# “Rewiring India’s Water Economy - Why Smarter Irrigation Must Replace Free Power”

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## From Scarcity to Sustainability - Water-Economy Expert Paves the Roadmap for India’s Water-Secure Future

**Intro:** India’s water story is at a crossroads. As climate change intensifies and cities grow, our ability to manage water wisely will decide the fate of farming, food security and rural livelihoods. With groundwater levels dropping and irrigation systems stretched thin, the call for bold, smart and sustainable solutions has never been louder. In this deeply insightful conversation, **Dr. Shivendra Kumar Srivastava,** a leading voice on irrigation policy and groundwater sustainability, lays out a practical and transformative vision. Speaking to **Mahima Sharma** of **Indiastat**, Dr. Srivastava brings clarity, urgency, and hope to one of India’s most pressing challenges. Another ***exclusive interaction*** on **Socio-Economic Voices** this week...

**MS: With India facing increasing water stress. How do you see our water resource availability evolving over the next two decade—especially in the face of climate change and urban growth? Can India realistically achieve water security without radical shifts in how we manage and price agricultural water?**

**Dr. Srivastava:** With annual precipitation of about 4000 billion cubic meters (BCM), India is placed among the countries with rich water resources endowment. But only a portion of this (assessed at 1126 BCM) can be abstracted from the natural occurrence for various uses. With the increasing population, per capita water availability in India has reduced from 5178 m3/year in 1951 to 1486 m3/year in 2021. This is lower than the water stressed norms of 1700 m3/year. By the year 2051, it is projected to reach closer to the level of absolute water scarcity norms of 1000 m3/year, until substantial progress in augmenting water storage capacity and conservation is achieved. Reducing water availability accompanies its uneven distribution across regions and time. These challenges are likely to be exacerbated with the increasing frequency of erratic rainfall due to climate change.

Amidst dwindling availability, meeting the rising demand of water from various competing sectors on account of increasing population, growing urbanisation, evolving lifestyle and food habits, and overall economic growth would be a daunting task. Agriculture is a predominant (~84%) consumer of water. Its demand from the domestic and industrial sectors is increasing at a faster rate, creating intense competition among the sectors.

**Under the changing scenario, achieving water security would require integration of both water supply augmentation and demand management measures, focussed at regional level.** Fortunately, we have a large untapped potential in augmenting supply and managing demand of water resources in the country.

**Coming to the second part of your question,** see India cannot realistically secure its water future without transforming how we manage and price agricultural water. Agriculture consumes about 80% of national water supplies—mainly through inefficient flood irrigation—and subsidised or free access promotes wasteful usage. Groundwater levels are plummeting in states like Haryana, where usage exceeds recharge by nearly 36% . Experts

urge volumetric pricing for large farms, tiered tariffs, targeted subsidies, and mandating micro-irrigation to encourage conservation . Without these radical policy shifts—integrating economic incentives and water-smart farming—India's path to lasting water security remains out of reach.

**MS: How can traditional water bodies and community-led conservation efforts be integrated into national water planning?**

**Dr. Srivastava:** A significant amount of storage capacity is required to tap the run-off water during the monsoon season and balance the seasonal flow variations. At present, there are 6281 (including 143 under construction) dams in the country with the live storage capacity of 304.58 BCM (including 46.76 BCM from under construction projects).

Although water storage infrastructure has improved over time, it is often inadequate to meet the growing demand of safe and reliable water needs.

- **Construction of new and revival of traditional water bodies**, therefore, can significantly augment the water storage infrastructure at gross root level.
- **Involvement of the community** in creating and managing such water infrastructure is an essential element of sustainable water management. In fact, national water policy emphasises institutionalisation and strengthening of the communities in managing the water infrastructure.
- This approach is presently being implemented in the **Repair, Renovation and Restoration (RRR)** component of PMKSY-HKKP (Pradhan Mantri Krishi Sinchayee Yojana - Har Khet Ko Pani) which aims at creating and managing water bodies with the active involvement of communities.

**MS: As we move towards doubling farmers' income, how must the trajectory of irrigation development evolve to ensure both productivity and sustainability?**

**Dr. Srivastava:** Irrigation, particularly through groundwater, played a catalytic role in bringing green revolution in the country during the 1960s by raising and stabilising crop productivity. But, food security is achieved at the cost of unsustainable exploitation of groundwater in several regions. **In about 25% of the administrative units (blocks/mandals/taluka), groundwater is being extracted at a faster rate than the replenishable limits, leading to its depletion.** The emergence of groundwater as a predominant source of irrigation is a major reason behind its unsustainable use.

To help farmers earn more, they often grow more crops or switch to crops that need a lot of water. But this puts extra pressure on the already limited water supply. **To handle this, we need big changes in how we use and manage water.** Instead of relying too much on groundwater, we should use different water sources together. We also need to save water by using smart tools like drip irrigation and good farming methods like proper land shaping and planned watering. In short, if we want irrigation to truly help farmers earn more, we must use water in a smarter, more sustainable way.

**MS: Do you believe canal irrigation is still viable in the long term, or has the shift to decentralised groundwater-based irrigation become irreversible?**

**Dr. Srivastava:** In the early years of planned development, India focused on building canals for irrigation. This helped double the canal-irrigated area from 8 million hectares in 1950-51 to 18 million hectares by 1991-92. However, between 1992 and 2016, there was no major increase in this area, even though the government kept spending money on canals. Meanwhile, groundwater use for farming grew much faster and eventually became more common than canal use.

Over time, farmers started relying more on groundwater than canals. In 1950-51, canals made up 40% of the total irrigated area, but by 2022-23, this dropped to just 23%. Groundwater's share grew from 29% to 63% in the same period.

The focus has mostly been on building new canals or upgrading old ones, but not enough on their day-to-day management. While it's important to invest in building canals, not spending enough on operations—like regular maintenance or managing water flow—has led to poor performance. Because of this, canals have become less reliable than groundwater for farming needs.

To bring canal irrigation back on track, **steps like proper funding for operations, updating water prices and involving farmers' groups (called water users associations) are needed.** These changes can help make canals more effective again.

A shift back to using canals instead of just groundwater can only happen if canals become more dependable. A positive step in this direction started in 2015-16 with the PMKSY (Pradhan Mantri Krishi Sinchayee Yojana). This program looks at the entire irrigation system—from creating water sources to improving how water is used in fields, and training farmers.

Due to PMKSY, the share of canals in expanding the irrigated area has increased—from 8% between 2005-06 and 2015-16 to 26% between 2015-16 and 2022-23. To keep this progress going, smart policies and strong institutions are needed.

**MS: Subsidised electricity has driven over-extraction of groundwater. What realistic policy reforms can balance farmers' needs with sustainability?**

**Dr. Srivastava:** In India, each state is responsible for managing water and electricity used for farming, including groundwater. That's why different states have different energy policies. To help farmers afford groundwater for irrigation, many states give electricity for free or at low prices.

**For example, states like Punjab, Tamil Nadu, Karnataka, Andhra Pradesh and Telangana give free electricity for using groundwater.** Other states charge farmers at low flat rates, low usage-based rates, or a mix of both. West Bengal is different—it charges farmers the full cost of the electricity.

Studies show that giving cheap or free electricity often leads to overuse of groundwater, which is harmful in the long run.

**As India focuses more on sustainable farming, it's important to balance between helping farmers and protecting groundwater.** One idea is to give subsidised (free or low-cost) electricity only up to a limit, and charge the full price if usage goes beyond that. This approach supports farmers financially but also encourages them to use water more wisely.

In March 2024, Uttar Pradesh started a new scheme. Farmers get 100% subsidy on fixed charges for pumps up to 10 horsepower (12.5 Hp in Bundelkhand), and on electricity usage up to 1045 units (1300 units for Bundelkhand) per month. If they use more than this, they must pay the full electricity price.

This kind of scheme may help save groundwater, but it will only work if the usage limits are realistic and reflect how much water is truly needed. These limits should be set locally, based on the type of crops and water needs in that area, and should be updated regularly as conditions change.

**MS: How do you view the "groundwater-energy trap" in India? What steps can break this unsustainable cycle without harming rural livelihoods?**

**Dr. Srivastava:** Groundwater and energy are strongly inter-linked. The power subsidy to improve farmers' affordability to groundwater often leads to depletion of groundwater as they fail to realise scarcity value of water. **As water level depletes, the requirement of energy to extract groundwater from the deeper level increases and repeated cycle establishes a "groundwater-energy trap". This is adversely affecting water and energy security.** Apart from depleting groundwater, increase in energy intensity also contributes to climate change by emitting greenhouse gases.

**Foremost measure to break this cycle is to incentivise farmers to reduce wasteful utilisation of water and energy resources.** Limiting the use of energy to the productive purpose only through appropriate pricing and rationing of electricity supply can cut non-productive use of groundwater to a large extent.

**Alternatively, subsidies can be de-linked from the electricity units and transferred directly to the farmers' bank account.** This approach can ensure financial assistance to the farmers as well as improve efficiency in water use through putting a positive marginal cost.

**Further, groundwater-energy nexus can be cut down by reducing water demand by adopting water efficient technologies and irrigation methods.** A shift from flood irrigation to precision irrigation through adoption of micro-irrigation can greatly reduce water and energy use along with augmenting farmers' income.

It is often observed that groundwater and energy policies are developed and implemented in isolation leading to unsustainable outcomes. can go a long way to capitalise groundwater-productivity linkage without affecting its sustainability. **I believe we should pitch for a greater integration and convergence at different levels. Instilling behaviour change among the farmers through awareness campaigns and community led innovations.**

**MS: Micro-irrigation and solar pumps are often presented as silver bullets. What systemic barriers are holding back large-scale adoption?**

**Dr. Srivastava:** Micro-irrigation and solar pumps hold a great potential in improving

Micro-irrigation uses water more efficiently—saving 15–50%—and also improves how well fertilisers work. It can increase crop yield, help farmers grow more crops in a year, and shift to more valuable crops, boosting their income.

**Solar pumps** use clean energy and help farmers get water for their fields without polluting. Both technologies are supported by government schemes like **PMKSY-PDMC** and **PM-KUSUM** to improve water and energy security.

Right now, micro-irrigation is used on about **16 million hectares**, saving around **11 billion cubic meters (BCM)** of groundwater every year. Around **5 lakh solar pumps** (as of December 2022) are cutting about **1 million tonnes of CO2** pollution each year.

Use of micro-irrigation has grown faster in recent years—**10 lakh hectares per year (2015–2023)** compared to **7 lakh hectares per year (2010–2015)**. Solar pump use also jumped—from **11,626 in 2013** to over **5 lakh in 2022**.

**But many farmers still haven't adopted these tools.** The reasons include:

- High starting cost
- Complicated paperwork to get subsidies
- Poor repair and service
- Low awareness about their benefits
  Also, **free or cheap electricity** for water pumps makes farmers less interested in switching to water- and energy-saving options.

In some states like **Gujarat and Andhra Pradesh**, using special agencies (called **SPVs**) to promote micro-irrigation helped more farmers adopt it quickly.

**MS: Can solar irrigation lead to over-pumping if excess solar energy is not regulated? How should policy be designed to prevent that?**

**Dr. Srivastava:** While the arguments on possible negative impact of solar energy on groundwater sustainability are inconclusive, **there exists measures to mitigate such risks, if they arise. These include diversifying the use of solar energy for multiple purposes, reducing demand of water, and community based installation.**

Once a farmer uses solar power for irrigation, any extra energy can be used for other farm work like milling or charging batteries, or even to power homes. Under the PM-KUSUM scheme, farmers can connect their solar panels to the electricity grid and sell the extra power to earn more money. If solar pumps are used along with water-saving systems like drip irrigation, it helps reduce the amount of water needed and protects groundwater.

Although both PMKSY-PDMC and PM-KUSUM support using solar pumps and water-saving methods together, they are run separately by different government departments. If these schemes worked together better, it would help farmers more. Also, promoting solar pumps for groups of farmers instead of individuals can cover larger areas and make solar energy use fairer and more efficient. Lastly, using the right size of solar panels is important so that groundwater isn't overused.

**MS: Many states fear farmer backlash if power tariff reforms are introduced. How can policymakers navigate this political economy challenge while promoting efficient water use?**

**Dr. Srivastava:** Supply of electricity at subsidised tariff is needed for providing resource poor farmers an affordable access to irrigation. However, it comes with negative externalities on groundwater and puts a heavy financial burden on the state exchequer. It is high time to optimise the trade off between economic and environmental gains of the society.

- Decoupling subsidies from the electricity use and transferring it directly to the farmers can ensure financial support as well as improve efficiency in water use.
- Another way can be to limit the subsidy support to the required threshold and repurpose it for promoting water efficient technologies.
- Making awareness about water saving and conservation a mass movement can go a long way for instilling a behavioural change towards responsible use of scarce water resources.

**MS: How should India’s water resource policies evolve to respond to global climate commitments?**

**Dr. Srivastava:** India’s water resources policies shall be evolved on the path of integrated and holistic approaches of water management to address the challenges of climate change. For instance, the promotion of micro-irrigation PMKSY-PDMC aligns with the commitments under the National Action Plan on Climate Change (NAPCC). This technology helps agriculture to adapt with the drought like conditions by improving water use efficiency as well as mitigates the green gas emission by reducing energy use. But, farm-level efficiency may not always translate to savings in water at aggregate level due to expansion in acreage and changes in cropping pattern. The technological dissemination plan, therefore, shall be supported with the overall water budget (assessment of demand and supply) at regional level. Similarly, integration of a given technology with complementary technology can be promoted to harness the co-benefits. Water policies shall recognise the inter-dependencies among the sectors for water resources use. Greater emphasis must be given on managing water resources in rainfed areas which are more vulnerable to the vagaries of climate change as compared to irrigated areas.

**About Dr. SK Srivastava**

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**About the Interviewer**

*Mahima Sharma is an Independent Journalist based in Delhi NCR. She has been in the field of TV, Print & Online Journalism since 2005 and previously an additional three years in allied media. In her span of work she has been associated with CNN-News18, ANI - Asian News International (A collaboration with Reuters), Voice of India, Hindustan Times and various other top media brands of their times. In recent times, she has diversified her work as a Digital Media Marketing Consultant & Content Strategist as well. Starting March 2021, she is also a pan-India Entrepreneurship Education Mentor at Women Will - An Entrepreneurship Program by Google in Collaboration with SHEROES. Mahima can be reached at media@indiastat.com*