Parameters related to Compare the level of irrigation (proportion of irrigated area) in the state of Haryana, India

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Abstract: The proportion of irrigated area is very significant variable that may explain the level of agricultural development. Area under irrigation has expanded very fast since 1969-70. Net area irrigated (NAI) constituted only about 39.68 percent of Net Sown Area (NSA) in the state during 1969-70. It increased to 61.12 percent during 1979-80. During 1989-90, it has reached to 73.94 percent. In 1999-2000 it increased to 81.3 percent and 83.73 percent in 2004-05. Also in the year 2017-18 it reaches up to 91.47. In fact in some of the districts in eastern parts of state this figure is as high as 100 percent\. The districts have been classified into 5 broad categories of proportion of irrigated area. These categories may be termed as areas of very low proportions of irrigation (less than 30 percent), areas of low proportion (30-60 percent), areas of moderate proportion (60-75 percent), areas of high proportion (75-90 percent) and areas of very high proportion of irrigation (90-100 percent). During 1969-70, the southern, south-western and north-western parts of state had very low proportion of irrigated area. The proportion of irrigated area in Mahendergarh is less than 15 percent and in Ambala district this was less than 30 percent. These areas were devoid of canals and also lacked in tubewell irrigation. Karnal and Rohtak were only districts where proportion of irrigated area were more than 45 percent to Net Sown Area. Karnal remained the leading district in terms of irrigation development during 1979-80, on the other hand Bhiwani, Gurgaon and Amabala districts had less than 45 percent of Net Sown Area irrigated. Moderate proportion was noted in Hisar, Sirsa, Jind and Rohtak while high proportion of irrigated area was recorded in Karnal, Kurukshetra and Sonepat district. During 1989-90, district Jind had very low proportion of irrigated area whereas Mahendergarh, Bhiwani and Ambala had low proportion. Yamunanagar, Rohtak, Faridabad, Gurgaon, Rewari and Sirsa had moderate proportion of irrigated area, Hisar had high and less of Haryana had very high proportion of irrigated area.

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Introduction:

Agriculture forms the backbone of the economy of Haryana. Though the percent share of agriculture in the State Gross Domestic Product (SGDP) has declined about 65 percent of state's population still depends directly on agriculture. The workers are involved in agricultural activities either as cultivator or agricultural labourers. The indices of Net State Domestic Product at factor cost by major sources at current prices have shown low growth rate of primary sector as compared to secondary and tertiary sectors. In the year 2003-04 the per capita net state domestic product of Haryana at current prices was 270.4 (State of The Environment Report, Haryana 2006).

The geographical conditions, especially the nature of monsoon rainfall, in India, make irrigation indispensable for sustainable agricultural development. There were various researchers who studied on it. Presently, due to the fast development of irrigation techniques, it attracted the researchers attention towards the impact of irrigation on agricultural characteristics of state like Haryana, as this is one of the leading agricultural states of our country. Here, some very important studies are given that remarks all the aggregate aspects of irrigation.

Jashbir Singh (March 1974); in this study the author remarks that agriculture without irrigation in Haryana, impossible as state's large areas suffers from rainfall hazards. There is noticeable imbalances in agricultural irrigation facilities in the state where the flood plains area have very high intensity of irrigation but southwestern and northwestern parts of state having very low and moderate density of irrigation each. With the difference in irrigation intensity, the agricultural production will also fluctuate. This imbalances shows that the temporal development in irrigation facilities could not keep step with the reclamation of culturable uncultivated land, a regional development that lacks coordination in planning. Need of irrigation is increasing for increasing agricultural production to fulfill the increasing requirements of increasing population, so the need aroused to develop a comprehensive system of irrigation. To achieve this aim, a well-distributed irrigation programme or

planning should have to be developed. Further he points out that there are scientific remedies for checking the injurious consequences of irrigation, canal irrigation particular. He finds out a trend of cropping pattern effected by irrigation that the higher the intensity of irrigation, the lesser the area under millets and pulses and the greater the area under superior cereals, economic crops and fodder, the cropping pattern also diverse in area where irrigation facilities significantly developed. (Geographical Review of India, vol. 36, March 1974.).

Materials and Methods:

Ideally, each investigation in agricultural Geography should involve four stage The identification of the problem, the collection of data, the formulation of a hypothesis or hypothesis and the testing of hypothesis and modification of hypothesis to provide an adequate explanation (Coppeck, 1969). Three main approaches to the geographical study of subsidence agriculture can be suggested, namely, an ecological approach, the land utilization approach and a statistical approach (McMaster, 1962). A statistical-ecological-physiographic approach is adopted in this investigation as it is not only an attempt to understand and determine the spatial distribution and pattern of the methods of irrigation, in addition it also attempts to detect the effectiveness of irrigation on property and strength of economy by agriculture. Any study should have its significant quantification with relevant data and evidences to provide importance and validity to itself, with suggestive nature. This work is based on secondary data collected from various government and non-government organizations. To make an assessment of irrigation development in the state, the related information and data was collected from State of the Environment Report, Environment Department, Haryana. To study The Changing cropping pattern and production, Statistical Abstracts of Economic and Statistical Organization, Planning Department, Government of Haryana were discussed by 10 years span of time of 1966-67 to 2005-06.

To draw out actual impact of irrigation on agriculture multiple correlations between intensity of irrigation, net sown area, cropping pattern, intensity of cropping, and agricultural efficiency is extracted. Tables and maps show all these factors also.

Results and Discussion:

Table 1: During the year 2005-06, Net Area Irrigated By Different Sources in the districts of state of Haryana.

Sr.No.	Districts	Canals	T.W.	Others	Total	NSA	%ageto NSA
1.	Ambala	14	101	1	116	134	86.6
2.	Panchkula	-	2	2	4	23	17.4
3.	Yamunanagar	4	109	-	113	125	90.4
4.	Kurukshetra	27	123	-	150	150	100.0
5.	Kaithal	99	86	11	196	197	99.5
6.	Karnal	34	161	-	195	196	99.5
7	Panipat	29	64	-	93	93	100.0
8	Sonepat	85	56	-	141	147	95.9
9	Rohtak	112	20	-	132	142	93.0
10	Jhajjar	55	44	-	99	154	64.3
11	Faridabad	22	95	-	117	148	79.1
12	Gurgaon	16	74	-	90	165	54.5
13	Rewari	2	108	-	110	126	87.3
14	Mahendergarh	2	119	-	121	152	79.6
15	Bhiwani	169	118	-	287	394	72.8
16	Jind	130	93	-	223	257	86.8
17	Hisar	218	9	-	227	315	72.1
18	Fatehabad	145	60		205	216	94.9
19	Sirsa	263	72		335	394	85.0
	Haryana	1426	1514	14	2954	3528	83.7

The successful expansion of area under irrigation has been a legend feature of Agriculture of Haryana. Other inputs and better cultivation methods of agriculture are effectively based upon irrigation. There is a trend of almost explosive expansion in the utilization of the groundwater, particularly in the districts of Kurukshetra, Karnal, Panipat and Yamunanagar through individually owned shallow tubewells providing the farmers with just the type of instant and controlled irrigation which the new high yielding varieties demand along with the application of fertilizers.

The proportion of irrigated area is very significant variable that may explain the level of agricultural

development. Area under irrigation has expanded very fast since 1969-70. Net area irrigated (NAI) constituted only about 39.68 percent of Net Sown Area (NSA) in the state during 1969-70. It increased to 61.12 percent during 1979-80. During 1989-90, it has reached to 73.94 percent. In 1999-2000 it increased to 81.3 percent and 83.73 percent in 2004-05. Also in the year 2017-18 it reaches up to 91.47. In fact in some of the districts in eastern parts of state this figure is as high as 100 percent.

Table 2: During the year 2017-18, Net Area Irrigated By Different Sources in the districts of state of Haryana.

Sr.No.	Districts	Canals	T.W.	Others	Total	NSA	%age to NSA
1.	Ambala	16	112	1	128	142	87.2
2.	Panchkula	-	2	3	52	24	19.2
3.	Yamunanagar	5	119	-	124	142	94.8
4.	Kurukshetra	31	143	-	174	174	100.0
5.	Kaithal	101	114	10	224	201	99.5
6.	Karnal	33	177	-	210	202	99.8
7	Panipat	31	68	-	99	99	100.0
8	Sonepat	86	64	-	150	156	98.0
9	Rohtak	114	28	-	142	152	99.7
10	Jhajjar	59	45	-	104	166	77.2
11	Faridabad	27	107	-	134	155	84.5
12	Gurgaon	20	118	-	138	172	61.2
13	Rewari	2	114	-	116	137	92.2
14	Mahendergarh	2	116	-	118	162	83.5
15	Bhiwani	172	121	-	293	401	82.7
16	Jind	177	128	-	305	261	92.8
17	Hisar	218	39	-	257	362	82.1
18	Fatehabad	253	102		355	252	94.2
19	Sirsa	272	101	-	373	402	87.0
20	Mewat	57	18	-	75	87	87.8
21	Nuh	22	3	-	25	31	32.5
22	Plawal	62	11	-	73	85	84.0
	Haryana	1666	1850	14	3451	3857	918.22

Table 3: During the year 1969-70, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1.	Hisar	41.02	1.02	-	42.04	1175
2.	Rohtak	34	11.2	-	45.2	500
3.	Gurgaon	5.69	24.89	0.21	30.8	474
4.	Karnal	25.39	32.96	0.15	58.52	634
5.	Ambala	2.07	12.45	1.65	16.18	241
6.	Jind	40.42	1.7	-	42.13	289
7.	Mahendergarh	3.46	2.76	5.19	11.42	289
	Haryana	26.77	12.32	0.59	39.68	3548

Spatial variations in the proportion of irrigated area in Haryana during 5 periods of time have been sown by table 1 to 9. The districts have been classified into 5 broad categories of proportion of irrigated area. These categories may be termed as areas of very low proportions of irrigation (less than 30 percent), areas of low proportion (30-60 percent), areas of moderate proportion (60-75 percent), areas of high proportion (75-90 percent) and areas of very high proportion of irrigation (90-100 percent).

It is evident from table 1 that during 1969-70, the southern, south-western and north-western parts of state had very low proportion of irrigated area. The proportion of irrigated area in Mahendergarh is less than 15 percent and in Ambala district this was less than 30 percent. These areas were devoid of canals and also lacked in tubewell irrigation. Karnal and Rohtak were only districts where proportion of irrigated area were more than 45 percent to Net Sown Area.

Karnal remained the leading district in terms of irrigation development during 1979-80, on the other hand Bhiwani, Gurgaon and Amabala districts had less than 45 percent of Net Sown Area irrigated. Moderate proportion was noted in Hisar, Sirsa, Jind and Rohtak while high proportion of irrigated area was recorded in

Karnal, Kurukshetra and Sonepat district (Table 4).

As shown in table 5 during 1989-90, district Jind had very low proportion of irrigated area whereas Mahendergarh, Bhiwani and Ambala had low proportion. Yamunanagar, Rohtak, Faridabad, Gurgaon, Rewari and Sirsa had moderate proportion of irrigated area, Hisar had high and less of Haryana had very high proportion of irrigated area.

Bhiwani district had low proportion of irrigated area in 1999-2000 whereas Rewari and Faridabad districts had moderate level of proportion of irrigated area. Ambala, Yamunanagar, Sonepat, Rohtak, Jhajjar, Mahendergarh, Hisar has high proportion of irrigated area. Panchkula and Gurgaon remained having very low proportion of irrigated area (Table 6).

Table 7 shows the overall picture of proportional present distribution of irrigated area in 2004-05. There is very low proportion of irrigated area in Panchkula district. Gurgaon district have low proportion of irrigated area. Hisar, Bhiwani, Jhajjar districts have moderate proportion of irrigated area, Sirsa, Mahendergarh, Rewari, Jind, Ambala and Faridabad lying in the category of high proportion of irrigated area whereas Yamunangar, Kurukshetra, Kaithal, Karnal, Panipat, Sonepat, Jhajjar and Fatehabad districts have very high proportion of irrigated area.

Similarly, during the present study, there is very low proportion of irrigated area in Panchkula district. Gurgaon district have low proportion of irrigated area in the year 2000-18. Hisar, Bhiwani, Mahendergarh, Jhajjar districts have moderate proportion of irrigated area, Sirsa, Rewari, Jind, Ambala and Faridabad lying in the category of high proportion of irrigated area whereas Yamunangar, Kurukshetra, Kaithal, Karnal, Panipat, Sonepat, Jhajjar and Fatehabad districts have very high proportion of irrigated area in the year 2000-18 (Table 8).

Table 4: During the year 1979-80, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1	Hisar	66.05	6.78	-	72.84	545
2	Sirsa	56.17	16.12	-	72.29	397
3	Bhiwani	20.84	7.65	-	28.49	379
4	Gurgaon	3.16	35.44	-	38.61	158
5	Faridabad	25	32.89	0.65	58.55	152
6	Jind	49.46	13.42	-	62.89	283
7	Mahendergarh	0.75	43.18	0.37	44.31	264
8	Ambala	2.02	27.93	2.02	31.98	247
9	Karnal	18.21	65.81	2.23	86.26	313
10	Kurukshetra	28.3	49.84	1.84	80	325
11	Rohtak	39	20.43	2.16	61.6	323
12	Sonepat	42.69	29.23	3.5	75.43	171
	Haryana	33.73	26.45	0.92	61.12	3557

Table 5: During the year 1989-90, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1	Ambala	2.15	53.23	1.43	56.8	139
2	Yamunanagar	2.38	70.63	0.79	73.8	126
3	Kurukshetra	11.68	83.76	-	95.4	154
4	Kaithal	50.23	47.90	-	98.1	215
5	Karnal	17.3	80.12	-	97	156
6	Panipat	27.0	69.67	-	96	155
7	Sonepat	44.33	49.05	-	93	106
8	Rohtak	52.11	23.28	0.26	75	378
9	Faridabad	26.99	39.87	-	66	163
10	Gurgaon	3.1	62.17	-	65	193
11	Rewari	4.68	71.09	-	75	128
12	Mahendergarh	4.48	48.71	-	53	156
13	Bhiwani	26.51	13.88	-	46	396
14	Jind	55.55	26.66	-	32	225
15	Hisar	69.63	10.54	-	80	550
16	Sirsa	67.42	-	-	67	353
	Haryana	37.82	35.98	-	73.94	3593

Table 6: During the year 1999-2000, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1	Ambala	12.72	71.81	1.81	86.4	110
2	Panchkula	-	35.48	6.45	41.9	31
3	Yamunanagar	3.2	79.2	-	82.4	125
4	Kurukshetra	20.4	79.59	-	100	147
5	Kaithal	48.73	45.17	5.58	99.5	197
6	Karnal	20.19	79.32	-	99.5	208
7	Panipat	29.89	70.1	-	100	97
8	Sonepat	66.28	33.14	-	99.4	175
9	Rohtak	61.26	16.19	-	77.5	142
10	Jhajjar	48.63	27.39	-	76.0	146
11	Faridabad	17.08	56.32	-	73.4	158
12	Gurgaon	8.24	30.92	-	39.2	194
13	Rewari	0.83	69.16	-	70	120
14	Mahendergarh	1.29	75.97	-	77.3	154
15	Bhiwani	31.07	21.05	-	52.1	399
16	Jind	55.93	36.86	-	93.2	236
17	Hisar	78.01	5.88	-	83.2	323
18	Fatehabad	61.81	32.72	-	94.5	220
19	Sirsa	70.54	19.45	-	90	370
	Haryana	40.56	40.31		21.3	3552

Table 7: During the year 2005-06, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1	Ambala	10.44	75.37	0.74	86.56	134
2	Panchkula	-	8.69	8.69	17.39	23
3	Yamunanagar	3.2	87.2	-	90.4	125
4	Kurukshetra	18	82	-	100	150
5	Kaithal	50.25	43.65	5.58	99.49	197
6	Karnal	17.35	82.14	-	99.48	196
7	Panipat	31.18	68.81	-	100	93
8	Sonepat	57.82	38.09	-	95.9	147
9	Rohtak	78.87	14.08	-	92.95	142
10	Jhajjar	35.71	28.57	-	64.28	154
11	Faridabad	14.86	64.18	-	79.05	148
12	Gurgaon	9.69	44.84	-	54.54	165
13	Rewari	1.58	85.71	-	87.3	126
14	Mahendergarh	1.31	78.2	-	79.6	152
15	Bhiwani	42.89	29.94	-	72.84	394
16	Jind	50.58	36.18	-	86.77	257
17	Hisar	69.2	2.85	-	72.06	315
18	Fatehabad	67.12	27.77	-	94.9	216
19	Sirsa	66.75	18.27	-	85.02	394
	Haryana	40.41	42.91		83.73	3528

Table 8: During the year 2017-18, level of irrigation (proportion of irrigated area) in the districts of state of Haryana.

Sr. No.	Districts	Canals	T.W.	Others	Total	NSA
1	Ambala	12.18	81.37	0.92	91.12	139
2	Panchkula	11.0	11.12	11.16	19.12	27
3	Yamunanagar	5.4	91.6	0	98.5	133
4	Kurukshetra	25	84	0.16	100	152
5	Kaithal	61.16	47.61	7.12	100	202
6	Karnal	19.12	92.18	0	99.97	201
7	Panipat	34.58	72.19	0	100	100
8	Sonepat	62.18	42.11	0	97.12	152
9	Rohtak	88.11	15.12	0	94.16	155
10	Jhajjar	37.12	32.16	0	77.12	162
11	Faridabad	16.92	75.16	0	82.16	165
12	Gurgaon	14.69	78.12	0	65.11	172
13	Rewari	2.78	91.16	0	92.11	132
14	Mahendergarh	2.02	81.12	0	88.02	165
15	Bhiwani	47.12	30.12	0	77.08	402
16	Jind	60.12	42.16	0	92.11	261
17	Hisar	73.9	5.16	0	82.07	377
18	Fatehabad	81.12	31.77	0	99.0	288
19	Sirsa	66.75	22.92	0	77.12	372
20	Mewat	14.12	14.12	0	22.17	177
21	Nuh	10.32	10.32	0	15.02	99
22	Palwal	17.18	17.18	0	19.18	165
	Haryana	52.18	62.14	9.18	91.07	4212

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