BAJIRAO IAS ACADEMY

SEMICON INDIA

UPSC CIVIL SERVICES MAINS 2025

GENERAL STUDIES PAPER-3 ANALYSIS

21st OCTOBER 2025

Examine the factors responsible for depleting groundwater in India. What are the steps taken by the government to mitigate such depletion of groundwater?

✍️ **Model Framework (Improved)**

Introduction:
Groundwater, a key source for agriculture and drinking in India, is rapidly depleting due to unsustainable usage.

Body:
Factors: Over-extraction for irrigation, free electricity, water-intensive crops, urbanisation, and poor regulation.
Government Steps: Atal Bhujal Yojana, rainwater harvesting, aquifer mapping, and promotion of micro-irrigation.

Conclusion:
Integrated policy and community action are vital for sustainable groundwater management.

Introduction

Groundwater in India is a critical resource, accounting for approximately 62 % of irrigation, around 85 % of rural drinking water supply and nearly 45 % of urban drinking requirements.

However, unsustainable extraction, inadequate recharge and weak governance have led to rapid depletion of aquifers. In this answer, we first examine the factors responsible for groundwater depletion in India and then outline the steps taken by the government to mitigate the challenge.

Body

1. Factors responsible for groundwater depletion

(A) Agricultural drivers

- **Over-extraction for irrigation**: Agriculture consumes the lion's share of groundwater; estimates suggest irrigation uses about 80 % of total water use, much of it from groundwater.

- **Water-intensive cropping & subsidies**: Crops such as paddy and sugarcane in semi-arid regions demand large amounts of water. Subsidised electricity and high MSP encourage farmers to over-pump.

- **Inefficient irrigation practices**: Flood irrigation remains widespread; micro-irrigation is under-utilised, leading to wastage and more extraction.

(B) Urbanisation, industry & land-use change

- **Rapid urban and industrial demand**: Expansion of cities and industries enhances both direct groundwater abstraction and pressure on aquifers.

- **Loss of recharge zones**: Concretisation, encroachment of wetlands, and destruction of water bodies reduce the natural recharge capacity.

(C) Climatic and natural system constraints

- **Erratic rainfall and climate change**: Changing monsoon patterns, decreased infiltration and higher evapotranspiration reduce groundwater replenishment.

- **Geological limitations**: Hard rock aquifers in peninsular India have lower recharge rates, making them more vulnerable to over-extraction.

(D) Governance, institutional & regulatory gaps

- **Subsidy / tariff distortions**: Flat or highly subsidised electricity tariffs encourage unmetered pumping of borewells.

- **Inadequate regulation of extraction**: Many states lack stringent regulations or monitoring of bore-wells, and groundwater remains largely unregulated as a common property.

2. Steps taken by the government to mitigate groundwater depletion

(A) Policy & institutional measures

- **Atal Bhujal Yojana (ABHY)**: Launched in 2019/20, this centrally-sponsored scheme targets groundwater management in priority states with community involvement, water-budgeting and participatory monitoring.

- **Model Groundwater (Sustainable Management) Bill, 2017**: Provides a framework for states to regulate extraction via permits, water budgeting and recharge obligations.

- **Monitoring & mapping programmes**: The Central Ground Water Board (CGWB) conducts aquifer mapping (e.g., National Aquifer Mapping Programme) to inform recharge interventions.

(B) Technical and demand management interventions

- **Promotion of micro-irrigation**: Under schemes like Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), subsidies for drip and sprinkler systems aim to reduce groundwater dependence.

- **Rainwater harvesting and recharge structures**: The government mandates rainwater harvesting in many urban areas and supports check-dams, recharge pits and watershed programmes.

(C) Supply-side and community-centric measures

- **Watershed development programmes**: Integrated Watershed Management Programme (IWMP) etc., help restore catchments, check surface runoff and promote infiltration.

- **Public awareness and community governance**: Encouraging village-level water security plans, gram panchayat led recharge efforts under ABHY and other missions.

Conclusion

Groundwater depletion in India is the outcome of multiple inter-linked factors — from excessive agricultural extraction and inefficient irrigation to urban pressures, climatic variability and weak governance.

While the government has launched a variety of policy, institutional, technical and community-level interventions, the challenge remains formidable.

Success will hinge on stronger enforcement of regulations, recharge-augmentation at scale, restructuring of subsidy regimes (especially in agriculture), and widespread behavioural change.

Examine the scope of the food processing industries in India. Elaborate the measures taken by the government in the food processing industries for generating employment opportunities.

✍️ Model Framework (Improved)

Introduction:
Food processing bridges agriculture and industry, adding value, reducing waste, and supporting rural incomes.

Body:
Scope: Vast agri-base, rising urban demand, export potential, and value addition.
Government Measures: PMKSY, PLI scheme, Mega Food Parks, ODOP, and skill development initiatives to boost employment.

Conclusion:
With policy support, food processing can enhance farm incomes and create large-scale rural jobs.

Introduction

India, being the world's second-largest producer of fruits and vegetables and a major producer of milk, cereals, and marine products, holds immense potential in the food processing sector. It acts as a bridge between agriculture and industry, contributing to value addition, reducing wastage, and generating employment.

Scope of Food Processing Industries in India

1. Vast Agricultural Base

- Over 58% of India's population depends on agriculture.
- Food processing adds value and shelf life to perishables, reducing post-harvest losses (~₹92,000 crore annually).

2. Rising Demand and Export Potential

- Changing food habits, urbanisation, and rising incomes are boosting demand for processed foods.
- India exported processed food worth over $5 billion in 2023.

3. Employment Generation

- The sector is labour-intensive and supports both skilled and unskilled employment.
- As per MOFPI, the sector provides direct employment to around 1.93 million people.

Government Measures for Employment Generation

1. Pradhan Mantri Kisan SAMPADA Yojana (PMKSY)

- Provides grants for cold chains, agro-processing clusters, and mega food parks.

2. Production Linked Incentive (PLI) Scheme

- Incentivises investments and job creation in food processing.

3. One District One Product (ODOP)

- Encourages local food processing entrepreneurship based on regional strengths.

4. Skill Development Initiatives

- Institutions like the **National Institute of Food Technology Entrepreneurship and Management (NIFTEM)** offer training and R&D support.

Conclusion

The food processing industry has a transformative potential in doubling farmers' income, reducing agri-waste, and generating mass employment. Strategic policy support and private sector participation can unlock its full potential.

How does nanotechnology offer significant advancements in the field of agriculture? How can this technology help to uplift the socio-economic status of farmers?

✍️ Model Framework (Improved)

Introduction:
Nanotechnology offers innovative solutions to enhance agricultural productivity and sustainability.

Body:
Advancements: Nano-fertilizers, nano-pesticides, precision farming tools, and smart delivery systems improve efficiency and reduce input costs.
Socio-economic Impact: Higher yields, reduced losses, better market access, and new employment avenues uplift farmers' livelihoods.

Conclusion:
Adoption of nanotechnology can transform agriculture and improve farmers' socio-economic status.

Introduction

Nanotechnology, the manipulation of matter at the atomic or molecular scale (1–100 nanometers), is revolutionizing various sectors, including agriculture. It offers innovative solutions to age-old problems like low productivity, high input costs, and inefficient resource use, potentially transforming Indian agriculture.

I. Advancements of Nanotechnology in Agriculture

1. Nano-fertilizers and Nano-pesticides

- Enhance nutrient use efficiency and reduce environmental pollution.
- Example: **ICAR** developed *nano urea* with **80% lesser quantity** than conventional urea.

2. Precision Farming

- Use of nanosensors for real-time monitoring of soil health, moisture, and pest activity.
- Enables targeted intervention, reducing input costs.

3. Post-Harvest Management

- Nano-coatings on produce to extend shelf life.
- Nano-packaging materials offer better barrier properties to prevent spoilage.

4. Water Management

- Nano-enabled hydrogels improve soil water retention in arid regions, boosting yields.

II. Socio-Economic Upliftment of Farmers

1. Increased Income through Higher Yields
- Efficient inputs reduce costs and improve productivity, enhancing profit margins.

2. Reduction in Post-Harvest Losses
- Value addition and longer shelf life lead to better market access and prices.

3. Employment Opportunities
- Growth of agri-based nano-industries fosters rural entrepreneurship and jobs.

4. Sustainable Farming
- Eco-friendly practices ensure long-term agricultural viability and resilience.

Conclusion

Nanotechnology holds transformative potential for Indian agriculture, enhancing productivity, sustainability, and income. With proper awareness, training, and regulatory support, it can significantly uplift the socio-economic conditions of farmers and ensure food security for the nation.

India aims to become a semiconductor manufacturing hub. What are the challenges faced by the semiconductor industry in India? Mention the salient features of the India Semiconductor Mission.

✍️ **Model Framework (Improved)**

Introduction:
India aspires to become a global semiconductor hub to boost technological self-reliance.

Body:
Challenges: High capital costs, lack of ecosystem, skilled workforce shortage, and tech dependency.
India Semiconductor Mission: ₹76,000 crore outlay, support for fabs, Design Linked Incentive (DLI), and R&D promotion.

Conclusion:
Timely execution and global collaboration are key to mission success.

Introduction

Semiconductors are the backbone of modern electronics—from smartphones to satellites. With growing global demand and supply chain disruptions (e.g., during COVID-19), India aims to establish itself as a global semiconductor manufacturing hub through the **India Semiconductor Mission (ISM)**, launched in 2021 under the Digital India initiative.

I. Challenges Faced by the Semiconductor Industry in India

1. High Capital Investment

- A semiconductor fab requires investments of **$5–10 billion**, making entry difficult.

2. Infrastructure Deficit

- Absence of a robust ecosystem (e.g., clean rooms, uninterrupted power, ultra-pure water).
- Example: No commercial-scale silicon wafer fabrication facility in India yet.

3. Skilled Workforce Shortage

- India lacks trained semiconductor engineers and technicians for advanced nodes (e.g., <10nm).

4. Global Supply Chain Dependence

- Critical materials like photoresists, advanced machinery (e.g., EUV lithography tools) are imported.

5. Technological Complexity

- Rapid obsolescence of technology requires continuous R&D, where India currently lags behind global leaders like Taiwan and South Korea.

II. Salient Features of India Semiconductor Mission (ISM)

1. Financial Incentives

- ₹76,000 crore outlay under **Semicon India Programme** to support design, fabrication, and packaging units.

2. Setting up Semiconductor Fabs and Display Fabs

- Support for two greenfield semiconductor fabs and two display fabs.

3. Design Linked Incentive (DLI) Scheme

- Up to 50% financial support for domestic semiconductor design startups.

4. Dedicated Institution – ISM

- Acts as the nodal agency for policy implementation, R&D coordination, and investor facilitation.

Conclusion

While challenges remain in infrastructure, technology, and talent, the India Semiconductor Mission reflects a strategic intent to reduce import dependence and build a resilient electronics ecosystem. Timely execution and global partnerships will be key to success.

Thank you

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