

Indian Agriculture & Irrigation Facilities**Dr. Sarwade M.P.**

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Abstract

Water is a critical input into agriculture in nearly all its aspects having a determining effect on the eventual yield. Good seeds and fertilizers fail to achieve their full potential if plants are not optimally watered. Adequate availability of water is important for animal husbandry as well. Fisheries are, of course, directly dependent on water resources. India accounts for about 17% of the world's population but only 4% of the world fresh water resources. Distribution of these water resources across the vast expanse of the country is also uneven. The increasing demands on water resources by India's burgeoning population and diminishing quality of existing water resources because of pollution and the additional requirements of serving India's spiraling industrial and agricultural growth have led to a situation where the consumption of water is rapidly increasing while the supply of fresh water remains more or less constant. As a result ground water tables in most cities are falling at alarming rate of 2 to 3 meters per year. Water scarcity has many negative impacts on the environment, including lakes, rivers, wetlands, and other fresh water resources. Additionally, water overuse can cause water shortage, often occurs in areas of irrigation agriculture, and harms the environment in several ways including increased salinity, nutrient pollution, and the degradation and loss of flood plains and wetlands. Furthermore, water shortage makes flow management in the rehabilitation of urban streams problematic. Owing to poor water resource management system and climate change India faces a persistent water shortage. As per OECD environmental outlook 2050, India would face severe water constraints by 2050. Indian agriculture accounts for 90% water use due to fast track ground water depletion and poor irrigation systems.

Key words: importance of water, availability of water, agriculture development

1. Introduction:

India ranks 2nd worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted 13.7% of the GDP (Gross Domestic Production) in 2013, and employed 50% of the workforce. The irrigation infrastructure includes a network of canals from rivers, ground water, well based systems, tanks and other rain water harvesting products for agriculture activities. Today ground system is the largest, covering 160 million ha of cultivated land in India with 39 million ha irrigated by ground water, 22 million ha by irrigated canals and about two third of cultivation in India is still depending on monsoon. India is the world's largest producer of fresh fruits and vegetables, milk, major spices, various crops such as jute, staples such as millets and castor oil seed. It is also the second largest producer of wheat and rice. The average size of the around 138 million farms was around 1.15 ha in 2010/11 and average size of large-scale farmers'

farms (170.000) is around 37 ha in 2016 (BMEL India country report 2016). Agricultural extension has only one extension worker per 800-1000 farmers and degree of mechanization reaches less than 50% (BMEL India country report 2016). Indicators of water stress and scarcity are generally used to reflect the overall water availability in a country or a region. As per the international norms, a country is classified as water stressed and water scarce if per capita water availability goes below 1700 m³ and 1000 m³, respectively. With 1544 m³ per capita water availability, India is already a water-stressed country and is moving towards turning into water scarce.

2. Objective:

- To study the irrigation facilities for agriculture in India.
- To observe the water availability and agriculture development in India.

3. Irrigation Facilities in India

India is not a water rich country and is further challenged due to negative impact of climate change;

enormous wastage owing partly to poor management and distorted water pricing policies. The Northern Ganga River Basin has abundant water resources, whereas the Southern River Basin has few, but with high levels of pollution in ground water and surface water. Increase in population and changing lifestyles has increased demand for water (largely for irrigation) in both urban and rural areas. India has 18% of world population, having 4% of world's fresh water, out of which 80% is used in agriculture. India receives an average of 4,000 billion cubic meters of precipitation every year. However, only 48% of it is used in India's surface and groundwater bodies. A dearth of storage procedure, lack of adequate infrastructure, inappropriate water management has created a situation where only 18-20% of the water is actually used. India's annual rainfall is around 1183 mm, out of which 75% is received in a short span of four months during monsoon (July to September). This result in run offs during monsoon and calls for irrigation investments for rest of the population of India is likely to be 1.6 billion by 2050, resulting in increased demand for water, food and energy. This calls for infrastructure expansion and improved resource utilization.

3.1 Intensity of irrigation in India

Since India is a country with an important agricultural sector, and over 55% of population is dependent on agriculture, many state governments are offering incentives to ensure availability of water for irrigation purposes, such as: State government of Punjab (Northern India) are offering free electricity for ground water pumping. Moreover, states of Gujarat and Maharashtra offer high subsidy for solar pumps. Variations in irrigation intensity are due to among others varied geographical conditions in different parts of the country. Rugged mountains, sandy deserts and rocky terrains deep aquifers from which extracting water becomes an expensive proposition tend to have very poor irrigation facilities. Fertile alluvial plains with perennial rivers and potable groundwater as well as areas of less than 125 cm of annual precipitation are by far, the areas of high percentage of irrigation. The highest intensity of irrigation exists in the Kashmir Valley, large parts of the states of Punjab (Northern India) and Haryana, the Ganga-Yamuna Doab of the state of Uttar Pradesh (Northern India), Western part of the South

Bihar (Eastern India) Plain, Birbhum, West Bengal (Eastern India), Lakhimpur, Assam (Northeastern, the Godavari Krishna Deltas and Chengalpattu district), Tamil Nadu (Southern India). The intensity of irrigation in these areas is above 60% and in some parts of Punjab (Northern India) it exceeds 75%. Dry areas of Ladakh district in Jammu and Kashmir and Lahul and Spiti district in Himachal Pradesh (Northern India) cannot raise crops without irrigation. Large parts of the Northern plain and East coastal plain have an average irrigation intensity varying from 30 to 60%. Parts of Brahmaputra Plain, the Chambal Valley and those of the Peninsular plateau have low intensity of irrigation varying from 15 to 30%. The areas of low intensity are those which either do not need irrigation by virtue of high and dependable precipitation or have not been able to develop irrigation facilities due to unfavorable geographical conditions such as rugged topography, lack of surface and ground water, among others. More areas with low irrigation intensity due to inappropriate geographical factors include large parts of Rajasthan to the west of the Aravali Range, parts of Bihar plain (Eastern India), central part of Peninsular plateau, the Maharashtra (Western India) and Kerala coasts, Manipur, Mizoram and Tripura. Andaman and Nicobar Islands (Southern India) have 0% irrigation intensity due to adequate precipitation throughout the year. The area, production and yield in food grain in 2013-14 and the proportion of area under food grains irrigated in 2011-12.

3.2 Groundwater based irrigation

At present, irrigation consumes about 84 % of total available water. Industrial and domestic sectors consume about 12 and 4 % of total available water, respectively. With irrigation predicted to remain the dominant user of water, "per drop more crop" is an imperative. The efficiency of water use must improve to expand area under irrigation while also conserving water. Irrigation infrastructure in India has seen substantial expansion over the years. The total irrigation potential created from major, medium and minor irrigation schemes has increased from 22.6 million ha during preplan period to 113 million ha at the end of the 11th Plan. Because this irrigation potential represents 81% of India's ultimate irrigation potential estimated at 140 million ha, the scope for further expansion of irrigation infrastructure on a

large scale is limited. Over the years, there has been significant shift in the sources of irrigation. The share of canal in net irrigated area has declined from 39.8% in 1950-51 to 23.6% in 2012-13. Alongside, the share of groundwater sources has increased from 28.7% to a whopping 62.4 % during the same period. This expansion reflects the reliability and higher irrigation efficiency of 70-80% in groundwater irrigation compared with 25-45% in canal irrigation. While proving to be a valuable source of irrigation

expansion, injudicious utilization of groundwater through the explosion of tube wells has raised several sustainability issues. The area, production and yield in food grain in 2013-14 and the proportion of area under food grains irrigated in 2011-12 are enlisted in **Table 1**

This shows the total Area, production and yield in food grain in 2013-14 and the proportion of area under food grains irrigated in year 2011-12.

Table 1

Area, production and yield in food grain in 2013-14 and the proportion of area under food grain irrigated in 2011-12

States	Area (m.hect) (2013-14)	%of India (2013-14)	Production (million tons) (2013-14)	%of India (2013-14)	Yield (kg per hectare) (2013-14)	% area irrigated (2011-12)
Uttar Pradesh	20.23	16.05	50.05	18.90	2474.00	76.10
Punjab	6.560	5.20	28.90	10.92	4409.00	98.70
Madhya Pradesh	14.94	11.85	24.24	9.50	1622.00	50.50
Andhra Pradesh	7.61	6.04	20.10	7.59	2641.00	62.50
Rajasthan	13.42	10.64	18.30	6.91	1364.00	27.70
West Bengal	6.24	4.95	17.05	6.44	2732.00	49.30
Haryana	4.40	3.49	16.97	6.41	3854.00	88.90
Maharashtra	11.62	9.22	13.92	5.26	1198.00	16.40
Bihar	6.67	5.29	13.15	4.97	1971.00	67.40
Karnataka	7.51	5.95	12.17	4.60	1622.00	28.20
Tamil Nadu	3.55	2.81	8.49	3.21	1917.00	63.50
Odisha	5.15	4.09	8.33	3.15	2396.00	29.00
Gujarat	4.29	3.40	8.21	3.10	1617.00	46.00
Chhattisgarh	4.95	3.93	7.58	2.86	1917.00	29.70
Assam	2.53	2.01	4.94	1.87	1532.00	46.00
Jharkhand	2.24	1.77	4.19	1.58	1952.00	7.00
Uttarakhand	0.89	0.71	1.78	0.67	1874.00	44.00
All India	126.04	100.00	264.77	100.00	2001.00	49.80

3.3 Programs supporting irrigation

It is worth mentioning that Government of India has taken many initiatives in the past. Yet the canal irrigated area decreased by 38 lakh13 hectares during that period, as infrastructure is old, water supply is unreliable, further there are no incentives. Similarly, even after a decade of a 50 to 90% subsidy for the micro irrigation, it covers less than 5% of India's cultivated area. The government schemes have succeeded in some states although faltered in others. Electric powered ground water exploitation has thus emerged is a unique confluence of physical, policy and political factors that have trapped many states in a vicious spiral of decline ground water,

deteriorating water quality, stagnant crop productivity, deteriorating power service delivery and

poor financial health of power generation companies. Most state governments provide subsidized or free electricity to farmers. It is well recognized that this has resulted in water use overuse and resulted in declining groundwater tables. It is estimated that Indian farmers use 2 to 4 times more water to produce a unit of major food crop than in China or Brazil.¹⁴ Of this maximum 45% is shared by tube wells followed by canals and wells. The various sources of irrigation in India for the years 2010-11 are listed in Table 2,

Table 2, Sources of irrigation in India (2010-11)

Canals	Tanks	Wells	Tube Wells	Others	Total
17005.7	2249.4	1149.4	29108.2	4289.2	64624.7

(Source: Department of Agriculture and Cooperation
(Agriculture Census 2010-11))

Government has given considerable importance to the development of command area under canals. Earlier during 1950-1951, the canal irrigated area was 8.3 million ha which is now 17 million ha. Despite that, the relative importance of canals has come down from 40% in 1951 to 26% in 2010-11. Wells and tube wells accounted for 29% total irrigated area in 1951 and they had a share of 64% of the total irrigated area in 2010-11

4. Conclusion

Different results of this research have been put forward for using water efficiently, some are listed below:

1. The method of irrigation followed in the country is flood irrigation, which results in a lot of water loss. Greater efficiency in irrigation was achieved through Proper designing of irrigation system for reducing water conveyance loss. Adoptions of water saving technologies such as sprinkler and drip irrigation systems have proven extremely effective in not just water conservation but also leading to higher yields. New agronomic practices like raised bed planting, ridge-furrow method of sowing, sub-surface irrigation and precision farming which offer a vast scope for economizing water use.
2. Water productivity can be improved by adopting the concept of multiple water use, which is beyond the conventional sectorial barriers of the productive sectors. There is scope for increasing income through crop diversification and integration of fish, poultry and other enterprises in the farming system. The multiple water use approach can generate more income benefits, and decrease vulnerability by allowing more diversified livelihood strategies and increasing the sustainability of ecosystems.
3. Emphasis should be given on water resources conservation through watershed development in suitable areas and development of micro-water structures for rainwater harvesting. The

promotion of water conservation efforts has direct implications for water resources availability, groundwater recharge, and socio-economic conditions of the population in India.

4. The effective water management is critically linked with the performance of local level water institutions. Therefore, institutional restructuring in favor of participatory irrigation management and water users associations (WUAs) needs to be strengthened.
5. National Water Policy is emphasizing the concept of Participatory Irrigation Management and WUA through active involvement of people in execution of irrigation project. According to the latest data available, 56,539 WUA manage 13.16 million ha of irrigated land. It will be useful to evaluate the effectiveness of this participatory approach.

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