

Impact of Irrigation through Indira Gandhi Canal Project on the Production and Land Utilization of Major Crops in Desert District of Jaisalmer

*** Khetpal Jangid**

Introduction

The majority of the country's economic development and population is directly and indirectly dependent on agriculture. The importance of agriculture is even more in the broad areas and regions in the naturally adverse conditions and is considered as the main mean of life saving production.

The development and expansion of human factors, research, technology and irrigation facilities have not only changed the climate and low fertile conditions of land in the country, but have also raised the main source of agricultural development and income as a result, there has been a considerable change in the land use patterns and joining the main stream of the area development has begun to become a partner in the economy of the country.

Located in the lap of the Thar Desert Jaisalmer District faces the rigors of climate conditions, which have been reduced by the irrigation facilities and the holy water of the Indira Gandhi canal project. This has also brought about changes in economic, social and environmental conditions, as well as massive changes in the area of agricultural crops, production, irrigated area and the productivity increase and land use pattern of the area.

The study clarifies that the development of irrigation facilities has marked positive change in the nature of agricultural production and land use. There has been a significant increase in the production of selected crops, whereas in some crops, due to soil borne factors and irrigation conditions, the production volume and productivity deficits are visible.

Study Area

Ruled by Yaduvanshi rulers in the ancient times, Jaisalmer district is located in the harsh desert area in the west of Rajasthan, between 26°-29' to 28°-02' North latitude and 69°-29' to 72°-20' east longitude. Connected to Redcliff line, this area from east to west 720 km. wide and from north to south 186 km. long, 38401 square kilometer area, 669919 population, 17 people per square kilometer density, 04 Tehsil, 03 subdivisions. Jaisalmer is the largest district of Rajasthan and in the country area wise and also known as famous desert Tourism District.

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Source: Google map

Objectives

The main objective of the Research paper is to analyze the development of irrigation source in the district, changes in the area of selected major crops, Irrigated area, production, productivity and changes in land use pattern, quantity of fertilizers in Rabi and Kharif after arrival of Indira Gandhi canal project and irrigation facilities. The production of crops, the sources of irrigation and irrigation intensity are to be analyzed.

Database and Methodology

For detailed study and analysis, the data was collected from office of the Director, Agriculture Department Jaipur, Rajasthan , Agricultural statistics at a glance and vital agricultural statistic Booklet and Annual progress reports of RSEB, Jaipur from 1998-1999 to 2015-16 and the collector's office. Secondary figures are obtained in the foam of document of land record branch of district and patwari's documents have been used and ordinary numerical techniques (percentage and average) have been used to check draft and density of crops and irrigation.

Cropping Pattern: status and changes

The crops produced in Jaisalmer are mainly cereals and food grains (Jowar, millet, wheat, maize, barley etc.) pulses (gram, moong, moth, chawla, sesamum etc.) oil seeds (groundnut, rape & mustered, taramera, Custer, soya bean etc.) other (guar seeds, cotton, cumin seed, isabgol etc.) are divided into sections.

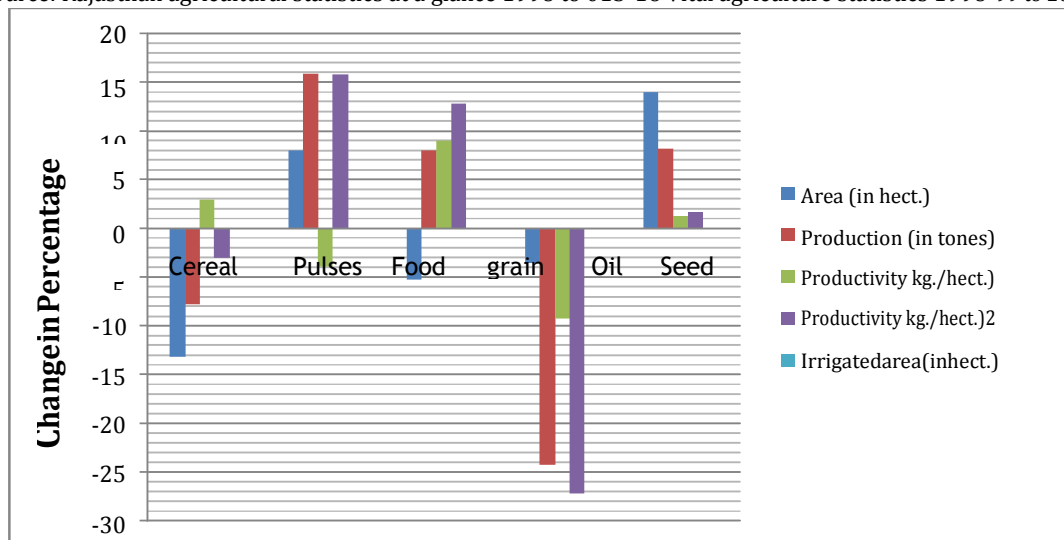
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Table no.1, Cropping Pattern of Major Crops (Percent to Gross)

| Crops | | Total under Rabi & kharif (% to Gross) | | | |
|------------|----------|--|---------------------------|----------------------------|------------------------------|
| | | Area (in hect.) | Production (in tones) | Productivity (Kg/hect.) | Irrigated Area (In hect.) |
| Cereals | 2004-05 | 20.9 | 14.77 | 7.58 | 6.68 |
| | 2014-15 | 7.72 | 6.95 | 10.53 | 3.68 |
| | % change | -13.18 | -7.82 | 2.95 | -3 |
| Pulses | 2004-05 | 2.65 | 7.19 | 29.18 | 10.32 |
| | 2014-15 | 10.65 | 23.05 | 25.24 | 26.11 |
| | % change | 8 | 15.86 | -3.94 | 15.79 |
| Food Grain | 2004-05 | 23.59 | 21.96 | 10.04 | 17 |
| | 2014-15 | 18.38 | 30 | 29.05 | 29.79 |
| | % change | -5.21 | 8.04 | 9.01 | 12.79 |
| Oil seed | 2004-05 | 9.9 | 46.7 | 50.82 | 42.73 |
| | 2014-15 | 6.31 | 22.47 | 41.57 | 15.54 |
| | % change | -3.59 | -24.23 | -9.25 | -27.19 |
| Other | 2004-05 | 42.91 | 9.35 | 2.35 | 23.25 |
| | 2014-15 | 56.9 | 17.51 | 3.59 | 24.86 |
| | % change | 13.99 | 8.16 | 1.27 | 1.61 |

Source: Rajasthan agricultural statistics at a glance 1998 to 015-16 Vital agriculture statistics 1998-99 to 2015-16



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During the year 2014-15, the largest area in the total area of the district was under cereals and food grains (18.38%) along with other produced crops (56.90%) at the same time, the highest production of food grains (30%), pulses (23.05%) and of oil seed crops (22.47%) was recorded. The study shows that the highest positive change in the decade from 2004-05 to 2014-15 is in the percentage of total rabbi and kharif crops of major crop groups was recorded in other produced crops (13.99%) and in pulley crops, where negativity appears in the field of food grains. In the total production, 15.68% of pulses and other crops (8.16%) remained part of the production, while the productivity of oil seed (-24.23%) area measured. According to productivity (Kg/Hect.), cereals and food grain increased 9.01% and 2.95%. And oil seed and pulses decreased by -9.25% and -3.94% respectively. Growth in the irrigated area of pulses and food grains (15.79% and 12.79%) in this decade shows the condition of soil productivity and climate compatibility.

Status changes according to particular crops

During the decade, gram (10.20%), guar seed (11.96%), isabgol (3.52%), cumin seeds (1.71%) indicates the growth, at the same time, the lowest decrease of millet (-16.59%), rape & mustard (-5.46%) and jowar (-0.79%) can be seen, while the initial area production was high, the area production of other produced crops has increased due to the development of irrigation facilities, soil structure and more in the percent.

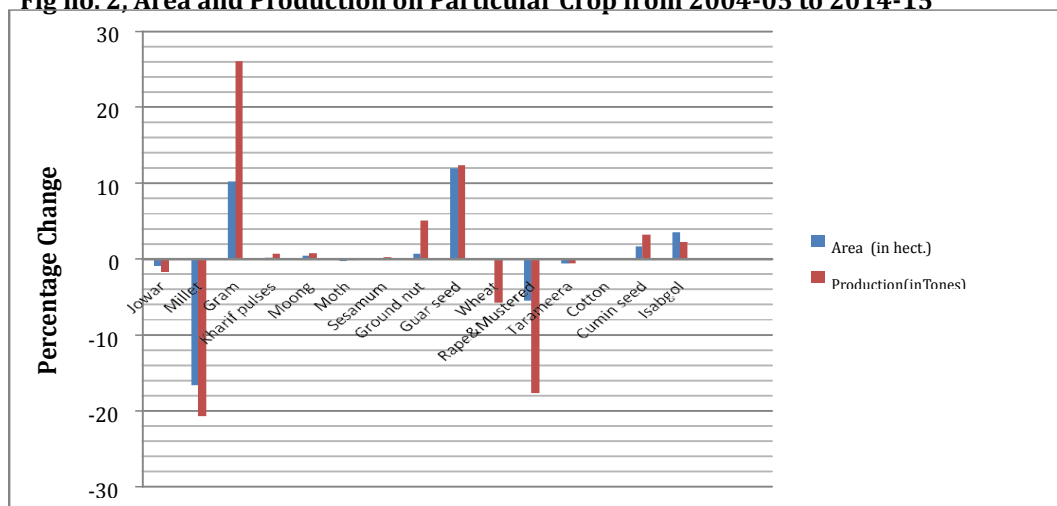
Table no. 2, Area and Production of Particular Crops

| Crops | Area (in hect.) | | | | Production (in tones) | | | |
|----------------|-----------------|---------|--------------------|-------------------|-----------------------|---------|--------------------|----------------|
| | % to Gross | | Increase /Decrease | Change on 2004-05 | % to Gross | | Increase /Decrease | Change 2004-05 |
| | 2004-05 | 2014-15 | | | 2004-05 | 2014-15 | | |
| Jowar | 1.01 | 0.23 | -0.79 | -53.1 | 1.7 | 0.07 | -1.63 | -93.81 |
| Millet | 25.17 | 8.58 | -16.59 | -29.41 | 24.02 | 3.34 | -20.68 | -81.16 |
| Gram | 2.73 | 12.93 | 10.2 | 877.84 | 6.32 | 32.37 | 26.05 | 592.66 |
| Kharif pulses | 0.73 | 0.92 | 0.19 | 160.34 | 0.57 | 1.24 | 0.67 | 195.23 |
| Moong | 0.42 | 0.88 | 0.46 | 328.37 | 0.42 | 1.2 | 0.78 | 285.86 |
| Moth | 0.3 | 0.04 | -0.26 | -71.81 | 0.15 | 0.03 | -0.12 | -64.41 |
| Sesamum | 0.1 | 0.21 | 0.11 | 331.97 | 0.12 | 0.4 | 0.28 | 342.75 |
| Ground nut | 1.17 | 1.84 | 0.67 | 225.84 | 6.61 | 11.71 | 5.1 | 139.69 |
| Guar seed | 51.13 | 63.09 | 11.96 | 155.43 | 2.26 | 14.6 | 12.34 | 771.88 |
| Wheat | 1.19 | 1.23 | 0.04 | 114.02 | 12.35 | 6.68 | -5.67 | -26.77 |
| Rape/ Mustered | 10.97 | 5.51 | -5.46 | 4 | 37.26 | 19.57 | -17.69 | -28.91 |
| Tarameera | 0.59 | 0.03 | -0.56 | -87.73 | 0.62 | 0.08 | -0.54 | -82.12 |
| Cotton | 0.09 | 0.03 | -0.06 | -30.67 | 0.63 | 0.58 | -0.05 | 26.14 |
| Cumin seed | 2.04 | 3.76 | 1.72 | 280.73 | 2 | 5.21 | 3.21 | 252.5 |
| Isabgol | 1.87 | 5.39 | 3.52 | 495.34 | 2.86 | 5.09 | 2.23 | 140.38 |

Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16 Vital agriculture statistics 1998-99 to 2015-16

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Fig no. 2, Area and Production on Particular Crop from 2004-05 to 2014-15

Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16 Vital agriculture statistics 1998-99 to 2015-16

On the production, most of the gram (26.05%, 592.66% compared to 2004-05), and guar seed (12.34%, growth of 771.88% on 2004-05) increases the yield, while millet (-20.68%), rape & Mustard (-17.69%) and jowar (-1.63%) decrease.

Land Utilization Pattern: Status & Changes

In the district the expanses of sand dunes, barren and fallow land and magra areas are more. In its total geographical area 3839154 Hectare shows the hardness of the desert conditions found in 1998-99, only 0.63% of forest and 1.18% in 2013-14. With the development of irrigation facilities, in the last 15-year period, there was a decrease of maximum of 14.74 % in the barren and not available for agriculture land, While 12.47% growth in Net agricultural areas shows positive results for land use and development.

| Land Utilization | 1998-99 | | 2013-14 | | Increase/Decrease |
|--|---------|------------|---------|------------|-------------------|
| | AREA | % TO GROSS | AREA | % TO GROSS | |
| Total Geographical Area | 3839154 | 100 | 3839154 | 100 | 0 |
| Forest | 24101 | 0.63 | 45367 | 1.18 | 0.55 |
| Total not Available for Agriculture | 464108 | 12.09 | 521154 | 13.57 | 1.48 |
| Total Other Cultivation Land (excluding fallow land) | 2881147 | 75.05 | 2315635 | 60.31 | -14.74 |
| Total Fallow Land | 201098 | 5.24 | 209738 | 5.46 | 0.22 |
| Net Area Shown | 268700 | 6.99 | 747260 | 19.46 | 12.47 |

Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16 Vital agriculture statistics 1998-99 to 2015-16

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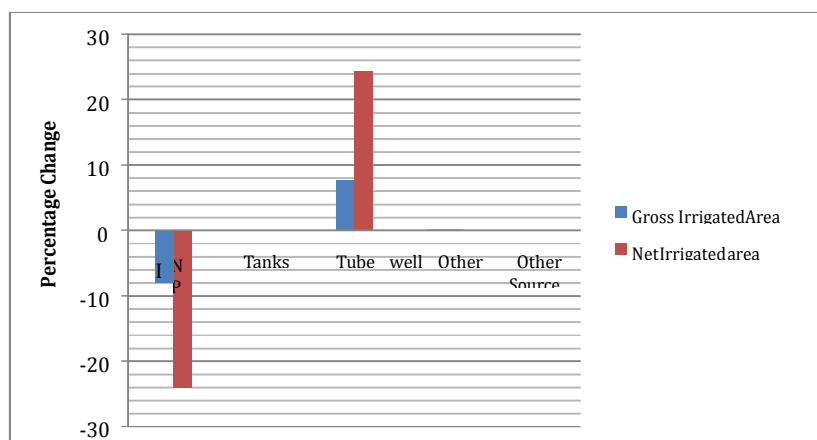
The comparative study of land use data shows that in the 1998-99, net agriculture area increased by 19.46% i.e. there fold changes, while in the same year, in the other agriculture area and barren and fallow lands 75.05% compared to 60.31%, -14.74% reduction was calculated. This change in land use pattern shows a positive impact on the changes and development patterns of the district's social, economic and environmental conditions.

Irrigation Facilities: Status and Changes

Agriculture in Jaisalmer has been possible only by increasing irrigation facilities. Monsoon rainfall in the last two decades is 148.5mm. And the number of rainy days recorded 18.8. This small amount of rainfall affects the overall ecological productivity with vegetation. Compared to the year 2004-05, gross irrigated area has increased by 219.17% in 2014-15. According to irrigation sources, two-thirds of the area is irrigated under the Indira Gandhi canal project.

Table no.4, Irrigation Status (Area in hect.)

| Sources | Gross Irrigated Area | | | | Net Irrigated Area | | | |
|---------------|----------------------|---------|-----------------------|------------------------|--------------------|---------|-----------------------|------------------------|
| | 2004-05 | 2014-15 | Increase/ Decrease | % Change on 2004-05 | 2004-05 | 2014-15 | increase/ decrease | % Change on 2004-05 |
| | % | % | | | % | % | | |
| IGNP | 67.95 | 60.17 | -7.78 | 182.65 | 67.95 | 43.13 | -24.82 | 23.94 |
| Tanks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tube well | 31.62 | 39.34 | 7.72 | 297.1 | 31.45 | 55.82 | 24.37 | 243.05 |
| Other well | 0.38 | 0.48 | 0.1 | 308.26 | 0.55 | 0.66 | 0.11 | 136.08 |
| Other Sources | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grand total | 100 | 100 | 0 | 219.17 | 100 | 100 | 0 | 93.57 |



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The area of IGNP under the gross irrigated area has decreased from 67.95% in 2004-05 to 60.17 %, which shows a deficit of 7.78%, where as in 2014-15 the area growth in 2004-05 is 182.65 %. In addition to the IGNP, other sources of irrigation are also important, in which electrified tube well show an increase of 297.10%, including the growth of 7.72%, while the other tube wells in the area have increased in the decade 2004-05 to 2014-15 by 308.26 %.

In the district, tube well (electrified and others) in addition to Indira Gandhi canal project are the main sources of irrigation , pond and other sources of irrigation generated conditions of perversity are negligible. In 2004-05 to 2014-15 decade irrigation sources according to gross irrigated area in electrified tube wells most recorded increase. Where as in 2004-05 31.62% the fraction of which was increased. In 2014-15 39.24% (7.32 %) growth has been on the Net irrigated area 31.45% then in 2014-15 55.82 % (most 24.37 %) increased. IGNP gross irrigated area 2004-05 to 2014-15 182.65% Increase while decade interval -7.78% decreased. Net irrigated area in 2004-05 67.95% of 2014-15 only 45.13% come to minimum (-24.82%) lack showing the neglected emblematic areas. The main cause of low water volume, soil perversity, outbreak airflow, low soil moisture properties, presence of hardpan, salts and alkali overdose , government system ,absence of encouragement and corruption etc. As the second major source, the percentage of electric running tube wells and other Wells on the remaining land of the district has gone up from 32% in 2004-05 to an elevated high of 56.48 %.

In gross area of district, the expanses of barren land are highest in comparison to agriculture land and pastures. Along with the expansion of sand and sandy soils and deficiency of vegetation cover, there is a lack of nutrient in the soil and problems are further aggravated by the shifting dunes. As a result, the use of organic and chemical fertilizer has increased due to more production and green revolution. Decadal studies show that in the year 2004-05, the gross quantity of Nitrogenous, phosphoric and potasic (NPK) was 3646 tones, which increased to 166679 tons in 2014-15, Shows 357.46% higher amounts. Mostly nitrogenous (N) fertilizer is used in the district according to soil quality. In these years, the quantum of phosphoric (P) fertilizers increased from 16.12% to 24.19% i.e. 8.07%, which shows an increase of 586.22% from the year 2004-05 to 2014-15.

Table no.5, Fertilizer Consumption in Term of Nutrients (in Tones)

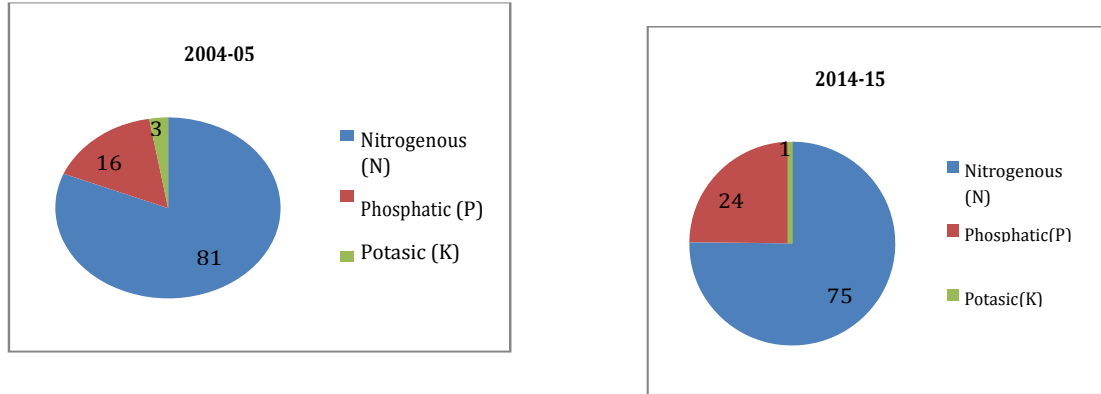
| Fertilizer | 2004-05 | | 2014-15 | | Increase / Decrease | % Change on 2004-05 |
|------------------------------------|----------|-------|----------|-------|---------------------|---------------------|
| | Quantity | % | Quantity | % | | |
| Nitrogenous (N) | 2960 | 81.18 | 12535 | 75.15 | -6.03 | 319.23 |
| Phosphatic (P) | 588 | 16.12 | 4035 | 24.19 | 8.07 | 586.22 |
| Potasic (K) | 99 | 2.7 | 109 | 0.65 | -2.05 | 10.1 |
| Grand total(NPK) | 3646 | 100 | 16679 | 100 | 0 | 357.46 |
| fertilizer consumption (Per hect) | 9.06 | | 17.15 | | | 89.29 |

Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16 Vital agriculture statistics 1998-99 to 2015-16

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Fertilizer use in the district was 9.06 tons per hectare in 2004-05 which increased to 17.15 tones per hectare in 2014-15 and has increased by 89.29%.



Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16
Vital agriculture statistics 1998-99 to 2015-16

Cropping and Irrigation Intensity: Status & Changes

With increasing irrigation facilities, favoritism and mutual encouragement, the rate of agriculture and irrigation resources and the flow of strokes has come to intensity.

The value of the part 2006-07, 2011-12 and 2014-15 of the crops and irrigation intensity are showing continuous increase. In 2006-07, the crop intensity of the district was 115, which increased to 126 % in 2014-15 i.e. It increased by 11%. In these years irrigation intensity increased from 117% to 238%, showing an increase of 121percentage.

Table no.6, Cropping and irrigation intensity (in percentage)

| Intensity | 2006-07 | 2011-12 | 2014-15 |
|-----------------------------|---------|---------|---------|
| Cropping Intensity | 115 | 121 | 126 |
| Irrigation Intensity | 117 | 216 | 238 |

Source: Rajasthan agricultural statistics at a glance 1998 to 2015-16 Vital agriculture statistics 1998-99 to 2015-16

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Rising crops and irrigation intensity in the district are also being formed due to the enrichment of economic dimensions in the form of gross production of Rabi, Kharif and Jayad with crops and agriculture work.

Conclusion and Recommendations

Before the development of irrigation facilities, Jaisalmer was an area of extreme dry, drought, famine, more frequent of sandy storm and very low of agriculture activities, pasture, plantation and development. The expansion of irrigation facilities led to the irrigation structure, transport facilities and development, rural-urban forms, business structure, immigration, social and cultural mixing, industrial production, living standard, demographic format, animal wealth, bio diversity and desert ecology, forestry, grassland and pastures, increase in drinking water facilities and land use forms and major changes have been made, which has led the region to the path of integrated development. With the help of agriculture self-sufficiency in selected crops, land use pattern, consumption of fertilizers, irrigation sources and agriculture and irrigation intensity instead of irrigation facilities in the district, motivates more production due to commercial use and increasing population density. With the acceleration of agricultural development in the district, it is necessary to reduce the negative impact on environment and ecology, and try to enrich its properties.

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