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## Analyzing Irrigation Water Management in Punjab

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### **Abstract:**

*Irrigation has acquired increasing importance in Indian agriculture. The various types of irrigation techniques are used in India like surface, drip, sprinkler and groundwater irrigation. Punjab state has witnessed a remarkable increase in the agricultural production during late 1960's with the introduction of package of yielding variety seeds, fertilizers and assured irrigation. The cropping pattern of wheat and paddy rotation has led to manifold increase in irrigation water demand. The objective of the paper is to analysis cropping intensity in different states of the country, also focused on groundwater behavior in various parts of Punjab as saline to sweet water zones and highlighted different ways for irrigation water management in the state. It describes that irrigation is the base for the agriculture output as it is an artificial application of water for the cultivation of crops. The paper shows that Punjab occupies a first position in irrigation intensity i.e. 98 percent of the cropped area is irrigated followed by Haryana, Uttar Pradesh and Bihar. There is need to protect water quality and quantity through different ways as little usage of fertilizers and chemicals, recharge water where there is requirement, check on early transplantation of rice, increasing water use efficiency, change in cropping pattern, recycling of water and encourage sprinkle irrigation on horticulture crops.*

### **1. Introduction**

During the past few decades there has been a structural transformation in the Indian economy. Despite a steady decline of its share in the GDP, still agriculture remains an important sector and plays a significant role in the overall socio-economic development of the country. It still provides livelihood to the people in our country. Even in 2012, 54.6 percent of the population earns its livelihood from agriculture. It fulfills the basic need of human beings and animals. It is an important source of raw material for many agro-based industries. India's geographical condition is unique for agriculture because it provides many favourable conditions. There are plain areas, fertile soil, long growing season and wide variation in climatic condition, etc. In 1960s, with the advent of green revolution the usage of high yielding variety seeds, chemical fertilizer, irrigation and modern machinery has been increased. Irrigation is considered as an essential input and base for about 56 percent possibly more of agricultural output. As in India rainfall is not sufficient to meet the demands for agriculture sector.

It is an artificial application of water for the cultivation of crops and India is having irrigation access mainly from two sources i.e. surface water and groundwater. Surface irrigation is generally provided through large and small dams and canal networks, run-off from river lift irrigation schemes and small tanks. Canal networks are largely gravity-fed (Oza, 2007). Groundwater irrigation is accessed by dug wells, bore wells, tube wells, submersible motors and is powered by electric pumps or diesel engines. So, the above sources are used a large extent. As the demand for irrigation in agriculture is increasing day by day due to more requirement of water in many crops like paddy, wheat etc. But to meet the growing needs of irrigation, the government and farmers have largely focused on a supply side approach rather than improve the efficiency of existing irrigation systems.

The state of Punjab originates its name from 'Punj' 'Aab' i.e. the land of five rivers. However, after the state's partition first in 1947, only Satluj and Beas flow through it, while Ravi touches it at its north border. Another small river Ghaggar flows through its southern border. The Ravi, Beas and Satluj are the Perennial rivers, while Ghaggar, is seasonal river. Punjab has an excellent network of irrigation facilities. As in 2011-12, 98 percent of the gross area sown/net sown area was irrigated. It describes that agriculture in the state is, therefore, dependent upon heavy requirement of water. The water sector is facing challenges like increasing demand, depletion of ground water, canal efficiency below their designated capacity, deterioration of water quality, water logging in South-Western districts and potable drinking water accessibility in South-Western districts.

Table 1 shows the Gross irrigated area and Net irrigated area in the Punjab state. The data indicates that gross irrigated as well as net irrigated area has been increasing due to usage of new irrigation sources i.e. tubewells has been installed at a larger pace. During the year 1990-91, 7055 thousand hectare was gross irrigated area out of which 3909 thousand hectare was net irrigated area. But with the

passage of time, the area under gross irrigated has increased to 7771 thousand hectare and likewise, net irrigated area to 4070 thousand hectare.

	1990-91	2000-01	2010-11	2011-12
Gross irrigated area	7055	7664	7724	7771
Net irrigated area	3909	4038	4070	4086

Table 1: Gross Irrigated Area and Net Irrigated Area in Punjab '000 hectares

Source: Economic Survey, 2013-14

Table 2 describes the net irrigated area through different irrigation sources. It shows that in 1990-91, a large number of net area was irrigated by tube wells i.e. 2233 thousand hectares followed by canals i.e. 1669 thousand hectare and it was just 7 thousand hectare by other sources. Further in 2000-01 the usage of canals has decreased and tube wells were increased. Data indicates that net irrigated area under canal has decreased to 962 thousand hectare and by tube wells it has increased to 3074 thousand hectare. During the year, 2011-12, the area under canals has increased to 1116 thousand hectare and by tube wells 2969 thousand hectare.

Sources	1990-91	2000-01	2010-11	2011-12
Canal	1669	962	1116	1116
Tube wells	2233	3074	2954	2969
Others	7	2	-	-

Table 2: Net Area Irrigated by Source in Punjab '000 hectares

Source: Economic Survey, 2013-14

The above table shows that agricultural growth mainly depends upon the artificial sources as rainfall of our country is dependent on the monsoons but monsoon rainfalls are uncertain, irregular and uneven or unequal. So, agriculture of our country is said to be, "the gambling of the monsoon". So irrigation is essential for agriculture. The state has highest net irrigated area in the India and agriculture sector accounts for about 85 percent of water consumption in the state. Out of total irrigated area, 27 percent area is irrigated through canals and 73 percent by tubewells. However, there has been a significant reduction in the state in canal irrigated area since 1990 and area irrigated by centrifugal tubewells has increased and now shifting towards submersible motors. This is due to increased demand of water, reduction in canal capacity due to siltation and the easy credit facilities for tubewell installation with some subsidy, besides liberal facilities for electrification of tubewells. Hence, the ground water is being over exploited to meet the increasing demands of water for irrigation intensive agricultural practices. The present ground water development in the state is 170 percent and about 80 percent area is over exploited in groundwater (ENVIS Centre: Punjab, 2015).

Green Revolution persistent till the eighties, after which the agricultural production in the state showed the signs of stagnation. In the nineties, the profitability of agriculture was decreasing due to the increasing cost of cultivation of major crops which further aggravated the situation by adversely affecting the socioeconomic condition of farmers in the state. Thus, the agriculture in state has reached a stage where it was very hard to make further progress under available technologies and natural resource base. So, irrigation facilities further improve the situation. But the emerging scene of Punjab agriculture is not free from some serious concerns. The state cropping pattern dominated by wheat-rice rotation is causing a serious damage to the state's natural resource base. Paddy in particular, a water-intensive crop is blamed for water-table depletion in tube-well irrigated areas and water-logging in canal irrigated areas (Singh, Grover, & Dhaliwal, 2012).

Integrated Watershed Management Project is being implemented between the Centre and state on sharing basis. During the year 2013-14 Government of India sanctioned 14 new projects in Punjab to treat 66722 hectares of land with a total cost of Rs. 8006.76 lakh.

India currently has an overall irrigation potential of 140 million hectares, out of which only about 109 million ha have been created, and around 80 million ha utilized. Gross Irrigated area as a percent of Gross Cropped area has increased from 34 percent in 1990-91 to 45.3 percent in 2008-09. However, there are wide variations in irrigation coverage across states and across crops. Figure 1 indicates that Punjab has the highest area under irrigation i.e. 98 percent followed by Haryana 85 percent, Uttar Pradesh 76 percent, Bihar 61 percent, Tamil Nadu 58 percent and West Bengal 56 percent. It describes that these states have more than half of the cropped area under irrigation while Odissa, Rajasthan, Madhya Pradesh, Karnataka, Chhattisgarh, Himachal Pradesh, Maharashtra, Kerala, Jharkhand and Assam have very low acreage under irrigation. Data reveals that Andhra Pradesh has 49 percent, 48 percent and Gujarat have 46 percent area under irrigation. Among crops, the major coarse cereals, pulses and most of the oilseeds are grown under rain-fed conditions.

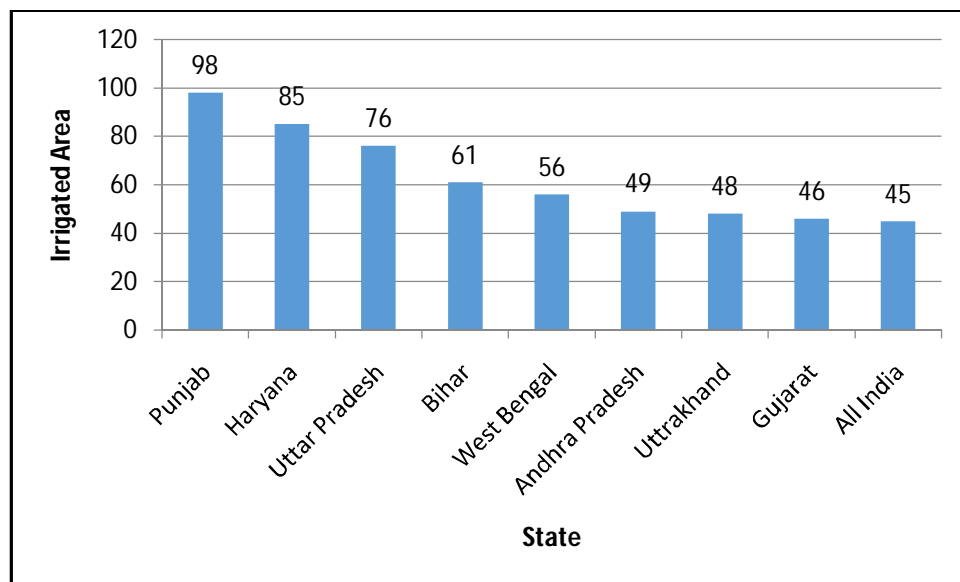


Figure 1: Statewise Irrigated Area in India

Source: CSRidentity.com

Paddy crop is strongly influenced by water supply. Water should be kept standing in the field throughout the growth period. Water management in paddy crop can be done in different ways. As through puddling and leveling minimizes the water requirement. At the time of transplanting, a shallow depth of 2cm of water is adequate since high depth of water will lead to deep planting resulting in reduction of tillering (TNAU Agritech Portal, 2015).

Water is an important natural resource and its increasing scarcity has resulted into the emergence of various issues for its efficient use, management and sustainability. The dominance of paddy-wheat crop rotation has converted the Punjab state from a water-surplus to a water-scarce state (Kaur, Sidhu, & Vatta, 2010). As water being a natural source it becomes essential to preserve it which is required for the irrigation and other purposes.

## 2. Preserving Water Quality

The water quality is affected from untreated industrial effluents and municipal wastes from habitations, pollution from open defecation, and run-off from farms containing fertilizers and pesticides. In order to protect water quality, little chemical fertilizers and pesticides should be used and apply them in ways that minimize residues in runoff water that is a waste for the farmer.

Where groundwater is the source of supply and is under stress, the cost of supply should include the cost of recharge wherever such recharge is required and the recharge component should be credited to a dedicated Recharge Fund so that its utilization is suitably monitored.

Irrigation water losses include air losses, canopy losses, soil and water surface evaporation, runoff, and deep percolation. The magnitude of each loss is dependent on the design and operation of each type of irrigation system.

Operate the irrigation system so that the timing and amount of irrigation water applied match crop water needs. An effective check on early transplantation of rice is expected to help in controlling the fall in water table; decline in irrigation water to be applied, which will result in the saving of electricity; and control of humidity at early stages, which will reduce the harmful pests and bacteria that are vulnerable to high and dry temperatures.

Whereas, sprinkler method of irrigation is feasible for most field crops (paddy being the notable exception), drip method is not all that versatile, though this is the one in which greatest economy in water use is attained. It is best suited for fruit tree-which, unlike wheat and many other crops, are grown with wider space between plants (Dhawan, 1993).

Irrigation systems consist of two basic elements: (1) the transport of water from its source to the field, and (2) the distribution of transported water to the crops in the field. A number of soil properties and qualities are important to the design, operation, and management of irrigation systems, including water holding capacity, soil intake characteristics, permeability, soil condition, organic matter, slope, water table depth, soil erodibility, chemical properties, salinity, sodicity, and pH. Some soils cannot be irrigated due to various physical problems, such as low infiltration rates and poor internal drainage which may cause salt build up (Irrigation Water Management, 2003)

## 3. Major Initiatives for Management of Water Resources in Punjab

In order to preserve irrigation sources, Punjab Government has started Accelerated Irrigation Benefit Programme, Command Area Development and Water Management Programme, Participatory Irrigation Management Programme. NABARD has assistance for the lining of Abohar and Bhakra main line canals. Projects have been started to rehabilitate ponds in all villages of the state. Project for modernization, remodeling, renovation and extension of canals, deep tube wells, lining of water courses, cleaning of head works, repairing of gates etc.

In order to control Pollution, National River Conservation programme, Surface Water monitoring under the MINAR scheme, Waste water pollution control programme, PPCB advices, guides and encourage, persuade & help the industry in putting up effluent treatment plants (ETPs) and Water quality programme has been introduced to control and reduce pollution.

There are different programme i.e. Flood Management Programme, Flash flood control programme and NABARD scheme for construction of subsurface drainage to control of floods and water logging (ENVIS Centre: Punjab, 2015).

#### 4. Conclusion

Agriculture remains an important sector for a large number of the population of the economy. So, different factors play a pivotal role in agriculture production; irrigation is one of them. The paper shows that Punjab occupies a first position in irrigation intensity, i.e. 98 percent of the cropped area is irrigated followed by Haryana, Uttar Pradesh and Bihar. Even the gross and net irrigated area has increased in Punjab. Mainly in central Punjab irrigation is done through tubewells as the canal water availability is less than its demand due to the present cropping pattern so the problem of groundwater depletion has emerged, on the other side in the southern region problem of water logging has emerged as the Sirhind canal and Rajasthan feeder are flowing through this area. Although, different programs have been started in order to preserve water quality, but it is recommended that Government should introduce more programmes and methods which require less water i.e. drip irrigation which will reduce the problem of ground water depletion.

#### 5. References

- i. Agriculture & Irrigation. Available at <http://csridentity.com/agriculture/irrigation.asp>
- ii. Dhawan, B D. (1993). Ground Water Depletion in Punjab. *Economic and Political Weekly*. 28(44), 2397-2401.
- iii. Kaur, B., Sidhu, R. & Vatta, K. (2010). Optimal Crop Plans for Sustainable Water Use in Punjab. *Agricultural Economics Research Review*. 23, 273-284.
- iv. Oza, A. (2007). Irrigation and Water Resources. Available at <http://www.iitk.ac.in>.
- v. Government of Punjab. (2013-14). Economic Survey, Chandigarh. [www.pbplanning.gov.in](http://www.pbplanning.gov.in).
- vi. Government of India. (2015). Irrigation and Water. ENVIS Centre: Punjab. Status of Environment and Related Issues. Ministry of Environment, Forests and Climate Change. Available at <http://www.punenvvis.nic.in>.
- vii. Irrigation Water Management. (2003). National Management Measures to Control Nonpoint Pollution from Agriculture. Available at <http://www.water.epa.gov>.
- viii. TNAU Agritech Portal. (2015). Irrigation Management: Transplanted Puddled Lowland Rice. Available at <http://www.agritech.tnau.ac.in>
- ix. Singh, J., Grover, D.K. & Dhaliwal, T.K. (2012). State Agricultural Profile – Punjab. Agro-Economic Research Centre. Department of Economics and Sociology. Punjab Agricultural University.