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## COST EFFECTIVE USE OF WATER RESOURCES FOR AGRICULTURE

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### ABSTRACT

*The current examination essentially targets discovering financially savvy model for enhancing utilization of water for agriculture has been embraced. As the dry spell inclined regions are the most severally influenced zones, it has been chosen to discover geological attainability of such model in the Drought Prone tahsilli ke Shirur. The current examination expects to respond to these exploration questions and targets structuring the system. The issues of dry season inclined territories are seen in the investigation territory and subsequently it might be pertinent to dry spell inclined zones in the state and nation.*

### 1. INTRODUCTION

Water assets are basic for human presence just as for agricultural irrigation. It is generally recognized that flooded agriculture utilizes practically 70% of the worldwide freshwater. In many creating nations, developing interest for irrigation, just as expanded populace and constrained administration are putting expanding pressure on water assets. To keep up supportable water use in agriculture and guarantee food security, a significant improvement in agriculture water use proficiency is required.

#### 1.1 INDIA'S AGRICULTURE SECTOR

India positions second worldwide in ranch yield Agriculture and associated sectors like ranger service and fisheries accounted 13.7% of the GDP (Gross Domestic Production) in 2013, and utilized half of the workforce. The irrigation framework incorporates a system of channels from streams, ground water, all around based frameworks, tanks and other downpour water gathering items for agriculture exercises. Today ground framework is the biggest, covering 160 million ha of developed land in India with 39 million ha flooded by ground water, 22 million ha by inundated trenches and around two third of development in India is as yet relying upon rainstorm.

India is the world's biggest maker of new foods grown from the ground, milk, significant flavors, different crops, for example, jute, staples, for example, millets and castor oil seed. It is additionally the second biggest maker of wheat and rice. The normal size of the around 138 million homesteads was around 1.15 ha in 2010/11 and normal size of enormous scope farmers' ranches (170.000) is around 36 ha in 2015. Agricultural expansion has just a single augmentation laborer for every 800-1000 farmers and level of motorization arrives at under half. Markers of water pressure and shortage are commonly used to mirror the general water accessibility in a nation or a locale. According to the global standards, a nation is delegated water focused and water scant if per capita water accessibility goes under 1700 m<sup>3</sup> and 1000 m<sup>3</sup>, individually. With 1544 m<sup>3</sup> for every capita water accessibility, India is now a water-focused on nation and is moving towards transforming into water scant.

#### 1.2 DROUGHTS AND THEIR IMPACT

Droughts impact sly affect economy, society and condition influencing crops, irrigation, domesticated animals, untamed life, soil, medical issues, open wellbeing at last prompting serious misfortune to human life. Drought in India has brought about a huge number of passing through the span of the eighteenth, nineteenth, and twentieth hundreds of years. The most recent discoveries recommend that while there have been interchange dry and wet spells in the course of recent decades, the recurrence of event of drought years has altogether expanded in India. The period somewhere in the range of 1950 and 1989 had 10 drought years, while there have been 5 droughts over the most recent a long time (since 2000). Indian

agriculture is vitally subject to the neighborhood atmosphere: great southwest summer rainstorm is basic in making sure about water for flooding crops. In certain pieces of India, the absence of rainstorm brings about water deficiencies, coming about in beneath normal crop yields. This especially happens in significant drought-inclined districts, for example, Southern and Eastern Maharashtra (Western India), Northern Karnataka (South-Western India), Andhra Pradesh (Southeastern shore of India), Odisha (Eastern shoreline of India), Telangana (Southeastern bank of India) and Rajasthan (Western India). Droughts mean less water accessibility for agriculture than expected. Expanded groundwater use during droughts can help defeat such basic periods. Be that as it may, the subsequent groundwater abuse and quality weakening mean there is likewise less groundwater accessible for agriculture than there was previously, in this manner causing much more weight on agricultural creation. The key purpose of thought is that all the previously mentioned impacts must be basically considered during arranging and reacting to drought conditions.

## **2. AVAILABILITY OF WATER FOR AGRICULTURAL MAKING**

### **2.1 AVAILABLE WATER**

India isn't a water rich nation and is additionally tested because of negative effect of environmental change; gigantic wastage owing halfway to helpless administration and misshaped water evaluating strategies. The Northern Ganga River Basin has plentiful water assets, though the Southern River Basin has not many, however with significant levels of contamination in ground water and surface water. Increment in populace and changing ways of life has expanded interest for water (to a great extent for irrigation) in both urban and rustic territories. India has 18% of total populace, having 4% of world's new water, out of which 80% is utilized in agriculture. India gets a normal of 4,000 billion cubic meters of precipitation consistently. In any case, just 48% of it is utilized in India's surface and groundwater bodies. A deficiency of capacity technique, absence of satisfactory foundation, wrong water the executives has made a circumstance where just 18-20% of the water is really utilized. India's yearly precipitation is around 1183 mm, out of which 75% is gotten in a limited capacity to focus four months during storm (July to September). This outcome in run offs during rainstorm and calls for irrigation speculations for rest of the year. The number of inhabitants in India is probably going to be 1.6 billion by 2050, bringing about expanded interest for water, food and vitality. This calls for foundation development and improved asset usage.

It merits referencing that environmental change will have negative effect on agricultural profitability running from crop determination; season of development, irrigation strategies and so on. Rice, wheat and sugarcane establish about 90% of India's crop creation and these are the most water expending crops. Rice, which is a significant fare crop, devours as much as 3,500 liters of water for a kilogram of grain delivered.

### **2.2 AVAILABILITY OF WATER IN DIFFERENT REGIONS OF INDIA**

The availability and interest for water assets in India show sizeable varieties starting with one district then onto the next. There is a wasteful and biased utilization of and conveyance of water. Almost 90% of the India populace lives in zones with some type of water pressure or food creation deficiency. Ground water has been moderately plentiful in many pieces of India. In any case, in certain areas, it is getting one of the most genuine asset issues. States of helpless water quality and water worry in India are appeared in Figures 1 and 2.

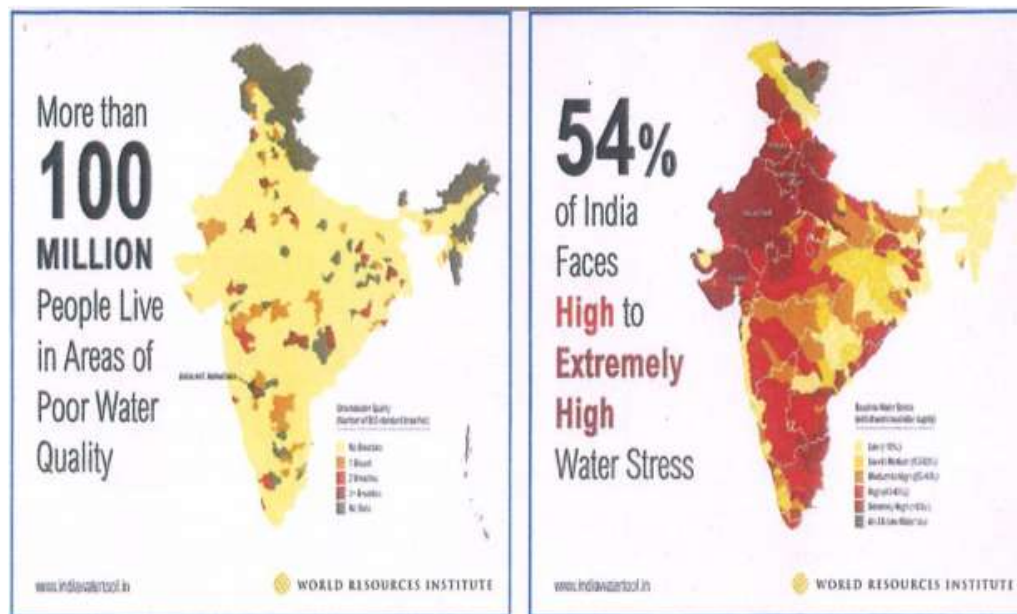


Figure 1 Conditions of poor water quality in India. Figure 2 Conditions of water stress in India

### 3. WATER AND AGRICULTURE

#### 3.1 SURFACE WATER AND GROUNDWATER USE FOR AGRICULTURE

Albeit generally speaking improvement of (groundwater draft as an extent of the complete accessibility) is 62%, there exists wide local fluctuation. Over-reliance on groundwater past supportable level use has come about into huge decrease in the groundwater table, particularly in northwest India. The Central Groundwater Board has arranged 16.2 % of the absolute evaluation units: Blocks, Mandals or Talukas numbering 6607 as 'Over-misused'. It has sorted an extra 14% as either at 'basic' or 'semi-basic' stage. The vast majority of the overexploited squares are in northwest district of the nation. The unreasonable groundwater use requires request the executives and flexibly expansion measures for improved water use productivity in agriculture sector. Then again, Eastern locale, where groundwater use is on a constrained scale, offers more noteworthy degree for tackling the advantages of groundwater utilization to improve crop yields. Linkage of Canals (utilization of surface water): building stockpiling stores on streams and interfacing them to different pieces of the nation can force decrease in territorial awkward nature and give parcel of advantages by method of extra irrigation, residential and modern water flexibly, hydropower age, navigational offices and so forth.

#### 3.2 GROUNDWATER EXPLOITATION FOR IRRIGATION

Comprehensively, about 40% of irrigation water is provided from groundwater and in India it is required to be over half. The normal pool nature of groundwater and the trouble of watching it straightforwardly make this asset hard to screen and control, particularly in creating nations. Groundwater assets are being drained in view of unreasonable extraction levels that surpass common revive rates. In India, groundwater irrigation covers the greater part of the all out flooded region (around 42 million ha). Indian specialists team up at local, state and neighborhood level. The Central Water Commission has the goal of advancing incorporated and feasible turn of events and the board of India's water assets by utilizing condition of craftsmanship innovation and competency planning all partners. They are chipping away at reservoir checking framework, ongoing water quality observing, and flood conjecture, stream bowl the executives, watershed advancement, revival of significant issues and so forth. The Central Ground Water Board has been arrangement to create and disperse innovations for checking and actualizing approaches for logical maintainable turn of events and the executives of ground water assets including misuse, appraisal, preservation,

expansion, security from contamination and methodology dependent on monetary and environmental proficiency and equity. Focal Water Commission and Central Ground Water Board have planned "General Guidelines for Water Audit and Water Conservation". These rules have been circled to all the state governments and concerned focal services and different utilities for confining their own particular rules.

#### **4. CHALLENGES FOR WATER IN AGRICULTURAL SECTOR**

The capacity to improve water the executives in agriculture is normally obliged by insufficient strategies, major institutional under-execution, and financing restrictions. Basic open and private establishments (incorporating agricultural and water services, bowl specialists, irrigation offices, water clients' and farmer associations) for the most part come up short on the empowering condition and fundamental abilities to viably do their capacities. For instance, bowl specialists regularly hold constrained capacity to implement water allotments and to gather partners. Establishments accused of creating irrigation regularly constrain themselves to capital-escalated bigger scope plans and will in general depend on open sector-based methodologies as opposed to creating open doors for little scope private financing and irrigation the board. Farmers and their associations are additionally frequently reacting to exceptionally contorted motivation structures as far as water evaluating and agricultural help approaches, which further ruin positive advancements in the sector.

Besides, most governments and water clients neglect to put sufficiently in the support of irrigation and drainage (I&D) frameworks. While deficient administration and activity may have an impact in the terrible showing of I&D frameworks, it is particularly the inability to adequately keep up frameworks that outcomes in their declining execution and the ensuing requirement for recovery. This inability to give sufficient assets to upkeep of I&D frameworks has come about in the "construct disregard restore disregard" cycle usually saw in the sector.

#### **5. IRRIGATION IN INDIA**

##### **5.1 STRENGTH OF IRRIGATION**

Since India is a nation with a significant agricultural sector, and over 55% of populace is subject to agriculture, many state governments are offering motivators to guarantee accessibility of water for irrigation purposes, for example, State administration of Punjab (Northern India) are sans offering power for ground water siphoning. In addition, conditions of Gujarat and Maharashtra (Western India) offer high endowment for sun based siphons. Varieties in irrigation force are expected to among others changed topographical conditions in various pieces of the nation. Rough mountains, sandy deserts and rough territories profound springs from which extricating water turns into a costly recommendation will in general have extremely helpless irrigation offices. Rich alluvial fields with enduring streams and consumable groundwater just as territories of under 125 cm of yearly precipitation are by a long shot, the zones of high level of irrigation. The most elevated power of irrigation exists in the Kashmir Valley, huge pieces of the conditions of Punjab (Northern India) and Haryana, the Ganga-Yamuna Doab of the territory of Uttar Pradesh (Northern India), Western piece of the South Bihar (Eastern India) Plain, Birbhum, West Bengal (Eastern India), Lakhimpur, Assam (Northeastern, the Godavari Krishna Deltas and Chengalpattu region), Tamil Nadu (Southern India). The power of irrigation in these regions is above 60% and in certain pieces of Punjab (Northern India) it surpasses 75%. Dry territories of Ladakh locale in Jammu and



Kashmir and Lahul and Spiti region in Himachal Pradesh (Northern India) can't raise crops without irrigation.

## **5.2 IRRIGATION METHODS**

There are different irrigation strategies like surface irrigation techniques (From customary Border, Check-bowl and wrinkle irrigation to Cab legation and Surge irrigation), and pressurized irrigation strategies (from sprinkler, miniaturized scale sprinkler, trickle, to Low Energy Precision Application (LEPA) and Low Energy Water Application (LEWA) techniques). All the techniques have their capacities and constraints and can be suggested in the wake of considering physical, monetary and social contemplations. In the event of Border irrigation, contingent upon soil type, incline and inflow rate outskirts measurements have been normalized under Indian conditions. Correspondingly, suggested estimations of the zone of the check bowl for various kinds of soils and inflow streams have likewise been processed after experimentation. Wrinkle irrigation is reasonable for zones with water shortage. The size and state of the wrinkles relies upon the crop developed, soil type, gear to be utilized and dispersing between crop lines. The size and state of the wrinkles can be changed broadly to suit the crop planting, irrigation framework, and the board of saline soils and utilization of saline water. The crop planting on the edge gives better outcomes for vegetable crops. The planting on the head of the edge is favored in high precipitation districts and planting at the base of the wrinkle is favored in low precipitation areas.

## **5.3 SURGE IRRIGATION**

Surge irrigation is the ongoing improvement in surface irrigation techniques. Under flood irrigation, water is applied in the fringe discontinuously and not on constant premise. It expands the development rate. It has been presented and assessed for field use. Broad investigations covering a wide scope of long wrinkle details, inflow releases, cycle proportion and number of floods with various test crops, similar to maize, sunflower, sorghum, and groundnut have set up the matchless quality of flood irrigation over constant stream. It was accounted for that flood irrigation was seen as detectable with 40 percent water sparing, 25 percent yield increment, 20 percent land sparing, 40 percent work putting something aside (for irrigation), ease for the work in night hours and sparing of 1250 for each ha on culturing. The cost increment is just minimal. The water use proficiency was most noteworthy (8.23 and 13.13 kg/ha-cm) under flood irrigation than check bowl, short strip and long wrinkle with nonstop stream.

## **5.4 GROUNDWATER-BASED IRRIGATION**

At present, irrigation devours around 84 % of all out accessible water. Modern and residential sectors expend around 12 and 4 % of complete accessible water, individually. With irrigation anticipated to remain the predominant client of water, "per drop more crop" is a goal. The proficiency of water utilize must improve to extend territory under irrigation while additionally preserving water. Irrigation framework in India has seen considerable development throughout the years. The complete irrigation potential created (IPC) from major, medium and minor irrigation plans has expanded from 22.6 million ha during pre-plan period to 113 million ha toward the finish of the eleventh Plan. Since this irrigation potential speaks to 81% of India's definitive irrigation potential assessed at 140 million ha, the degree for additional extension of irrigation foundation for an enormous scope is constrained. Throughout the years, there has been noteworthy move in the wellsprings of irrigation. Close by, the portion of groundwater sources has expanded from 28.7 % to an incredible 62.4 % during a similar period. This extension mirrors the unwavering quality and higher irrigation effectiveness of 70–80% in groundwater irrigation contrasted and 25-45% in channel irrigation. While ending up being an important wellspring of irrigation extension, rash usage of groundwater through the blast of cylinder wells has raised a few maintainability issues.

The region, creation and yield in food grain in 2013-14 and the extent of region under food grains irrigated in 2011-12

## **6. WATER USE EFFICIENCY**

Various methodologies have been advanced for utilizing water productively, some are recorded beneath:

1. The strategy for irrigation followed in the nation is flood irrigation, which brings about a great deal of water misfortune. More noteworthy efficiency in irrigation were accomplished through:
  - Proper planning of irrigation framework for decreasing water transport misfortune.
  - Adoptions of water sparing innovations, for example, sprinkler and trickle irrigation frameworks have demonstrated very compelling in water preservation as well as prompting more significant returns.
  - New agronomic practices like raised bed planting, edge wrinkle strategy for planting, subsurface irrigation, and exactness cultivating which offer a tremendous extension for streamlining water use.

In this specific circumstance, the Indian government has attempted to instill new strategies and plans to improve agricultural profitability, while at the same time expanding water use efficiency. The Indian government acquaints plans as excellent exertion with increment irrigated territory. One model is the starting of (approx.) ~ USD 7, 5 billion "Pradhan Mantri KarishiSinchayi Yojana (PMKSY)". This plan gives a sound system to the development and successful water use in irrigation. The effect of this plan can be enormously upgraded, be that as it may, by reestablishing the first adaptability of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) 15 in resource creation. In spite of these endeavors, still a specific arrangement is required in constantly water focused on zones where estimates actualized as of not long ago were insufficient.

2. Water efficiency can be improved by receiving the idea of different water use, which is past the customary sectoral obstructions of the beneficial sectors. There is extension for expanding salary through crop enhancement and incorporation of fish, poultry and different ventures in the cultivating framework. The different water use approach can produce more pay advantages, and decline weakness by permitting more broadened job methodologies and expanding the manageability of environments.
3. Emphasis ought to be given on water assets preservation through watershed improvement in appropriate zones and advancement of small scale water structures for rainwater collecting. The advancement of water preservation endeavors has direct ramifications for water assets accessibility, groundwater revive, and financial states of the populace.
4. The powerful water the executives is fundamentally connected with the exhibition of nearby level water foundations. Hence, institutional rebuilding for participatory irrigation the executives and water clients affiliations (WUAs) should be reinforced.
5. National Water Policy is stressing the idea of Participatory Irrigation Management and WUA through dynamic inclusion of individuals in execution of irrigation venture. As indicated by the most recent information accessible, 56,539 WUA oversee 13.16 million ha of irrigated land. It will be helpful to assess the viability of this participatory methodology.

## **6.1 TECHNOLOGIES AND PROGRAMS RELATED TO WATER USE EFFICIENCY**

Different government endowment programs are endeavoring to help selection of more productive innovations, with changing level of progress. Some portion of the rationale behind this endowment program is the expectation that the appropriation of water sparing advances can lessen groundwater extraction and settle water tables. Be that as it may, groundwater is only occasionally managed or even estimated in India, and power utilized for siphoning is intensely financed and regularly evaluated at a level duty. As of late, the province of Madhya Pradesh (Central India) has presented a program on raised bed planting of soybean. Planting of soybean on edges has helped preserve water and raise efficiency. Small scale irrigation through sprinklers and dribbles has acquired sensational change a few pockets of the nation particularly in undulating geology and sand raises regions where no different strategies for irrigation can work.

## **6.2 WATER RIGHTS AND WATER PRICING**

### **➤ Water rights**

In India water rights are associated with land possession. That basically implies that the land proprietors have rights to separate water through wells on their territories. Likewise, they are urged to gather downpour water on their property.

### **➤ Water pricing**

Pricing water and water related administrations enough can urge individuals to squander less, contaminate less, put more in water-related framework, and worth water shed administrations. In many states, there is no installment of water expenses or some other charge. Indeed, even in numerous states power is sans given to siphon water if water is to be utilized for irrigation purposes. The twisted water estimating is coming about in over abuse of the regular assets which may have long haul suggestion, for example, salination accordingly delivering great agricultural land ill suited for developing crops, and nearness of substantial metals. The state governments abstain from pulling back these arrangements as farmers may consider high water estimating as denying of their qualification, which could thusly prompt clash and may likewise bring about increment in food costs.

## **7. CONCLUSION**

By and by, India is confronting an abatement in accessible water assets that has suggestions on India's agriculture sector. A few areas in the nation are encountering water pressure. On the off chance that water use efficiency doesn't improve, the nation could endure submerged shortage in the following 1 to 2 decades. It is incredibly significant that the agriculture sector adds to forestall the intensification of the circumstance by utilizing the accessible advances and assets to build water use efficiency. Improvement of arrangements, systems and administrative measures to forestall the water abuse ought to be thought about. Mindfulness and direction of water clients in the agriculture sector to change to more water proficient creation strategies can help the nation against water shortage. In addition, implementation of best practices can help present approach producers and organizers to improve administration structures to additionally comprehend key markers that can aid information driven dynamic. These difficulties can be better ensnared, if there are good approaches and systems that urge the agriculture sector to build water use efficiency.

## **REFERENCES**

1. Upadhyaya A. 2012. Exploring options for conjunctive use of surface and ground water in canal command of Bihar. Technical Bulletin No. R-36/PAT-24, ICAR Research Complex for Eastern Region, Patna, 22.

2. Upadhyaya A and Khan MA. 2009. Strategies for sustainable land and water resources management. Proceedings of the International Workshop Water quality research to evaluate the effects of agricultural conservation practices utilized in the United States and India. September 7-8, 2009, Macmillan Publishers India Ltd., New Delhi. 37-42.
3. Zimmerman A. 2010. Abiotic and microbial oxidation of laboratory-produced black carbon (biochar). Environ. Sci. Technol. 44 (4):1295-1301.
4. Zwieten van L, Kimber S, Morris S, Chan KY, Downie A, Rust J, Joseph S and Cowie A. 2010. Effects of biochar from slow pyrolysis of paper mill waste on agronomic performance and soil fertility. Plant and Soil 327:235-46.
5. Singh AK, Rahman A, Sharma SP and Upadhyaya A. 2009. Small holders' irrigation- Problems and options. Water Resources Management 23 (2): 289-302.
6. Pandey AK, Singh AK, Singh SK and Kumar A. 2012. Livelihood sustainability of small and marginal farmers of Bihar through multiple use of water for enhancing agricultural productivity. Envi. & Ecol. 30(4A): 1529-33.
7. Pandey AK, Singh AK, Singh SK and Kumar A. 2012b. Improving strawberry productivity and quality through drip irrigation and polythene mulch in Bihar. Envi. & Ecol. 30 (3A): 760-63.
8. Chaudhary SK and Batta RK. 2004. Future of automation in irrigation water management. Journal of Indian Water Resources Society 24 (2): 36-46.
9. Bhatnagar PR, Singh AK, Upadhyaya A and Sikka AK. 2004. Promoting multiple uses of water – experiences of aquaculture. Poster presentation in Policy Consultation Workshop of DFID NRSP Research Projects R 7830/7839 on Realising Potential: Livelihoods, Poverty and Governance, August 3-4, 2004, New Delhi.
10. Hanemann, M. 2014. Property rights and sustainable irrigation-A developed world perspective. Agricultural Water Management 145, 5-22.