ROLE OF IRRIGATION MANAGEMENT TO MEET FOOD REQUIREMENT FOR GROWING POPULATION OF INDIA

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Abstract

At the time of independence, India had very little irrigation schemes to feed its population. Over the years, the country has been successful in developing irrigation potential by building large numbers of major. medium and minor irrigation schemes. But the productivity of our land lags behind many a countries in the world. Average irrigation efficiency in India is about 35% compared to 55% in China and 75% in Japan. With limited land and water resources of the country, improved management of irrigation, which consumes nearly 80% of available water resources of the country, is a must. The paper deals with different aspects of water use and irrigation water management.

Key Words: Water availability, Irrigation, Irrigation Efficiency, Irrigation Management, Water transfer

1.0 INTRODUCTION

In 1947 when India woke to freedom, the country was facing stark realties of recurring famines and floods. There were hardly any moisture conservation or watershed programs or any storage to meet the demands for domestic use, irrigation, industries and hydro-power generation. Based on limited experience and inadequate technological strengths, the country embarked on its journey into water world of the future. Several multi- purpose river valley projects like DVC, Bhakra-Nagal, Nagarjunsagar etc. were completed. A national water mission has now been set up by the Govt. of India to explore pathways and future option to reduce emerging water stress and to meet increased marketing demands and chain management of agricultural production of rice, wheat, edible oil, pulses etc. Soil health, use of good seeds, organic farming and GM crops etc. are also included in the agenda. Inspite of all the progressive measures and investment of enormous resources over the last 12 five year plans, the country is still lagging behind China and some neighboring countries. Table-1 gives a comparison of wheat and rice production/productivity in China, India and some other countries in the world.

Table 1: SomeAgricultural Statistics For Wheat and Rice (as in 2009)

Crop and Country	Area under Cultivation (million hectare)	Total Production (million tonne)	Productivity (tonne per hectare)	% share in world production
1. PADDY				
World	158.30	685.24	4.2	100.0
1. China	29.88	196.68	6.5	28.7
2. India	41.85	133.70	3.1	19.5
3. Indonesia	12.88	64.40	4.9	9.4
4. Bangladesh	11.35	47.72	4.2	6.9
5. Vietnam	7.44	38.90	5.2	5.6
2. WHEAT				

World	225.62	685.61	3.0	100.0
1. China	24.29	115.11	4.7	16.7
2. India	27.75	80.68	2.9	11.7
3. Russia	26.63	61.74	2.3	9.0
4. U.S.A.	20.18	60.31	2.9	8.8
5. France	5.14	38.33	7.4	5.5

2.0 Available Water Resources and Demand of Water in India

India is blessed with large numbers of rivers spread throughout the country. Table-2 shows the potential and utilizable water resources (CWC-1993, Iyer-1989) of different river basins- both surface and subsurface. The table also gives the built up storages (Kumar et al,2016) available in the different basins. It may also be noticed that by the year 2050, utilizable water resources more or less matches with demand of water from different sector. Unless our population is stabilized by 2050, there will be deficit in supply compared to demand.

Using 2011 census figures, the population of India in 2025 is now being projected as 1394 million, when average per capita availability of water will fall to just 1340 m^3 in an average year to meet our requirements from different sectors (Table-3).Although the average figure 1340 m^3 is above 1000 m^3/year below which the area is water stressed, there are certain basins in India which are water stressed (Table-4). Govt. of India proposes to transfer water (IWRS-1996) from surplus to scarce areas by building 30 link canals (Fig.1).

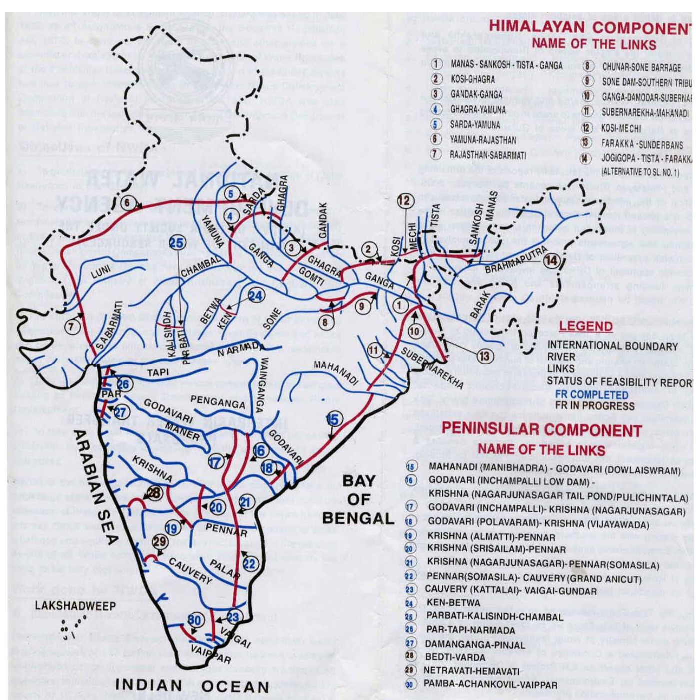

Fig.1Interlinking Indian Rivers (NWDA)

The proposed interlinking of rivers envisages irrigation of an additional area of 35 Mha besides hydro-power generation, navigation etc. and generation of employment in rural India. However, there are several problems in its execution (Mazumder-2006, 2011).

Table-2 shows that our storage capacity (304 BCM) is meager compared to utilizable water resources (1121BCM) and loss of 817 BCM of water resulting in floods in some of the basins. Most of the available water comes from monsoon lasting only 2 to 3 months in an average year which means the surplus water of monsoon must be stored/conserved to meet the requirements during 9 to 10 months a year. Earlier storages were built in upper reaches in mountains, or in downstream rocky terrains, for subsequent releases/abstractions during off monsoon period, The current search is for innovative techniques to increase water conservation, rain water harvesting and increased artificial recharge of ground water since construction of storages is being increasingly difficult due to displacement of people and submergence of forests and stiff resistance from environmental lobby. Water savings, treatment and reuse techniques continue to be on priority lists in urban cities and process industries (Kumar and Mazumder,2016).

Table-2:Basin wise Water Availability and Storage

S. No.	**River Basin**	**Catchment area (Sq.Km)**	**Average Water Resources Potential (BCM)**	**Utilizable Water Resources (BCM)**			**Storage (BCM)**
				Surface	**Ground**	**Total**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Indus	321289	73.3	46	26.49	72.49	16.3232
2	Ganga-Brahmaputra-Meghna						
	(a) Ganga	861452	525	250	170.99	420.99	56.326
	(b) Brahmaputra	194413	537.2	24	26.55	50.55	2.5131
	(c) Barak & others	41723	48.4	-----	------	----	9.891
3	Godavari	312812	110.5	76.3	40.65	116.95	43.4442
4	Krishna	258948	78.1	58	26.41	84.41	54.807
5	Cauvery	81155	21.4	19	18.22	18.22	9.098
6	Subernarekha	29196	12.4	6.8	-----	6.8	2.459
7	Brahmani-Baitarni	51822	28.5	18.3	------	18.3	6.218
8	Mahanadi	141589	66.9	50	16.48	66.48	14.4673
9	Pennar	55213	6.3	6.9	------	6.9	5.079
10	Mahi	34842	11	3.1	------	3.1	5.167
11	Sabarmati	21674	3.8	1.9	------	1.9	1.686
12	Narmada	98796	45.6	34.5	10.83	45.33	24.4567
13	Tapi	65145	14.9	14.5	8.27	22.77	10.605
14	West Flowing Rivers from Tapi to Tadri	55940	87.4	11.9	17.69	29.56	17.098
15	West Flowing Rivers from Tadri to Kanyakumari	56177	113.5	24.3	18.84	43.14	12.4393
16	East Flowing Rivers	86643	22.5	13.1	------	13.1	3.857

	between Mahanadi and Pennar						
17	East Flowing Rivers between Pennar&Kanyakumari	100139	16.5	16.5	-------	16.5	1.456
18	West Flowing Rivers of Kutch and Saurashtra including Luni	321851	15.1	15	-------	1.5	6.847
19	Area of Inland Drainage in Rajasthan	—	Negl.			-----	------
20	Minor Rivers draining into Myanmar (Burma) and Bangladesh	36302	31	------	------	-------	-----
	Total		**1,869.4**	**690**	**431.44**	**1121.44**	**304.348**

Table-3:Water Demand for Different Uses

Sl.No.	Total Water Requirement for Different Uses (in BCM)			
	Uses	Year 2010	Year 2025	Year 2050
		High Demand scenario	High Demand scenario	High Demand scenario
1.	Irrigation	557	611	807
2.	Municipal	43	62	111
3.	Industries	37	67	81
4.	Power (Energy)	19	33	70
5.	Others	54	70	111
	Total	**710**	**843**	**1180**

Table4: Surplus and Scarce Basins in India

Surplus Basins		**Scarce Basins**	
Basins	**Per Capita Availability in m^3 PerYear**	**Basins**	**Per Capita Availability in M^3 Per Year**
Brahmaputra Basin	18,417	East flowing Rivers between Mahanadi and Pennar	919
Barak Basin	7,646	Cauvery	666
West flowing Rivers between Tadri and Kanyakumari	3,538	Pennar	648
West flowing Rivers between Tapi andTadri	3,194	West flowing River Basin of Kutch and Saurashtra including Luni	631
Narmada	2,855		
Brahmani-Baitarni	2,696		
Mahanadi	2,546	East flowing River Basins between Pennar and Kanyakurnari	383
Godavari	2,026		
Indus	1,757		
Ganga	1,473		

3.0 GROWTH OF POPULATION, FOOD REQUIREMENT, IRRIGATED AREA

Fig.2 illustrates growth of our population, food requirement and irrigated area over the period 1951 (First five-year plan started)to 2050. Due to steady growth of our population, food requirement has also increased steadily from 90 Mtons in 1951 to about 300 Mtons today which will further rise to about 460 Mtons in 1950.Our irrigated area, however, remained constant at 113 Mha after 2001 as our land and and water resources are fixed unless the river-inking project is successfully implemented. Only way we can meet the future challenges is to increase productivity of land and by bringing two and three crops in

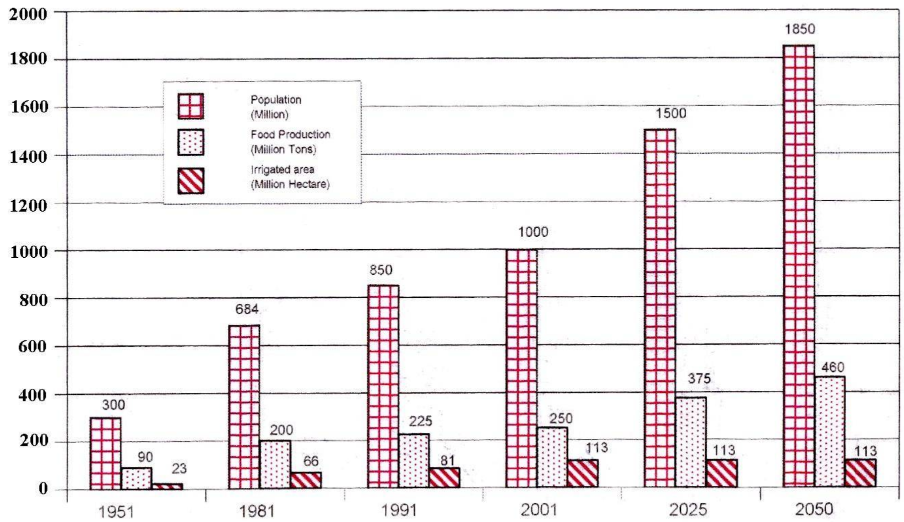

Fig.2 Growth of Population, Food Production and Irrigated Area (1951-2050)

a year with the available water resources. This means more crops per drop or water i.e.improving irrigation efficiency (Mazumder-1986, 2002).

3.1Need and Means For Improving Water - Use Efficiency

The efficiency of water use in irrigation (CWC-2010) which consumes about 80% of our utilizable water resources (Table-1 and 2) must be improved to ensure productivity of agricultural land per unit of area, unit of water and unit of time. At present, overall efficiency of irrigation in India is about 35% which is too low when compared with the figures of 75% in Japan and 55% in China. Even a marginal increase in irrigation efficiency will cause substantial savings of water which can be either diverted for other uses or more agricultural land can be brought under irrigation with the same amount of available water. Usually, the head Enders try to use all the water leaving very little or no water for tail enders (Bharat Singh,1991). Often new projects are to be built for meeting their irrigation demands. The existing project may cater the demand for the entire command area by improving efficiency of water use. Irrigation efficiency can be improved by several means (Mazumder, 2007) but the most effective method is to charge the consumers by volumetrically measuring the water consumed as in the case of domestic use by applying the principle - pay for water and punish for wastage.

3.2 Improved Mangement of Irrigation Water

The average project efficiency in three major river-valley projects, determined by the author, was found to vary from 18.6% to 38.8% (Mazumder, 1984). Most of the irrigation water was found to be lost in conveyance and field application and extremely poor management of water (Mazumder-1986) at the farm level. While emphasizing the present day need of intensive irrigation for maximizing yield per unit of area, Bharat Singh (1991) identified the following major shortcomings of our present irrigation schemes:

- Gap between the creation of irrigation potential and its utilization
- Unreliable and inadequate supply
- Inequitable distribution of water between head and tail enders.
- Non-responsive and authoritarian administration
- Lack of control and increasing malpractices
- Low efficiency of canal systems and poor on farm management of irrigation water.

Planning Commission (2007), renamed as Niti Ayog by Govt. of India, recognized the three major shortcomings responsible for poor performance of irrigation schemes in India, namely,

- Unlined channels
- Lack of land consolidation, improper leveling and sizing of irrigated land
- Poor on- farm management of irrigation water beyond outlets.

Zimermann (1966) examined several drawbacks of protective type extensive irrigation practice being followed in India where available water is spread over vast areas through a widely spaced unlined canal networks. Most of the water in such a system is lost in conveyance and most of the remaining water is lost because of inefficient irrigation management (IWRS,2007). Several steps for improving irrigation efficiency by reducing avoidable losses have been outlined by Mazumder (2007).Author is of the view PPP mode of irrigation development, management and maintenance should be encouraged (Mazumder,2010) by the Govt. for achieving better efficiency and remove prevailing corruption in irrigation sector which is by and large under the Govt. control today.

4.CONCLUSION

Since independence India has made significant progress in irrigation development to meet the food requirement for 125 crores of our population today. But the productivity of land is not up to expectation. With limited land and water resources, the only way to feed India's growing millions is to grow more food per drop of water. It calls for improved management of irrigation which consumes nearly 80% of available water resources of the country.

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