Groundwater Depletion and Cropping Intensity

Why in News

In a recent study, it has been found that **groundwater depletion** in India could reduce **winter cropped acreage** significantly in years ahead.

- The researchers studied India's three main **irrigation types** on winter cropped areas: dug wells, tube wells and canals.
- The researchers also analysed the groundwater data from the **Central Ground Water Board.**
- **Wheat, barley, peas, gram and mustard** are **grown in winter.**

Key Points

- **Present Scenario:**
  - India has **achieved impressive food-production gains since the 1960s,** due to an increased reliance on irrigation wells, which allowed Indian farmers to expand production into the mostly dry winter and summer seasons.
  - India is the world's **second-largest producer of wheat and rice** and is home to more than 600 million farmers.
  - India produces **10% of the world's crops** and is now the **world's largest consumer of groundwater,** and **aquifers are rapidly becoming depleted** across much of India.
    - In the **green revolution era**, policy-supported environment led to a large increase in rice cultivation in northwestern India mainly in Punjab and Haryana which are ecologically less suitable for rice cultivation due to predominantly light soils.
    - This policy-supported intensive agriculture **led to unsustainable groundwater use for irrigation** and in turn groundwater scarcity.

- **Findings of the Study:**
    - **Related to Groundwater:**
        - Groundwater is a critical resource for food security, accounting for **60% of irrigation supplies in India,** but unsustainable consumption of groundwater for irrigation and home use is leading to its depletion.
        - Groundwater depletion in India could result in a **reduction in food crops by up to 20% across the country** and up to 68% in regions projected to have low future groundwater availability in 2025.
            - It is found that 13% of the villages in which farmers plant a winter crop are located in critically water-depleted regions.
            - The results suggest that these losses will largely occur in northwest and central India.
    - **Related to Switching to Canal Irrigation:**
        - Indian **government has suggested that switching from groundwater-depletion wells to irrigation canals** is one way to overcome projected shortfalls.
            - The irrigation canals divert surface water from lakes and rivers.
            - However, switching to canal irrigation has **limited adaptation potential at the national scale.**
        - The study suggests that switch to canal irrigation **will not fully compensate for the expected loss of groundwater** in Indian agriculture.
        - Further, in comparison to tube well irrigation, **canal irrigation was associated with less winter cropped area** and cropped area that was more sensitive to rainfall variability.
    - **Related to Impact on Crop Production:**
        - **Reduction in Cropping Intensity:** Even if all regions that are currently using depleted groundwater for irrigation will switch to using canal irrigation, cropping intensity **may decline by 7% nationally** and by 24% in the most severely affected locations.
            It is found that irrigation canals would favour farms close to canals, leading to unequal access.
        - **Reductions in Wheat Production:** The reductions in crop area will occur largely in the states that grow wheat, potentially leading to substantial reductions in wheat production in the future.
        - **Food Security:** The low wheat production could have ramifications for food security given that India is the second largest producer of wheat globally and wheat provides approximately 20% of household calories in India.

Cropping Intensity

- It refers to **raising of a number of crops from the same field during one agricultural year;** it can be expressed through a formula.
- **Cropping Intensity = Gross Cropped Area/Net Sown Area x 100.**
    - **Gross Cropped Area:** This represents the total area sown once and/or more than once in a particular year, i.e. the area is counted as many times as there are sowings in a year. This total area is also known as total cropped area or total area sown.
    - **Net Sown Area:** This represents the total area sown with crops and orchards. Area sown more than once in the same year is counted only once.
- Around 51% of India's geographical area is already under cultivation as compared to 11% of the world average.
- The present cropping intensity of 136% has registered an increase of only 25% since independence. Further, rainfed drylands constitute 65% of the total net sown area.

Central Ground Water Board

- It is a subordinate office of the **Ministry of Jal Shakti** and is the National Apex Agency entrusted with the responsibilities of providing scientific inputs for management, exploration, monitoring, assessment, augmentation and regulation of groundwater resources of the country.
- It was **established in 1970** by renaming the Exploratory Tubewells Organization under the Ministry of Agriculture and later on merged with the **Groundwater Wing of the Geological Survey of India** during 1972.

Way Forward

- **Irrigation Infrastructure in Easter India:** There are enough groundwater resources supported with higher monsoon rainfall in eastern Indian states like Bihar. But due to lack of enough irrigation infrastructure, farmers are not able to make use of natural resources there.
    - There is a need for better policies in eastern India to expand irrigation and thus increase agricultural productivity.
    - This will also release some pressure from northwestern Indian states.
- **Water-saving Technologies:** Adoption of water-saving technologies like a sprinkler, drip irrigation.
- **Less water-Intensive Crops:** Switching to less water-intensive crops in some areas may help use the limited groundwater resources more effectively.

Source: TH