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A Study of Irrigation Management issues: Evidence from Uttar Pradesh and Uttarakhand

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***ABSTRACT**--Every economy strives to achieve an increasing growth rate. For this the usual path suggested by experts is a gradual shift from the primary sector to secondary and finally to the tertiary sector. Primary sector of the economy encompasses areas like agriculture, forestry, fishing etc. that make extensive use of the natural resources. On the other hand, the secondary sector produces the manufactured goods and the tertiary sector provides the services. The secondary and the tertiary sector however depend heavily upon the primary sector for their subsistence. India has its core competency in the primary sector so in the author's opinion developing and strengthening the agricultural sector will help India attain the desired growth rate. Undivided Uttar Pradesh being the most populous state of the country and ranking third in terms of size is expected to contribute the maximum towards the above mentioned objective. Hence this paper makes an honest attempt to identify the trends of irrigated area in the state, find out the variance and then probe into the reasons of such variance. Finally, we recommend some measures which to our mind if implemented would go a long way to minimize the gap between the projected and actual land under irrigation. This work would be of interest of policy makers, researchers, students beside others having general inclination towards water management measures.*

***Keywords**-- Irrigation, Primary sector, Irrigated area, natural resources, Undivided Uttar Pradesh.*

I. INTRODUCTION

India is said to be a "krishi Pradhan" nation. More than 65% population of country belongs to rural area which is directly or indirectly related to agriculture. Agriculture is the nerve of India. Indian agriculture system is depended on Monsoon. Not only Indian agriculture system every budget is a gamble on the monsoon.

Agriculture contributes to around 18 % towards India's GDP. If India wants to increase GDP growth & maintain economic balance, which is required then it must strive to increase to the participation of agriculture in GDP. Agricultural land is natural resources so we cannot increase it. We can only enhance the proper utilization of available land. This can be achieved by increasing the productivity of crops. We need better quality seeds, good fertilizers, pesticides & minimum dependency on monsoon to achieve this which means there is a clear need to increase the irrigation facility. UUP is the largest population area in India and ranks third in size amongst the states. So it is expected that share of GDP through UUP's agriculture must be the largest. This paper attempts to cater to this issue. This fact was known even to the Britishers who took the initiative to develop irrigation department in UUP. The first Irrigation department in Uttar Pradesh was established in the year 1823. Other significant milestones are enunciated as under-

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SIGNIFICANT MILESTONES	
1823	First Irrigation Office opened at Saharanpur.
	Remodeling of old Moghul Canal on left bank of Yamuna taken up and commissioned as Eastern Yamuna Canal in 1830.
1840	Construction of Ganga Canal started and completed in 1854
1874	Commissioning of Agra Canal
1878	Commissioning of Lower Ganga Canal
1879	Unprecedented famine took heavy toll of life in Bundelkhand
1880	First Famine Commission set up
	Commission recommended that 40% of the cropped area should be provided with irrigation facilities.

CENTRAL PUBLIC WORKS DEPARTMENT ESTABLISHED

1885	Betwa Canal opened to Irrigate Jalaun and Hamirpur districts.
1901	First Famine Commission setup.
1903	Second Famine Commission setup
	Commission reiterated the provision of Irrigation facilities as above.
1913	Hydro Power Station on Upper Ganga Canal started at Bahadrabad (Near Hardwar)
1930	Tube well construction commended in Meerut Distt.
1939	Steam Power Station at Sohawal in Distt. Faizabad to supply Power for pump Canal on River Ghaghra.
1939	Separate Hydro Electric wing named "Hydel" was set up in deptt.
1950	Hydro Electric wing seperated, Electricity Deptt was formed.
1954	First flood work entrusted to Irrigation Deptt.
1945	After IInd world war, emphasis on grow more food schemes. Investigation of new projects. Commercial policy underwent radical change at independence emphasis was on welfare of presentoverall deployment of State.
1949	Research Institute at Roorkee was formed.
1961	Rihand Dam completed : project cost Rs 28 crores.
1961	On completition of second five year plan following major measures was taken: 1. Setting up of central Design Directorate at Lucknow. 2. Central Organisation at Lucknow for procurement of Store & Equipment at Lucknow. 3. Creation of Post of Chief Engineer for each major project. 4. Creation of Post of Engineer in Chief. 5. Creation of Post of Liasion Officer at New Delhi for dealing import licenses and foreign exchange. 6. Separate Organisation for looking after construction and operation of State tube wells under Director of Tube wells was setup on 31.07.1965.

	7. During severe drought in 1966, existing system of Irrigation was found inadequate, need was felt for lift irrigation and lift irrigation schemes were taken up in act 1966 to fight unprecedented drought conditions
1968	Directorate of Lift Irrigation was created.
1968	Main function of Irrigation Deptt in short are to deal with. 1. Utilisation of water resources of state for the propose of irrigation by mean of Canals tube wells, dams, bundhies etc. 2. Utilisation of water resources of state for Power Development. 3. Flood control in river, improvement of damage, removal of water logging and training of rivers for protection of towns. 4. Assessment of Irrigation revenue and collection of miscellaneous revenue occurring from Canals. 5. In 1954 Building and Roads branch was named as P.W.D and Irrigation Deptt. 6. Technical Audit Cell for Irrigation at Secretariat was setup in Sep. 1964

(Source- Official website of Irrigation department, Uttar Pradesh)

Irrigation is the artificial uses of water for the cultivations of trees, grasses, crops, and so on. UUP's (Undivided Uttar Pradesh) farmers gain access to irrigation from mainly two sources, Surface water and ground water. Surface water includes: - Canal, pounds, tanks, etc. Ground water includes: - Tube wells, dug wells, Bore well etc.

UUP had the largest irrigated area amongst all states. Major dams and channels are constructed on Ganga, Yamuna, Betwa, Sariu & Son. Tube well is a main source of irrigation of crop, but its operating cost is very high. Private tube wells can only be afforded by medium & large farmers. Surface water irrigation has heavy investment in initial stages & it is mostly dependent on Central & State Government's assistance.

Irrigation in India is mostly handled by the Government. To protect their vote, bank the State & Central government in power was always afraid of increasing water tax (Aapasi). So incomes of irrigation department keep on decreasing which is not sufficient even to meet out their own expenses. Because of this the irrigation department traditionally depends upon Government grants. In the absence of sufficient revenue, the State & Central government face the challenge of bringing in new investment, cleaning of canals, maintenance, broadening of distributaries & tributaries to support the increasing demand for building irrigation facilities. This gave scope for some farmers for illegal encroachment for increasing their cultivated area as well as residential area.

It is observed that all farmers do not get required amount of water as per the requirement of the crop. Major sufferers are the tail-enders whose land is not situated in the vicinity of the canal. The causes of tail-ender detriment are excessive use by head-reach farmers, less funds allotted to tail regions for maintenance, poor maintenance and construction, and design fault. With this background in mind it was decided to probe into the causes and suggest recommendations.

Objectives of Study

The current study was undertaken with the following objectives-

1. To identify the trends of various sources of irrigation in the state of Undivided Uttar Pradesh (UUP) based on historical data.

2. To identify the lacuna which led to variance from projected performance and suggest steps to increase future efficiency of irrigation department?

Scope of Study

Our study encompasses the state of Uttar Pradesh and as the data relates back to 1984-85 so it also includes the state of Uttarakhand under its scope.

II. RESEARCH METHODOLOGY

This paper is entirely based on secondary data. The data for the study was obtained from various websites including the official website of the Irrigation department, Uttar Pradesh, the Department of Irrigation, Uttarakhand and Directorate of Economics and Statistics etc. to name a few. The data regarding various sources of irrigation and their coverage in terms of thousands of hectares was obtained. These sources comprise both of ground water as well as surface water irrigation. These are namely canals (both government & private), tanks, tube wells, other wells and other sources.

Using the technique of least square method and a data comprising of seventeen years starting with 1984-85 to 2000-01 trend lines were obtained for each of the sources of irrigation. Next on the basis of these trend lines projected figures were computed from 2001-02 till 2014-15 for all the sources. These projected figures were then compared against the actual figures to arrive at the variance figures. For the purpose of calculating the variance we took the difference of the actual figures from the projected one. The variance formed the basis of our discussion and further analysis into the ongoing situation and the challenges faced by the irrigation department. Table 1 to 5 depicts the actual, projected and variance figures for each of the five sources covered.

Table 1: Net Total Area Irrigated (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	13174	12374	-800
2002-03	13189	12571	-618
2003-04	13573	12769	-804
2004-05	13464	12966	-498
2005-06	13418	13163	-255
2006-07	13658	13360	-298
2007-08	13425	13558	132
2008-09	13775	13755	-20
2009-10	13722	13952	230
2010-11	13723	14150	427
2011-12	13750	14347	597
2012-13	14267	14544	277

2013-14	14364	14742	378
2014-15	14605	14939	334

Table 2: Net Area Irrigated by Canals (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	2843	2827	-16
2002-03	2726	2812	86
2003-04	2856	2797	-59
2004-05	2788	2782	-6
2005-06	2748	2767	19
2006-07	2708	2752	44
2007-08	2447	2736	289
2008-09	2766	2721	-45
2009-10	2642	2706	64
2010-11	2642	2691	49
2011-12	2659	2676	17
2012-13	2625	2661	36
2013-14	2594	2646	52
2014-15	2562	2631	69

Table 3: Net Area Irrigated by Tanks (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	85	58	-27
2002-03	127	55	-73
2003-04	149	51	-98
2004-05	146	47	-99
2005-06	137	43	-94
2006-07	149	39	-110
2007-08	105	35	-69
2008-09	125	31	-93
2009-10	126	28	-98
2010-11	126	24	-102
2011-12	126	20	-106
2012-13	108	16	-92
2013-14	107	12	-94
2014-15	103	8	-95

Table 4: Net Area Irrigated by Tube wells (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	9351	8767	-584
2002-03	9485	8989	-496
2003-04	9566	9211	-355
2004-05	9585	9432	-153
2005-06	9613	9654	41
2006-07	9702	9876	174
2007-08	9779	10097	319
2008-09	9802	10319	517
2009-10	9829	10541	712
2010-11	9833	10762	930
2011-12	9822	10984	1162
2012-13	10363	11206	843
2013-14	10543	11427	884
2014-15	10845	11649	805

Table 5: Net Area Irrigated by Other wells (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	765	421	-344
2002-03	736	417	-319
2003-04	907	412	-495
2004-05	773	408	-365
2005-06	819	404	-415
2006-07	1005	399	-605
2007-08	1019	395	-624
2008-09	1012	391	-621
2009-10	1046	387	-660
2010-11	1044	382	-662
2011-12	1070	378	-692
2012-13	877	374	-503
2013-14	923	369	-554
2014-15	907	365	-542

Table 6: Net Area Irrigated by Other Sources (In thousand hectares)

Year	Actual Area	Projected Area	Variance
2001-02	161	299	138
2002-03	115	297	183
2003-04	94	296	202

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2004-05	172	295	122
2005-06	101	294	192
2006-07	94	292	199
2007-08	77	291	214
2008-09	70	290	220
2009-10	79	288	209
2010-11	77	287	210
2011-12	73	286	213
2012-13	293	284	-9
2013-14	197	283	86
2014-15	188	282	94

III. RESULTS AND DATA INTERPRETATION

A perusal of the above table brings in light the following facts-

1. There is a positive variance indicating that the actual total area under irrigation is far below the targeted area under irrigation from the year 2007-08 for each succeeding year.

2. Similar trend is observed in case of canals as well as tube wells where the actual area under irrigation could not meet the projected figure from 2005-06 onwards.

3. The worst case is with the other source category where the positive variance is seen from year 2001-02. This shows lack of initiates taken by government to develop other forms of irrigation other than the traditionally known sources.

IV. SUGGESTIONS

In order to overcome the above gap and to enhance the efficiency of the irrigation department of Uttar Pradesh & Uttarakhand the following suggestions are hereby proposed-

Attention must be paid to increase new scientific methods of irrigation so that utilization of water may be enhanced just like use of more sprinklers, drip irrigation, underground irrigation, methods of reducing salivation etc. to name a few. This however calls for extensive research and development in this area.

Another way of increasing the area under irrigation is through use of water saving irrigation. Here the water that is usually drained out as waste must be utilized as far as possible for irrigation purposes. A classic example to elaborate this point is the use the water from the kitchen, drainage system and R O plant for irrigation.

Further the storage capacity of water must be improved, so that the water that is naturally available in the form of rain does not go waste. This may be achieved with the help of scientific techniques for water storage like rain water harvesting etc.

Solar tube well sets must be made available to the farmers at subsidized rate from the government. This will bring down the operating cost of running tube wells which run through either electricity or diesel.

There is also a need to implement strict rules for theft control. For this to materialize the entire process must be digitized. Farmers should be sent SMS to inform them about the timings of release of water from canals and the

allotted time for irrigation. Also heavy penalty must be imposed on persons found engaged in illegal activities and stealing water. Their names must be publicized in their village and adjoining areas. This is expected to have a social pressure on such individuals. As most of the unauthorized activities are accomplished during night there is a need to increase the tenure and frequency of night patrolling.

Water utilization can be optimized by eradicating the corruption present within the irrigation department and bringing in a transparent system. Some of the corrupt practices which should be stopped is the false crop classification by the "Sinchpal" for petty bribe by the interested farmers and excess water supply to few farmers only other than scheduled time who make private payments to him.

Though there are excellent government policies to counteract illegal acts there is lack of awareness among those who are directly or indirectly affected. So it is advised that the government must now pay attention on timely implementation of the policies to bring out the benefits of the available policies rather than searching for new policies. Need of the hour is not the policy formulation but its effective implementation.

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