security in the study area.

Keywords: Irrigation, Modern Agriculture, Economic Prosperity and Food Security.

Introduction

Irrigation is pivotal to agricultural, social and economic growth of a country. It has provided stability to food production. Agriculture has always occupied a place of pride in desert's economy. The great significance of agriculture in the desert life and economy is well borne out by the fact, that it is the mainstay of the people. It is the primary source of income and provides foodgrains, pulses, oilseeds and commercial crops in the arid region, and forms the basis of various infrastructural developments (Peter P. Mollinga, 2000). It forms the basic key to economic development which has resulted in food security and poverty alleviation in the study area.

Irrigation is generally defined as the application of water to the land for the purpose of supplying moisture essential to plant growth. Irrigation is the artificial application of water to the soil usually for assisting in growing crops. In crop production it is mainly used to replace scanty rainfall in periods of drought, but also to protect plants against extremes of temperature and other atmospheric conditions (Mathur, Archana S, Das Surajit and Sircar, Subhalaxmi; 2006). In the Indira Gandhi Canal Project (IGNP) area most of population is engaged in agriculture and allied pursuits for their livelihood and it is still the chief occupation of sustenance for growing population.

The IGNP area spreads over four districts of the Indian Thar Desert in Rajasthan for the point of view of irrigation facilities namely Hanumangarh, Sriganganagar, Bikaner and Jaisalmer by covering an area of 92,649 sq km. The project area is located between 26⁰5' to 30⁰6' north latitudes and 69⁰30' to 75⁰3' east longitudes. The rainfall is very low, uncertain and irregular. The landform is mainly a sand covered peneplain with sparse vegetation cover (Nigam, M.N. and Tiwari, A.K.; 2003). Soils are poor in fertility status, organic matter and nitrogen with low moisture retention capacity. Groundwater is generally located very deep, found only in small isolated patches and its quality is poor and saline. The main highlights of the IGNP are described in table 1.

Table 1
IGNP- Main Highlights

1. Origin of the Canal	Harike Berraj on Ravi-Sutlej Rivers
2. Allocation of Water	8.6 MAF (Out of it 7.59 MAF is allocated for IGNP)
3. Length of Feeder Canal	204 km (170 km in Punjab-Haryana and 34 km in Rajasthan)
4. Length of Main Canal	445 km
5. Phase I of the Project	Rajasthan Feeder, Main Canal (189 km upto Pugal, Bikaner) and distributerries. Irrigated Area (CCA): Flow- 4.84 lakh ha, Lift-0.62 lakh ha, Total- 5.46 lakh ha Irrigation Intensity (Per cent): Flow- 110 (Rabi-63, Kharif-47), Lift- 100 (Rabi- 55, Kharif- 45)
6. Phase II of the Project	Indira Gandhi Main Canal (256 km) from 189 km to end point Mohangarh, distributerries and Sahwa Lift Canal. Irrigated Area (CCA): Flow- 7.24 lakh ha, Lift- 3.30 lakh ha, Total- 10.54 lakh ha Irrigation Intensity (Per cent): Flow- 80 (Rabi- 46, Kharif- 34), Lift- 60 (Rabi- 35, Kharif- 25)
7. Construction of Water Courses (Khale)	Phase I- 5.29 lakh ha, Phase II- 7.03 lakh ha, Total- 12.32 lakh ha
8. Water reserved for drinking, energy projects, military, industries etc.	0.87 MAF
9. Beneficiary Districts	Sriganganagar, Hanumangarh, Bikaner, Jaisalmer, Jodhpur, Churu, Jhunjhunu, Sikar, Nagaur and Barmer

Source: Progress Report 2014-15, Indira Gandhi Nahar Board, GoR, Jaipur

Aim of the Study

The landuse and cropping pattern of the IGNP area is changing with the time and space. The study area has developed as a major cropped area and has become important producer and supplier of some agricultural crops providing assured income and food security in the rural masses. The canal and tube-well irrigated area is flourished with cash crops. The objective of the study is to examine the impact of irrigation on food security and poverty alleviation in the study area.

Hypothesis

The landuse and cropping pattern of the study area has changed with the expansion of irrigation facilities. The IGNP is an important source of irrigation that has provided food and fodder.

Therefore, it has been hypotheticated that

expansion of irrigation and increase in agricultural production has positive relationship in mitigating the poverty and providing food security in the rural masses.

Methodology

The primary data have been collected from 5 respondents each from 238 sample villages situated in study area through survey-cum-schedule method. The sample villages have been taken from both canal and tube-well irrigated areas by random sampling. A detailed schedule was prepared for the collection of data and information regarding irrigated area, cropping pattern, crop yield and growth of income and employment of farmers as well as agricultural labourers. The respondents comprise farmers, agricultural labourers and people engaged in allied activities. Whereas secondary data are collected from various departments such as IGNP, Irrigation, Landuse and Agriculture, Forests, Colonization and Land Settlement, Indian Meteorology Department, Jaipur etc. The collected data and information have been collected to find out the irrigated area, cropping pattern, yield per hectare, income from various crops and livestock rearing; and change in the socio-economic life. The statistical and cartographic presentation is done by tabulation, graphs and diagrammatic maps to support the opinions and relevant reactions of the respondents and to get a better idea of the impact of irrigation.

The large scale irrigation by canal and tube-wells has brought changes not only in the physical environment of the area but also in the social and economic conditions of the population. Economic impacts of the IGNP are positive, whereas social impacts are both positive and negative. Economic impacts include change in occupation, generation of employment opportunities, poverty alleviation, Increase in household income, asset building, expenditure pattern, savings, increase in living standard, and appreciation of land valuation etc. Social impacts of the IGNP account change in demographic features, increase in settlements, social composition, literacy, cultural practices, habits, customs, and lifestyle etc. With help of surface water irrigation, this arid region has been transformed into an agriculturally rich field of surplus foodgrains and bumper harvest of commercial crops such as oil-seeds, cotton, sugarcane and pulses.

Poverty Alleviation and Food Security

The impacts of irrigation on poverty reduction are both direct and indirect. Direct benefits of irrigation include higher productivity through increase in crop yield and diversification of cropping patterns and application of modern techniques resulting higher household income, consumption and employment. It has also resulted in surplus production for marketing that has created employment opportunities in *Krishi Mandis*. It also indirectly benefits the landless farmers and labourers through higher wages.

Increase in Irrigated Area

The irrigated area to net sown area has increased in the IGNP area. Sriganganagar ditrict has the highest percentage (76.24) of irrigated area to net sown area followed by Hanumangarh (40.05), Jaisalmer (22.33) and Bikaner (17.94). It also

important to mention here that irrigated area to net sown area has increased the maximum 13 times in Jaisalmer district and 2.5 times in Bikaner district (table 2). Both of these districts are irrigated by the introduction of IGNP whereas Ganganagar and Hanumangarh districts have been irrigated by the Gang Canal since 1927 and also contribute the maximum area under IGNP irrigation.

There is inverse relationship in poverty and irrigated area. It is claimed that while the incidence of poverty is higher in the areas with less than 10 per cent cropped area under irrigation, it is about 28 per cent where irrigation covers more than 50 per cent of cropped area, and just 13 per cent with over 70 per cent of their cropped area under irrigation (Sriganganagar and Hanumangarh districts).

Table-2 IGNP- Irrigated Area to Net Sown Area (in Per cent)

Year	District			
	Bikaner	Ganganagar	Hanumangarh	Jaisalmer
1988-89	7.04	70.54	-	0.5
1996-97	10.23	73.31	38.69	8.47
2001-02	17.94	75.05	40.05	22.33
2014-15	23.86	76.24	46.50	27.53

Source: CAD, IGNP, GoR, Jaipur, 2014-15

Wage Rates

Irrigation development necessarily triggers the employment generation in agricultural as well as allied fields. It further adds to employment by creating favourable market conditions. It stimulates the agriculture sector of the rural economy through increased demand for agricultural inputs- agricultural labour, manufacture of tools and equipments, supplies of seeds and fertilizers; and the marketing of the produce. Increased income of farmers creates demand for non-agricultural goods and services- clothing, education, medical, transport and communication; many of which are marketed locally and can be supplied by resource-poor individuals. The

resultant stimulation of non-agricultural incomes thus reduces poverty in rural areas.

The wage rates have increased manifold in the study area. Earlier, employment opportunities are almost negligible and people have to migrate seasonally, temporarily or permanently to Gujarat, maharashtra, Delhi, Punjab, Assam, Mumbai etc. for wages. But after irrigation the area has abundant employment opportunities. The wages for unskilled labourer ranges Rs 300-500 per day while it is Rs 600-900 of skilled labourer (mechanic, fitter, electrician, driver etc). These rates also have wide seasonal and areal variation. During peak crop seasons wages rise upto 150-200 per cent (table 3).

**Table 3
IGNP Area- Wage Rates of Labourers**

District	Wages (in Rs)					
	Rabi		Kharif		Zaid	
	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled
Hanumangarh	600-900	400-500	600-900	350-500	500-900	300-450
Ganganagar	600-900	400-500	600-900	350-500	500-900	300-450
Bikaner	650-1000	400-500	650-950	350-500	550-950	300-500
Jaisalmer	550-850	350-500	500-700	350-500	400-700	300-400

Source: Field Survey conducted during 2014-15

According to the records of the IGNP, the number of jobs created by this project is 51.8 lakh man-day. The residents are still employed in the project for operation and maintenance. Many industries based on agriculture, engineering, minerals and forests have established in the area. Agro-based industries like flour and oil milling, dairying, manufacture of sweets, textiles and guwar gum, wool, cattle feed etc; engineering works i.e. agricultural tools and equipments, repair of pump-sets, motor binding etc. are the newly grown industrial activities.

They have grown up to 4-6 times. It is noticed during the field survey that there is a lot of work and jobs in agricultural sector. There were new opportunities of jobs have existed. There were only 12 per cent members among the sample households employed in manufacturing industries.

Farmers always face shortage of labourer during harvestation of crops. It is interesting to note here that most of the farmers (57 per cent) have dropped cotton cultivation due to shortage and high cost of labour during collection of cotton-balls (harvestation) in Sriganganagar and Hanumangarh districts. There is also a huge demand of mechanics, technicians and fitters for repair and installation of agricultural equipments and machineries. Veterinarians are also required for animal health care services. With all these; transporters, experts of agriculture and soil science, diesel works, solar power, marketing and credit services, education and medical facilities also have a big market in the IGNP area. Recently, property marketing has a huge area of employment and earnings in the project area.

Table 4
IGNP Area- No. of Households
Engaged in Major Industries

Industry	Before Canal Irrigation	After Canal Irrigation
Agro-based		
Flour Milling	12	34
Oil Milling	13	41
Dairying	116	753
Sweets Manufacturing	11	39
Wool Milling	23	33
Textiles	09	23
Cattle Feed	16	46
Guwar-gum	02	26
Engineering		
Agricultural Equipments	15	63
Pumping Set	04	31
Motor Binding	02	28
Mechanical Works	05	42
Mineral based		
Plaster of Paris	06	22
Cement	00	13
Thermal Power	00	09
Brick Manufacturing	03	13
Cable Wire	00	09
Forest based		
Furniture	13	31

Source: Field Survey Conducted During 2014-15.

Reduction in Food Prices

Irrigation has led to lower food prices which are especially beneficial to the poor since they spend a disproportionately large share of their income on food (Hussain, I., 2007).

Access to irrigation water through IGNP and tube-wells is widely credited to be one of the major underlying factors for the substantial productivity gains obtained since their inception. The rates of foodgrains, pulses, milk, vegetables and fruits are upto the reach of common people in the study area. The current prices (2015) of wheat are Rs 1400-2200 per quintal, bajra Rs 1200-1700 per quintal, gram Rs 55-80 per kg, moth Rs 50-80 per kg, moong 50-90 per kg, cow milk Rs 28-36 per litre, buffalo milk Rs 35-50 per litre, ghee Rs 350-650 per litre, mutton Rs 300-

350 per kg, chicken Rs 180-250 per kg and egg Rs 120-150 per tray (30 eggs). The availability and rates of vegetables and fruits vary seasonally but their rates remain quite affordable. It is also important to estimate here that if a labourer of 6 members in family works for atleast 180 days (Rs 300/day) and earns Rs 54,000 per annum, with this 8 quintals of grains and pulses from his own farm and Rs 18,000 per annum from his livestock; his life runs comfortably without any financial burden.

Change in Food Habits

Irrigation enables greater agricultural production than it is achieved with rainfed agriculture. The additional food production obtained with irrigation provides food security to the local people. The national food security is attained through the pursuit of self-sufficiency in domestic production which has been a widespread objective since 1960s. It has not only created savings in foreign exchange but also protected farmers and consumers from market fluctuations and, ensured rural and regional food supplies. Increased food production from irrigated agriculture also confers nutritional benefits for farmers, their families and the local population through increased supplies and varieties of food stuff such as foodgrains, pulses, vegetables, fruits and milk products. Improved nutrition has further enhanced quality of life, health care, labour productivity and life expectancy. It has also benefitted the urban poor by keeping food prices low despite growing demand from increasing population.

The demand for food varieties is increasing in the IGNP area due to agricultural prosperity. It is affected by a shift in diets, which is occurring as a result of increased prosperity, education, health awareness, transportation and changing preferences. The daily intake or varieties of food items at various times/occasions is mentioned in table 5. Earlier Now a day, they tend to consume more dairy products, more pulses, fruits and vegetables, and fewer cereals than in the past. Consumption of meat and egg is also increasing in the area. It was very surprising to hear from old respondents (6.5 per cent) during the field survey that wheat, rice, green vegetables and fruits were not upto reach of common people before introduction of irrigation in this area. Rice was used on particular occasions and celebrations.

Table 5
IGNP Area- Food Habits of Sample Households

Food Item	Before Irrigation			After Irrigation		
	Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner
Grains-(Chapati) Wheat/Bajra/Rice	Bajra	Bajra	Bajra	Wheat	Wheat	Wheat
Pulses-Moth/ Moong/Gram	--	Gram /Moth	Gram/ Moth	Gram/Moth	Gram/Moth	Gram/Moth
Edible Oils- Sesamum/ Groundnut/ Mustard/Soyabean	--	Sesamum/ Mustard	Sesamum /Mustard	Mustard/ Groundnut/ Soyabean	Mustard/ Groundnut/ Soyabean	Mustard/ Groundnut/ Soyabean
Milk	Milk	--	Milk	Milk	--	Milk
Milk Products- Ghee/Butter/Curd	Butter/ Curd	Ghee, Curd	Ghee	Butter/ Curd	Ghee, Curd, Paneer	Ghee, Paneer, Cheese
Green Vegetables	--	Dry veg	Dry veg	Seasonal	Seasonal	Seasonal

Fruits	--	Local	Local	Seasonal	Seasonal	Seasonal
Tea/Coffee	--	--	--	Tea	Tea	Tea
Non-veg	--	--	Mutton, Chicken	--	Mutton, Chicken	Mutton, Chicken
Egg	Deshi	--	Deshi	Poultry	Poultry	Poultry
Bread/Cornflex	--	--	--	Bread	Bread	Bread
Noodles/Maggi	--	--	--	Maggi		
Any Other	--	--	--	Biscuits, Kurkare, Chips, Chocolates		

Source: Field Survey Conducted During 2014-15.

They also used to serve 1-2 wheat chapatis below which *bajri roti* were put in plate to special guests. *Bajri roti* with curd, lassi, chhas, curry and *sangri* were the main items of daily food till 1990 in the study area. After initiation of canal, their food items have changed significantly. Wheat, rice, pulses, green vegetables, fruits and dairy products have become quite common in their daily diet. It is responded by the old people that they used to eat *bajra* and local dry vegetables throughout the year since wheat and green vegetables were not grown there. But since the irrigation has started they are widely available the year round. With this fruits and modern dairy products have also become the major items of their food.

Progress in Soio-economic Life

The irrigation has brought a tremendous change in the socio-status of Other Backward Classes, Scheduled Castes and Scheduled Tribes in the IGNP area. Their occupation has shifted from poor farmer, cattle herder and labourer to landlords. Now, they have beautiful houses and prosperous lifestyle. It is also very important to mention here that 67 per cent of landholdings are owned by Other Backward Class (Jat, Bishnoi, Sidh, Swami), 18 per cent by Scheduled Castes and Scheduled Tribes and the rest by General Category people. So there is just reverse situation in this area where 85 per cent of the cultivated land is owned by the so called weaker sections of the society (table 6).

Table 6
IGNP Area- Socio-economic Life of
Sample Households

Status	Before Canal Irrigation	After Canal Irrigation
Housing	Kucha	Pucca
Household Amenities	Marginal/Not available	Better/ Available
Occupational Structure	Agriculture, Labourer	Agriculture, Services, Manufacturing
Family Status (especially of SC/ST/OBC)	Poor	Better
Family Income	Low	Increased
Food Habits	Based on local products	Modern
Medical & Educational Services	Poor	Developed
Domestication of Animals	Indigenous cow, goat, sheep, camel	Hybrid cow, buffalo, goat

Source: Field Survey conducted during 2014-15.

Conclusion

The survey revealed that after the construction of the canal there have been a remarkable increase in income and employment, availability of nutritional food, improvement in living standard, change in size and type of houses; and an improvement in their food habits. Further, there has been a positive change in the social framework in rural area as the villages have become modernized and farmers have now become financially independent and sound.

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