

# CHANGE IN CROPPING PATTERN UTILIZING NARMADA MAIN CANAL WATER: A CASE STUDY OF BARMER DISTRICT

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## Abstract

Irrigation is the most important determinant which triggered chain reaction in Indian agriculture. The scenario of canal irrigation system has change due to performance and environmental problems, which lead to exploiting of alternate sources. Considering the importance of Narmada main canal water and its effect on cropping pattern, the study is taken up in Barmer district of Rajasthan. This zone of Rajasthan has high saline water and hence agriculture output was very poor. More than 65 % of lands were barren and could grow only thorny trees. Bajara is the dominant crop in this district. In Barmer before Narmada main canal water most of the areas were irrigated by wells only and total irrigated area was 106249 ha. After Narmada main canal water supply 879 ha. area is irrigated by canal water and total irrigated area is increased to 130193 ha. After Narmada main canal water area of wheat is decreased by 0.1 %, production is increased by 24.76 % and yield is increased by 24.9 %. Area of jowar is increased by 12.66 %, production is increased by 21.79 % and yield is also increased by 13.58 %. Area of onion is decreased by 20.25 %, production is also decreased by 47.45 % and yield is going down upto 30.11 %.

**Index Terms:** Barmer Canal Irrigation, Narmada Main Canal Water, Increasing Crop production

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## 1. INTRODUCTION

Indian agriculture is a prelude to economic development and a pre-requisite for poverty alleviation and overall economic development. Agriculture is the principal occupation of the people of India. More than 70 per cent of the working population derives their livelihood by cultivation. Moreover, in India agriculture is the basis of the economic structure of India, for it is not only the source of raw materials for the principal industries of India such as jute textiles, sugar and cotton but it also accounts for the maximum portion of the total income. Food grain crops are dominant everywhere and they cover as much as three fourth of the total cropped area in India. Sources of irrigation in India are tanks, wells (including tube wells), canals, etc. Net irrigated area: 60.85 % is irrigated by wells (including tube wells and pumping sets), 29.24 % by canals, 4.62 % by tanks & 5.29 % by other sources. Cropping pattern is defined as the spatial representation of crop rotations, or as the list of crops that are being produced in an area and their sequence in time.

Barmer districts of Rajasthan have high saline water, very poor monsoon and agriculture activity was very poor. The Narmada main canal was inaugurated on 24 April 2008; the Narmada main canal comes as a blessing for the farmers and residents of Barmer district. After Narmada main canal water for the people of Barmer district of Rajasthan, it will not only mean end of water scarcity, but will also help 233 villages in the area to irrigate 2,50,000 hectares of land. Apart from this,

589 areas in Barmer - a total of 1,107 villages with a population of 4.5 million will be able to use the water for drinking purposes. Venkataramanan and Prahladachar 12 (1980) has studied the growth rates and cropping pattern changes in agriculture in six states from 1950 to 1975. Mishra P.4 (1990) analyzed water management in the arid agriculture of Barmer district. Sharma J. L.7 (1990) has studied inter-state disparities in growth of agriculture in India from 1966-67 to 1987-88. Increased production was statistically non-significant in Gujarat, Tamil Nadu and Rajasthan states. Shivakumar P.9 (1994) reported that in Karnataka, there was statewide shift from food based agriculture to horticulture, sericulture, dry land crops and forestry. Vivekananda and Sathyapriya12 (1994) has studied the Karnataka's changing cropping pattern and reported that the share of area under all cereal crops declined from 55 % to 47 % between 1956-57 and 1989-90 Parmer et al. 5 (1995) examined the degree of change in cropping pattern in the four districts of south Gujarat during the period 1960-61 to 1989-90. Singh et al. 10 (1997) studied the cropping pattern during pre (1959-60 to 1968-69) and post (1969-70 to 1990-91) green revolution period in the three agro-climatic zones of the plateau region of Bihar. Carlyle W. J. 2 (2002) has studied changes in cropping patterns from the early 1960 to the mid 1990 in the Canadian Prairies using census data. Sharma P. K. and Sood Anil 8 (2003) have studied spectacular progress in agriculture in Punjab during the last three decades with the help of Remote Sensing and GIS. Kushwaha, S. S. and Gajja, B. L.3 (2009) has studied the change in the cropping pattern in Rajasthan, India. The crop

diversification had been witnessed in favour of oilseed crops. Punithavathi J. and Baskaran R. 6 (2010) has studied 20 crops with varying hectares in Papanasam taluka, Tamildu and determined dominant crops out of this 20 crops. Bhatt M. M and Shah A.R.1 (2011) has studied that the new agricultural technology and conserving of state farms into sharkets and dekhans has brought changes in the traditional cropping pattern in Uzbekistan, particularly in the main food crops-wheat and rice.

**2. STUDY AREA**

Rajasthan the largest state of India with high population growth and has agrarian economy with greater drought vulnerability. The rural communities in Rajasthan are mainly dependent on rain-fed agriculture. Rajasthan has cultivated area of almost 20 million hectares but due to some unavoidable circumstances on 20% of the total cultivated area is irrigated. Study area includes Barmer district of Rajasthan. Barmer is located between 24°58' and 26°32' North latitude and between 70°5' and 72°52' East longitude 2. These zones of Rajasthan have high saline water (khaara paani) hence the agricultural output was very poor. More than 65% of lands were barren and could grow only thorny trees. Avg. rainfall is 277 mm in Barmer. Groundwater is only source of irrigation in these zones. The Narmada main canal was inaugurated on 24 April 2008; the Narmada main canal comes as a blessing for the farmers and residents of Barmer district. After Narmada main canal water for the people of two district of Rajasthan, it will not only mean end of water scarcity, but will also help 233 villages in the area to irrigate 2,50,000 hectares of land.

**3. METHODOLOGY**

Selection of study area is done in such a way that the region which gets maximum benefits of Narmada main canal water. Data for source wise irrigated area before & after Narmada main canal are collected and analyzed. Percentage of net irrigated area before & after Narmada main canal is determined for Barmer district. Area, production & yield of various crops before & after Narmada main canal for both regions are collected from Individual change in percentage of area, production & yield of various crops before & after Narmada main canal are determined. Percentage increase & decrease in area, production & yield of various crops before & after Narmada main canal are determined and concern charts are drawn.

**4. DATA ANALYSIS**

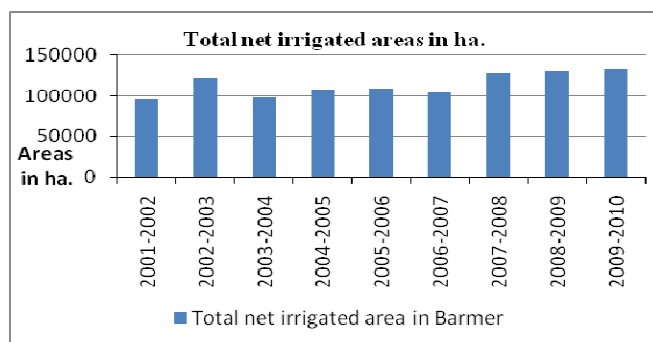
Source wise net irrigated areas for Barmer before & after Narmada Canal are tabulated in table 1 and concern charts is shown in figure 1.

Area, production & yield of various crops from 2001-2011 are collected both for Barmer 3. These data are separated with respect to before & after Narmada main canal water supply. [(2001-2007), (2008-2011)] Table 2 & 3 show these data in terms of min. & max range for Barmer. Individual changes in percentages of area, production & yield of various crops for Barmer before and after Narmada Canal is tabulated in table 4 and table 5 respectively. Table 6 shows percentage increase or decrease in area, production & yield of various crops for Barmer before & after Narmada main canal. Percentage increase & decrease in area, production & yiled of various crops before & after Narmada main canal for Barmer area are shown in figure 4, figure 5 & figure 6 respectively.

**Source Wise Irrigated Area:**

**Table: 1** Net irrigated areas (in ha.) for Barmer before & after Narmada canal

Year	Canal	Tank	Tube well	Other well	Other source	Total
2001-2002	0	0	7003	89052	151	96206
2002-2003	0	0	11264	110340	20	121624
2003-2004	0	0	15223	83650	0	98873
2004-2005	0	0	14401	93298	0	107699
2005-2006	0	0	16360	92532	20	108912
2006-2007	0	8	25856	77687	634	104185
2007-2008	0	0	29548	96621	1437	127606
2008-2009	117	0	38358	91521	390	130386
2009-2010	879	0	40765	89754	1189	132587



**Fig: 1** Year wise total net irrigated area of Barmer before & after canal

**Table: 2** Area, production & yield of various crops for Barmer before Narmada canal

Sr no	Name of crop	Area in ha. (2001-2007)	Production in tonnes (2001-2007)	Yield in tonnes/ha (2001-2007)
1	Wheat	12158-18400	10900-42911	0.9-2.79
2	Jowar	360-3788	46-1744	0.13-0.71
3	Bajara	777384-1020181	5805-563591	0.01-0.55
4	Maize	9-111	8-161	0.89-1.83
5	Barley	15-147	39-342	1.81-2.6
6	Gram	2-3152	2-2721	0.47-1
7	Moong	33217-56377	1127-34584	0.02-0.63
8	Moth	33217-262866	0.1-217192	0-0.88
9	Groundnut	7-235	11-320	0.67-1.57
10	Sesamum	1634-4562	0.1-2359	0-0.57
11	Rapeseed & Mustard	2490-40176	2257-37920	0.76-1.31
12	Castor Seed	4196-18494	3771-14818	0.48-1.24
13	Dry Chillies	21-70	10-65	0.15-0.95
14	Onion	1-152	2-231	0.91-2

**Table: 3** Area, production & yield of various crops for Barmer after Narmada canal

Sr no	Name of crop	Area in ha. (2008-2011)	Production in tones (2008-2011)	Yield in tonnes/ha (2001-2007)
1	Wheat	11467-15200	9986-23127	0.9-2.79
2	Jowar	1221-2074	117-1800	0.13-0.71
3	Bajara	960403-1011401	18402-166442	0.01-0.55
4	Maize	1-15	1-28	0.89-1.83
5	Barley	56-72	156-186	1.81-2.6
6	Gram	35-113	18-53	0.47-1
7	Moong	45965-57944	364-6211	0.02-0.63
8	Moth	184567- 231623	3649-40608	0-0.88
9	Groundnut	305-688	526-1147	0.67-1.57
10	Sesamum	2139-7550	38-1361	0-0.57
11	Rapeseed & Mustard	10249-24715	6674-15842	0.76-1.31
12	Castor Seed	21303-39440	11386-30771	0.48-1.24
13	Dry Chillies	28-32	14-21	0.15-0.95
14	Onion	16-101	3-80	0.91-2

**Table: 4** Individual percentages of area, production & yield of various crops for Barmer before Narmada Canal

Sr no	Name of crop	Individual (%) area before	Individual (%) production before	Individual (%) yield before
1	Wheat	0.93	16.45	13.85
2	Jowar	0.11	0.40	2.51
3	Bajara	59.17	11.63	0.15
4	Maize	0.00	0.02	9.11
5	Barley	0.00	0.08	16.43
6	Gram	0.01	0.09	4.95
7	Moong	3.12	4.96	1.22
8	Moth	14.03	37.47	2.08
9	Groundnut	0.00	0.11	14.35
10	Sesamum	0.21	0.44	1.57
11	Rapeseed & Mustard	0.91	8.89	7.60
12	Castor Seed	0.72	5.87	6.31
13	Cotton (Lint)	0.00	0.00	6.96
14	Dry Chillies	0.00	0.01	3.66
15	Onion	0.00	0.06	8.68
16	Guar Seed	20.73	13.42	0.50

**Table: 5** Individual percentages of area, production & yield of various crops for Barmer after Narmada Canal

Sr no	Name of crop	Individual (%) area after	Individual (%) production after	Individual (%) yield after
1	Wheat	0.90	14.89	21.77
2	Jowar	0.14	0.34	3.12
3	Bajara	55.46	24.40	0.54
4	Maize	0.00	0.00	9.36
5	Barley	0.00	0.05	18.79
6	Gram	0.01	0.04	5.08
7	Moong	3.37	4.49	1.76
8	Moth	13.70	18.70	1.76
9	Groundnut	0.04	0.30	9.90
10	Sesamum	0.29	0.69	3.05

11	Rapeseed & Mustard	1.15	4.17	4.74
12	Castor Seed	1.62	7.90	6.44
13	Cotton (Lint)	0.00	0.00	3.79
14	Dry Chillies	0.00	0.00	4.07
15	Onion	0.00	0.01	4.40
16	Guar Seed	23.25	23.94	1.35

**Table: 6** Percentage increase or decrease in area, production and yield for Barmer

Sr No	Name of Crop	Area	Production	Yield
1	Wheat	-0.10	24.76	24.90
2	Jowar	12.66	21.79	13.58
3	Bajara	-1.91	58.70	58.42
4	Maize	-61.90	-59.63	4.15
5	Barley	-7.69	9.88	9.49
6	Gram	-8.68	-4.46	4.17
7	Moong	5.28	24.81	20.93
8	Moth	0.15	-4.44	-5.45
9	Groundnut	74.39	66.52	-15.61
10	Sesamum	16.76	48.61	34.33
11	Rapeseed & Mustard	12.65	-7.53	-20.45
12	Castor Seed	39.54	42.25	3.83
13	Cotton (Lint)	-15.79	-40.98	-26.80
14	Dry Chillies	-22.08	-14.29	8.11
15	Sweet Potato	-	-	-
16	Onion	-20.25	-47.44	-30.11
17	Guar Seed	7.06	53.14	48.15
18	Small Millets	-	-	-
19	Arhr	-	-	-
20	Urad	-	-	-
21	Lineseed	-	-	-
22	Tobacco	-	-	-
23	Potato	-	-	-

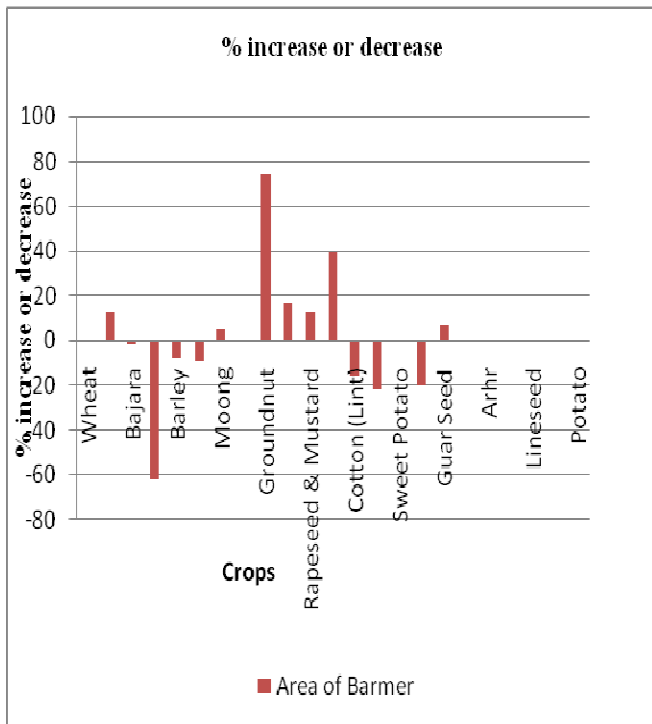


Fig: 4 Percentage increase or decrease in area of Barmer

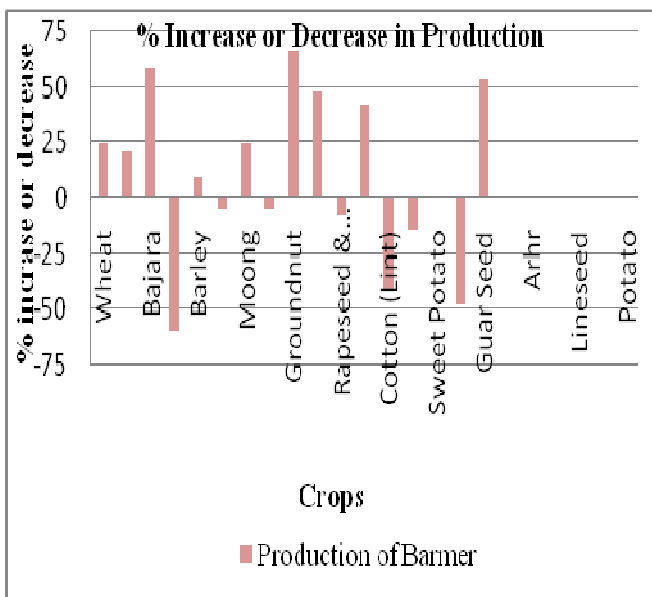


Fig: 5 Percentage increase or decrease in production of Barmer

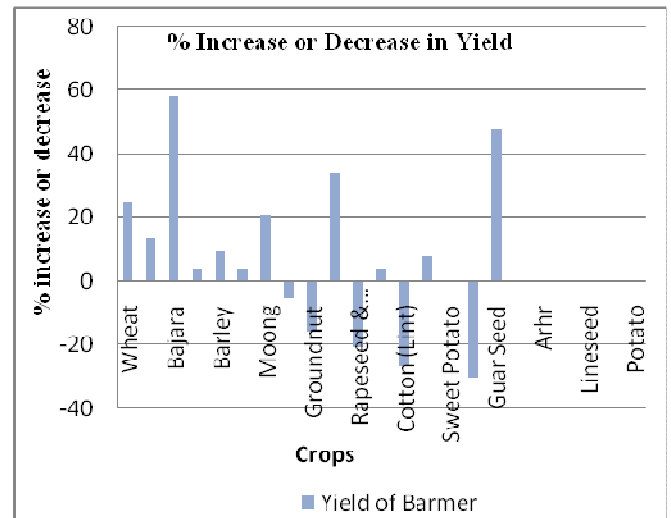


Fig: 6 Percentage increase or decrease in yield of Barmer

### FINDINGS

1. Area of Groundnut is increased by 74.39% and production is increased by 66.52 %.
2. Area, production and yield of Moong is also increased by 5.28 %, 24.81% and 20.93 % respectively.
3. Area and production of Maize is decreased by 61.90% and 59.63%.
4. Area, production and yield of onion are decreased tremendously.
5. Area, production and yield of Sesamum are increased by 16.76 %, 48.61 % and 34.33 % respectively.
6. Area, production and yield of Guar Seed are also increased by 7.06 %, 53.14 % and 48.15 % respectively.

### CONCLUSIONS

From the analysis of above study it can be concludes that Narmada main canal water is blessing for farmers of Barmer district of Rajasthan. More than 65 % of lands were barren and could grow only thorny trees. Before Narmada main canal water availability, bajra was the major crops for Barmer region. In Barmer before Narmada main canal water availability most of the areas were irrigated by wells and total irrigated area was 106249 ha. After availability of Narmada main canal water total irrigated area is increased 18 %. After Narmada main canal water area of wheat is decreased, production is increased and yield is also increased. Area of Jowar is increased, production is increased and yield is also increased. Area of onion is decreased, production and yield is going down. Are, production & yield of most of crops are increased after Narmada main canal water supply.

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