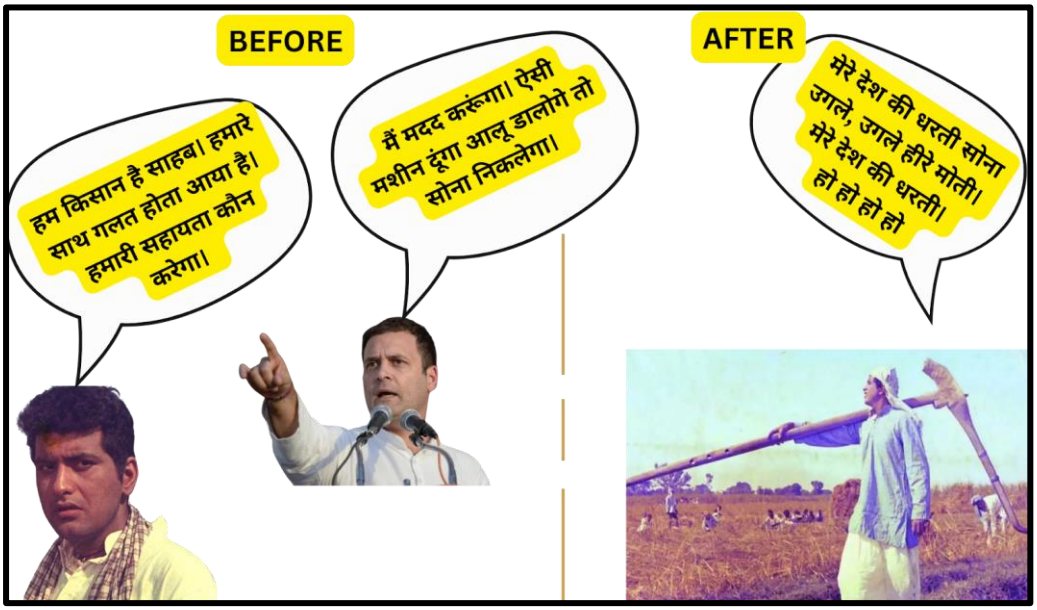
AGRICULTURE

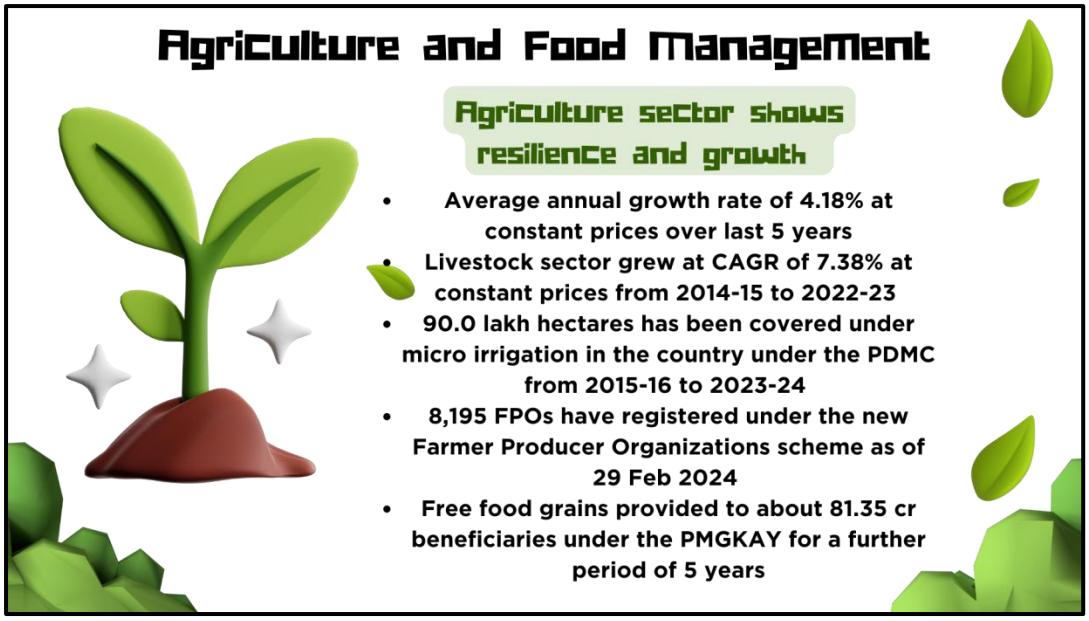
LET US LEARN ABOUT AGRICULTURE

- *Agriculture is the science and art of cultivating plants and livestock. It is a primary activity that involves the production of food, fiber, medicinal plants, and other products necessary to sustain and enhance human life.*



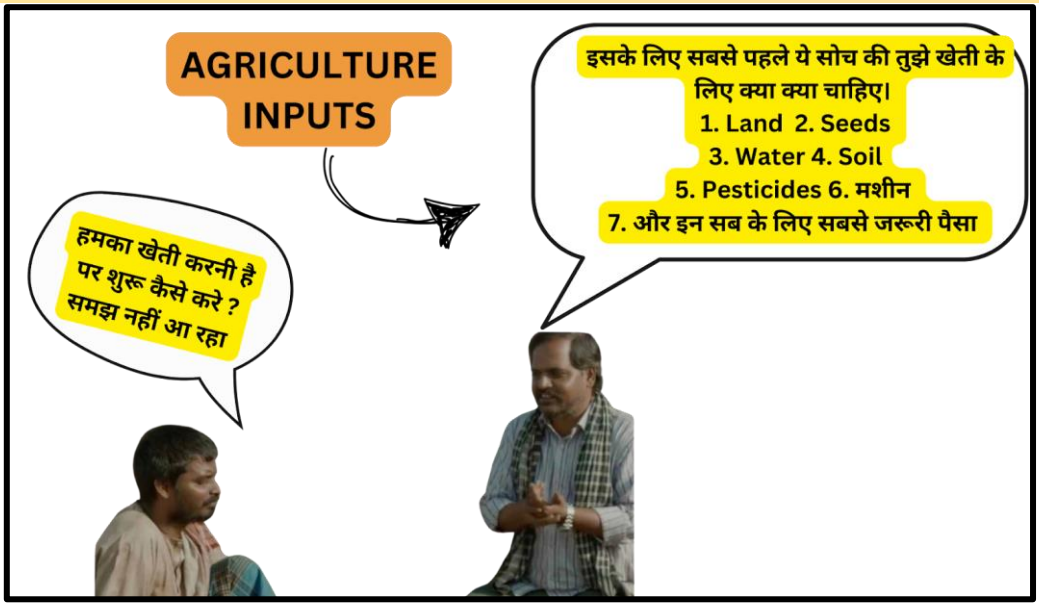
GROWTH STATISTICS AS PER ECONOMIC SURVEY 2023-24

- *Annual average growth rate of 4.2% over the last five years.*
- *Growth rate in 2023-24: 1.4%, a decline from 4.7% in 2022-23 due to poor monsoons and reduced foodgrain production.*
- *This was due to a decrease in food grain production driven by delayed and poor monsoons. The Survey noted that while India is a major agriculture producer, its crop yields are much lower compared to other major producers.*
- *Low yields are caused by:*
    - *Fragmented landholdings*
    - *Low farm investment*
    - *Lack of farm mechanization*
    - *Insufficient access to quality inputs.*
- *Agriculture provides livelihood support to 42.3% of the population.*
- *GDP Contribution: Agriculture has a share of 18.2% in India's GDP at current prices.*



- ***WHERE INDIA STANDS?***
  - *India is the world's largest producer of milk, pulses and jute, and ranks as the second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton.*
  - *It is also one of the leading producers of spices, fish, poultry, livestock and plantation crops.*
  - *Worth $ 2.1 trillion, India is the world's third largest economy after the US and China.*

ELEMENTS OF AGRICULTURE



LAND

- *It is the fundamental resource for agriculture that includes arable land, forests, pastures, and wastelands.*
- *Land serves as a fundamental resource with multiple applications, particularly in agriculture, which sustains a significant portion of India's population. The judicious and sustainable use of this resource is crucial for fostering growth across various sectors, especially rural livelihoods.*

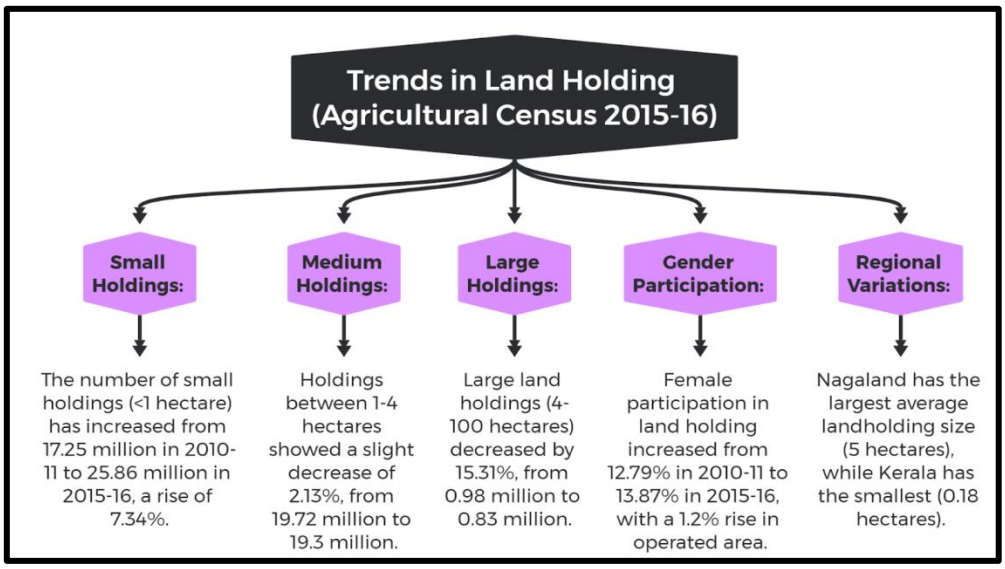
CLASSIFYING AND UNDERSTANDING LAND RESOURCES

- *India's land is classified by the Land Revenue Department, based on its usage. These classifications, which are crucial for managing land resources, may differ from the geographical records measured by the Survey of India. The main land-use categories include:*
    - ***Forests**: Areas designated for forestry, though they may not necessarily have actual forest cover.*
    - ***Wasteland and Barren Land**: This category includes land that is unsuitable for cultivation, such as deserts and rocky terrains.*
    - ***Non-Agricultural Land:** Encompasses areas used for urban and rural settlements, roads, industries, and other infrastructure.*
    - ***Pastures and Grazing Land:** Typically under community or government ownership, used for grazing livestock.*
    - ***Orchards and Tree Groves:** This category covers lands with tree crops, often owned privately.*
    - ***Culturable Wasteland:** These are fallow lands that, if properly managed, can be brought back into cultivation.*
    - ***Fallow Land:** Divided into current and non-current fallows, this land is left uncultivated for specific periods to regain fertility.*

CHANGES IN AGRICULTURAL LAND USE PATTERNS

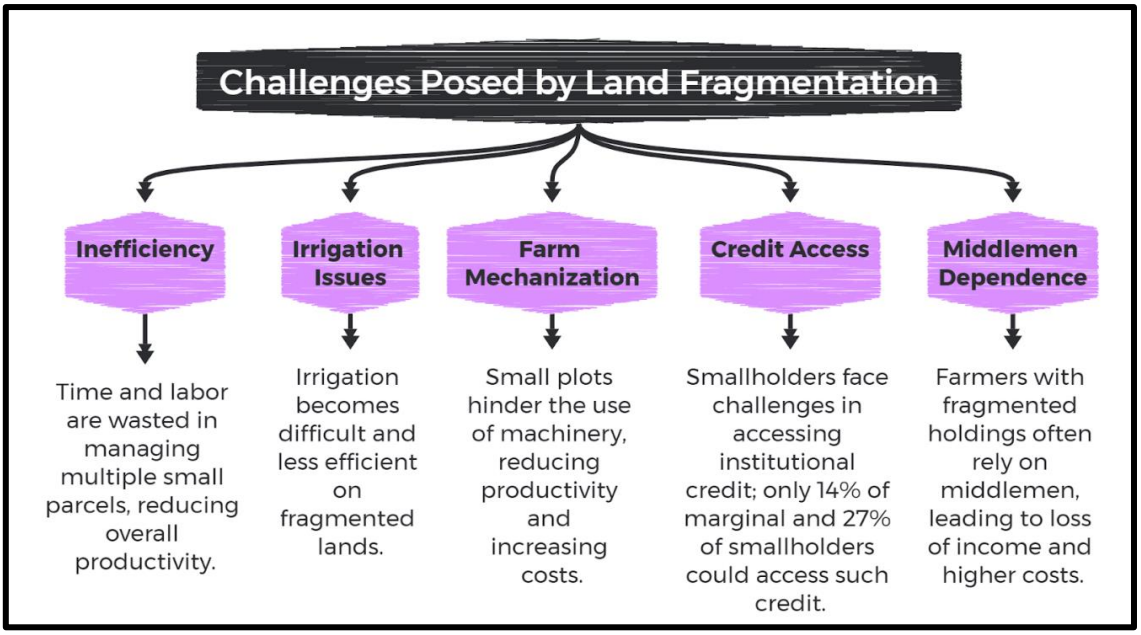
- *There has been a marginal decline in the total land available for farming.*
- *The uncultivated land has also decreased due to reclamation efforts, reflecting higher agricultural pressures.*
- *Increased area under wheat and rice, mainly due to the Green Revolution.*
- *Decline in land allocated to pulses, millets, and fodder crops.*

- *Growth in land use for oilseeds, sugarcane, vegetables, and orchards to meet rising demand.*
- *Urbanization and industrialization have diverted about 70% of prime agricultural land to non-agricultural purposes, with degraded lands and pastures increasingly brought under cultivation.*

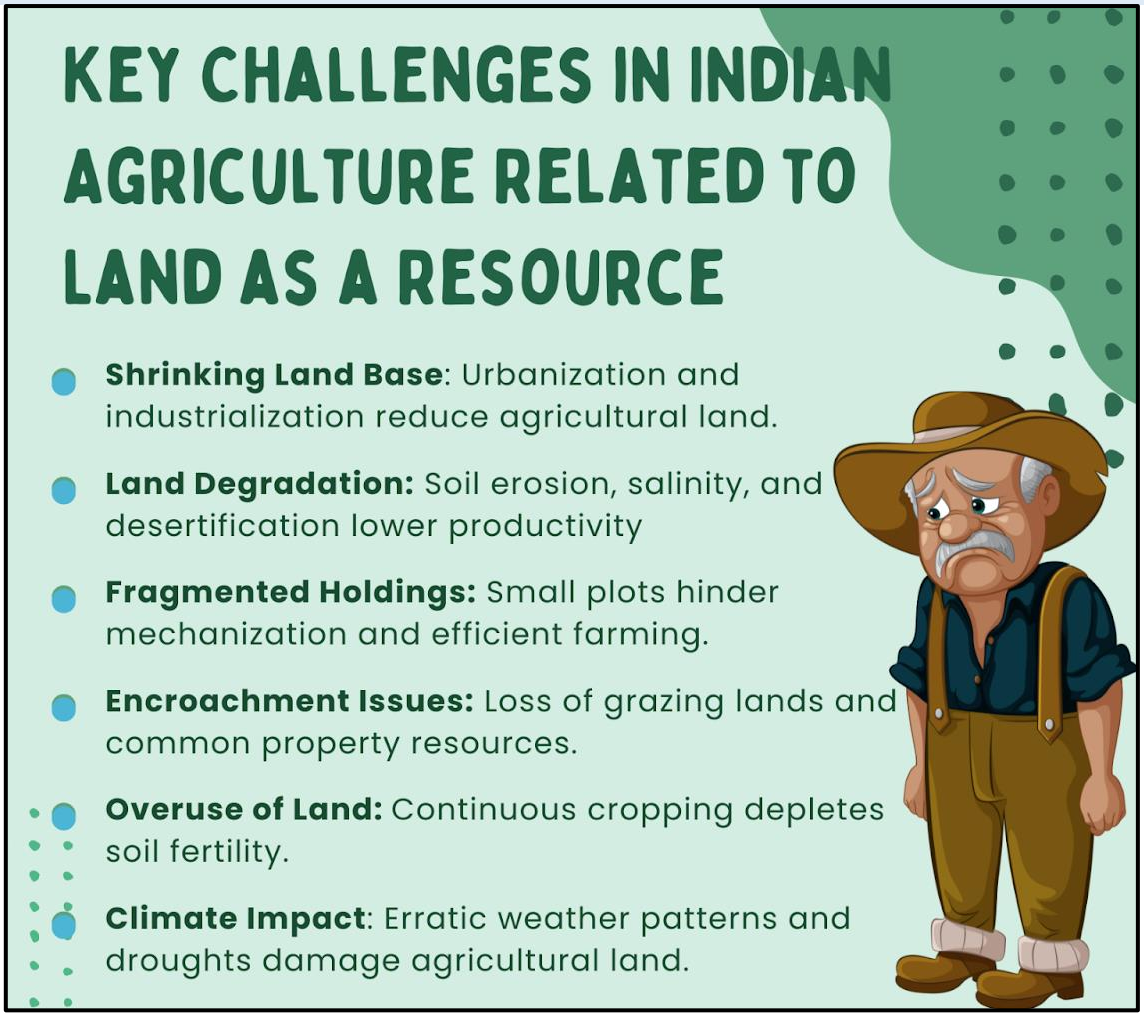


FACTORS DRIVING LAND USE CHANGES

- ***Population Growth:*** *Rapid urbanization expands cities beyond formal boundaries, increasing pressure on land resources.*
- ***Encroachment and Forest Exploitation:*** *Agricultural and residential expansion leads to deforestation and degradation of wetlands and shrubs.*
- ***Overgrazing:*** *Declining soil fertility forces farmers to use cultivated land for grazing.*
- ***Economic Demands:*** *Industrial growth, infrastructure development, and urban sprawl drive land conversion.*
- ***Land Fragmentation***
    - *Land fragmentation refers to the breakdown of large holdings into smaller, often unviable parcels, due to inheritance laws and demographic pressures.*
    - *The shrinking land-man ratio (less than 0.2 hectares per rural person) and fragmentation of holdings have led to inefficient land use.*
    - *States like Kerala, Bihar, and Uttar Pradesh face severe fragmentation, with average holdings often less than 1 hectare.*
    - *Small and fragmented holdings contribute to low agricultural productivity, inefficient irrigation, and poor mechanization.*



ANALYSIS OF THE LAND AS A RESOURCE



POSSIBLE SOLUTIONS

- ***Land Consolidation:*** *Combining fragmented land holdings into larger, more viable units can improve agricultural efficiency.*
- ***Cooperative Farming:*** *Farmers should pool resources for mutual benefits, improving operational scale and profitability.*
- ***Contract and Corporate Farming:*** *Encouraging collaborative initiatives like contract farming and corporate farming can help integrate and consolidate landholdings.*
- ***Awareness Campaigns:*** *Educating farmers through NGOs, associations, and Panchayati Raj institutions about the benefits of land consolidation is essential.*
- ***Panchayati Raj System:*** *Pilot collective farming initiatives, structured and monitored by local governing bodies, could demonstrate the benefits of land consolidation at grassroots levels.*
- ***Sustainable Land Management:*** *Promote agroecological practices, crop rotation, and organic farming to restore soil health.*
- ***Improved Irrigation Practices:*** *Implement micro-irrigation techniques to reduce water wastage and prevent salinity.*
- ***Comprehensive Land Reforms:*** *Address land fragmentation and improve land redistribution policies to ensure equitable access.*
- ***Smart Land Use Policies:*** *Balance agricultural, industrial, and urban development to minimize conflicts and ensure sustainable growth.*
- ***Technological Interventions:*** *Use Geographic Information Systems (GIS) for land mapping and planning to optimize resource allocation.*

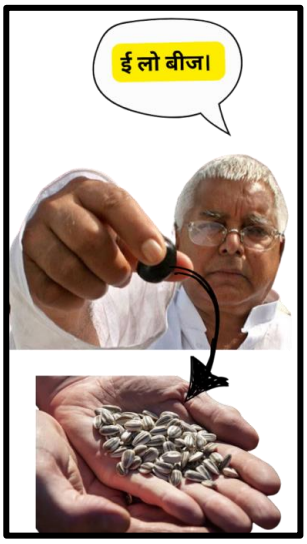
Common Property Resources: Their Role in Rural India
Common Property Resources (CPRs) are community-owned assets crucial for rural livelihoods. These resources—such as grazing lands, community forests, and village water bodies—are particularly vital for marginalized farmers, many of whom lack access to private land. Additionally, women often bear the responsibility of gathering fuel and fodder from these shared resources.

SEEDS

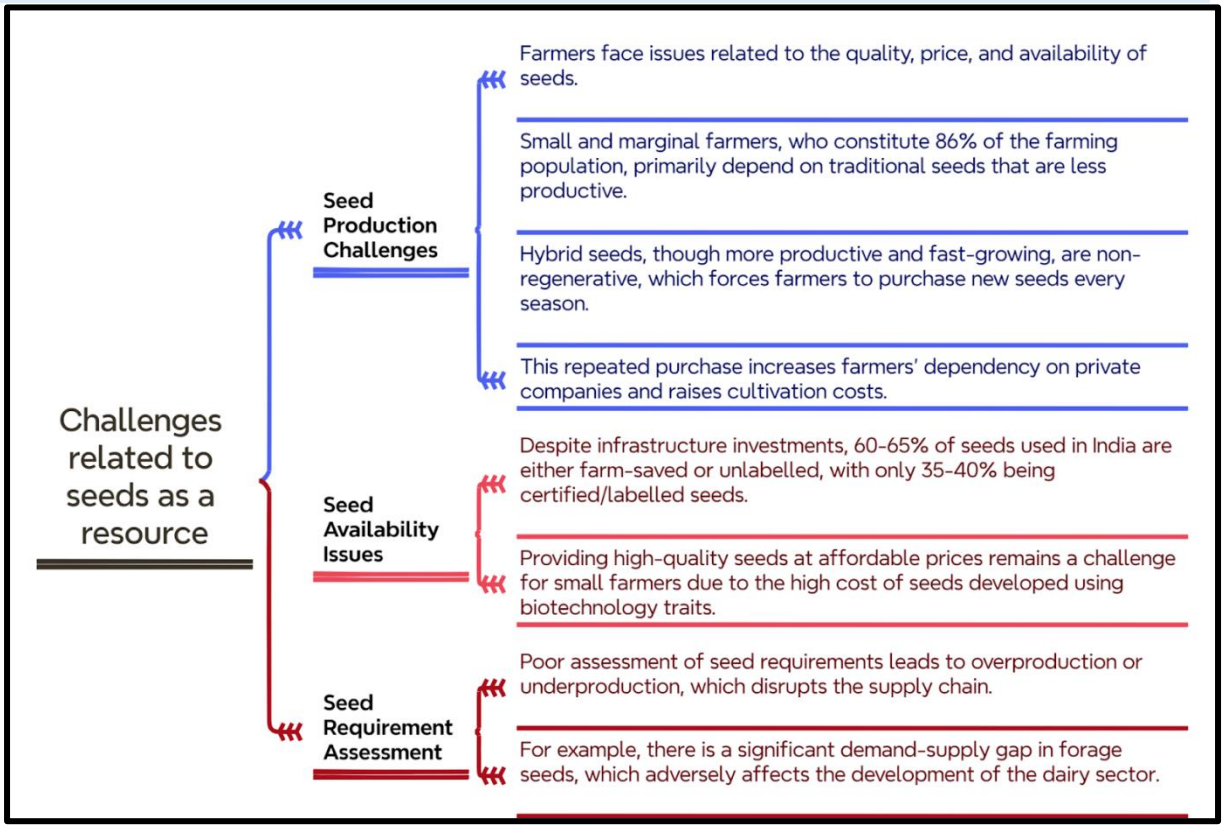
- *Seeds are the foundation of crop production, and the choice of seed has a direct impact on crop yield and quality.*
- *Quality seeds are essential as they enhance productivity by 15-20% and play a vital role in meeting the country's food and nutritional security needs.*
- *The response of other agricultural inputs like fertilizers and water largely depends on the quality of seeds used.*

TYPES OF SEEDS:

- **Traditional Seeds:** *Varieties adapted to local conditions, often less productive but more resilient.*
- **Hybrid Seeds:** *Engineered for high yield but may require more input (fertilizers, water).*
- **Genetically Modified (GM) Seeds:** *Designed to resist pests or diseases or to tolerate adverse conditions.*



ANALYSIS OF THE SEED SECTOR



MEASURES TAKEN FOR SEED DEVELOPMENT

Measure	Description
National Seeds Corporation (NSC)	*Established in **1963** to increase the production of **high-quality seeds** in India.*
High Yielding Variety Programme	*Launched in **1966-67** to boost food grain production using **improved seeds**.*
National Seeds Policy (2002)	*Focuses on increasing **quality seed production**, developing **genetic modification techniques**, and protecting new seed varieties.*

Indian Council of Agricultural Research (ICAR)	Established as the **premier research organization** for seeds in India.
Legislative Framework	Includes measures such as **Seed Act (1966)**, **Seed Rules (1968)**, **Protection of Plant Varieties and Farmers' Rights Act (2001)**
Seed Village Programme (2005)	Provides subsidies: • **50% for cereals** • **60% for pulses, oilseeds, and fodder crops** to upgrade farm-saved seeds.
Seed Banks	Established to **preserve seed biodiversity** and ensure access to diverse seed varieties.
National Seed Grid	A real-time **district-wise seed database** for monitoring seed production and farmer requirements.
National Gene Bank	Set up in Delhi for conserving **seed biodiversity** of registered varieties.
Regional Gene Banks	Four regional gene banks established at **Dapoli, Ranchi, Solan**, and **Jodhpur** to conserve perennial crops.

STRENGTHENING THE SEED SECTOR

- The **Seed Replacement Rate** for self-pollinated crops like wheat and paddy should be enhanced to **33%**, while for cross-pollinated crops like bajra, it should be raised to **50%**.

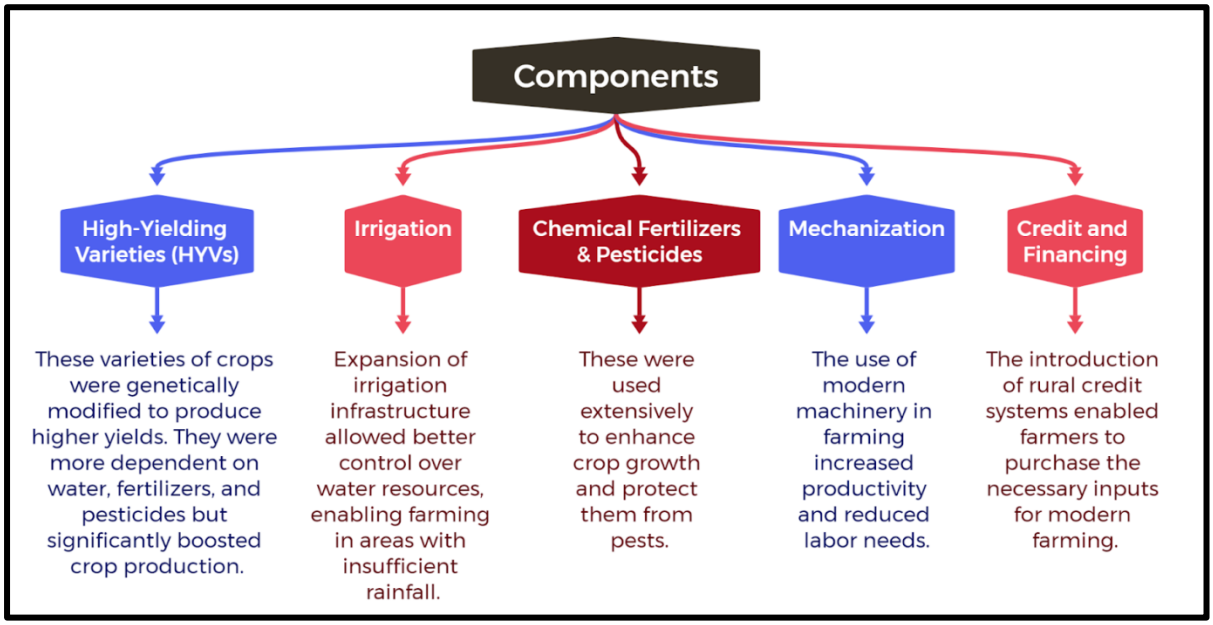
> **Seed Replacement Rate (SRR)** refers to the percentage of total seed requirement in a country that is met by the use of newly certified seeds each year. It is a critical indicator of the health and sustainability of a nation's agricultural sector as it reflects the quality and quantity of seeds being used by farmers.

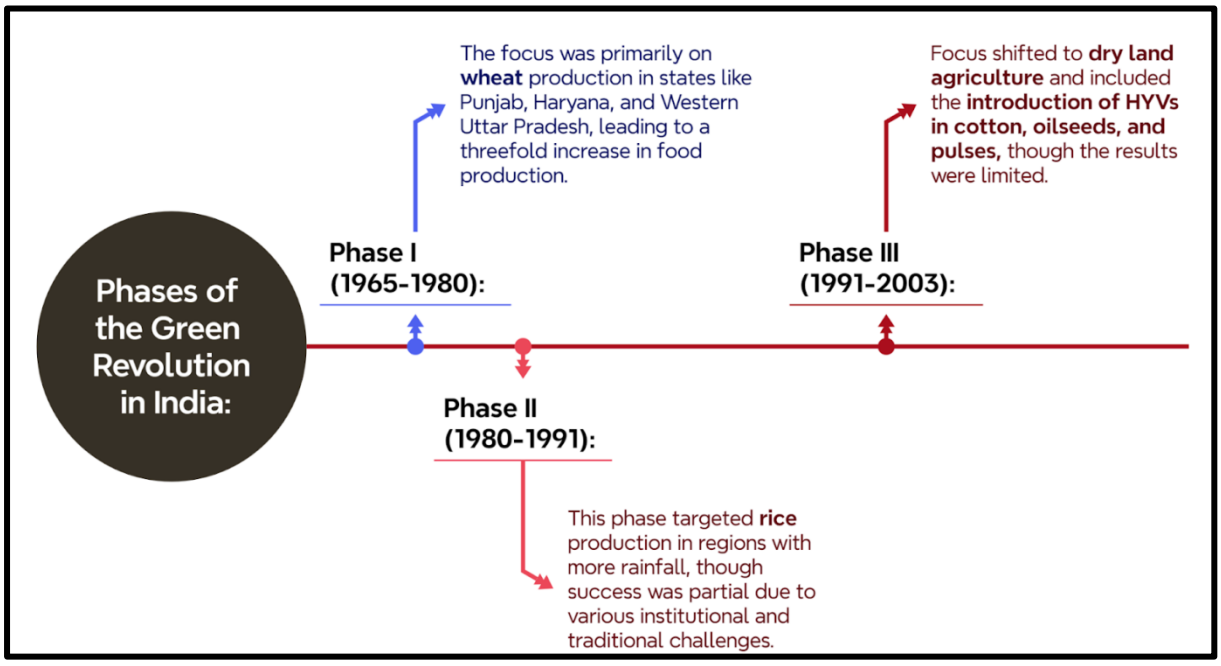
- A robust **seed reserve scheme** should be developed to compensate for non-seed use and manage cost variations in procurement.
- **ICT-based tracking** should be introduced for real-time monitoring of the entire seed production chain to ensure quality and traceability.
- Infrastructure for **seed processing and storage** needs to be upgraded with advanced tools and mobile facilities to benefit small farmers.
- Integrating forage crops into the seed production chain will strengthen the dairy and livestock sectors.
- **Decentralization** of seed production platforms should involve SHGs, FPOs, and young entrepreneurs.
- Establishing **Community Seed Banks (CSBs)** will promote local seed varieties and ensure biodiversity conservation.

- *Rationalizing the cost of certified seeds will make them affordable for small and marginal farmers.*

THE GREEN REVOLUTION

- *In India, the Green Revolution started in the mid-1960s as a response to severe food shortages and the risk of famine.*
- *Dr. M.S. Swaminathan is often called the "Father of the Green Revolution in India."*
- *It introduced high-yielding varieties (HYVs) of wheat and rice, developed mainly in Mexico and the Philippines, and spread across the country, especially in Punjab, Haryana, and Western Uttar Pradesh.*





OTHER REVOLUTIONS

Revolution	Aim	Key Components/Focus	Key Crops/Products
Yellow Revolution	Increase in horticultural crop production and productivity	Fruits, vegetables, nuts, spices	Horticultural crops
Blue Revolution	Sustainable growth in fish and aquatic organism production	Fish farming, fishing practices, water resource management	Fish and aquatic organisms
White Revolution	Increase in milk production and dairy industry development	Dairy farming, cattle breeding, milk processing	Milk and dairy products
Pink Revolution	Significant growth in shrimp and prawn production and export	Shrimp aquaculture, breeding technology, disease control, modern processing	Shrimp and prawns
Grey Revolution	Increased production and extensive use of chemical fertilizers	Manufacturing and distribution of synthetic fertilizers	Chemical fertilizers
Brown Revolution	Enhancement of leather and leather product production and processing	Modernization of tanning industry, leather quality improvement, leather exports	Leather and leather products
Red Revolution	Increase in meat (especially tomato) production and processing	Livestock development, modernizing meat processing units, food safety standards	Meat (especially tomato)
Golden Revolution	Integrated development and growth in fruits, vegetables, honey, and bamboo production	Modern agricultural practices, crop diversification, value addition	Fruits, vegetables, honey, bamboo
Black Revolution	Increase the production of crude oil.	To increase production on petroleum products	Petrol and crude oil
Silver Revolution	Increase the production of Eggs , and poultry product	Boost in production of eggs and poultry product	Eggs and poultry product.

WATER/IRRIGATION

- *Water is a critical input for agriculture, with over 80% of India's water resources used in farming.*
- *Efficient water use is key to sustainable agricultural development, higher farm incomes, and food security.*
- *To achieve this efficient use of water, various irrigation systems have been developed, each suited to India's diverse geographic and climatic conditions, thereby ensuring that water is optimally utilized for agricultural productivity*

TYPES OF IRRIGATION

CANAL IRRIGATION

- *Canal irrigation accounts for around 24% of India's total irrigated area.*
- ***Geographical Distribution:*** *It is most effective in the northern plains, including states like* ***Uttar Pradesh, Punjab, Haryana, and Bihar****, where fertile soil and perennial rivers provide ideal conditions.*

- ***Working Mechanism****: Water is diverted from rivers to canals, delivering a continuous water supply to fields, particularly in low-relief, fertile areas.*

Canal irrigation is vital for large-scale agriculture, especially in regions where surface water is abundant. However, issues like siltation, waterlogging, and inefficient canal management can reduce its effectiveness.

TANK IRRIGATION

- *Tank irrigation covers a smaller proportion of India's total irrigated area, having decreased from 14% in 1960-61 to 3% in 2010-11.*

- **Regions:** Common in the peninsular region, particularly in Tamil Nadu, Andhra Pradesh, and Telangana.
- **Mechanism:** Small bunds (dams) are constructed across streams to store water for irrigation.
- **Advantages:** Tanks are easy to manage at the panchayat level and offer supplementary benefits like fishing.

Despite its decline, tank irrigation remains important in areas with undulating terrain where other forms of irrigation are impractical. However, the decrease in tank irrigation highlights the shift towards more efficient systems like wells and tube wells.

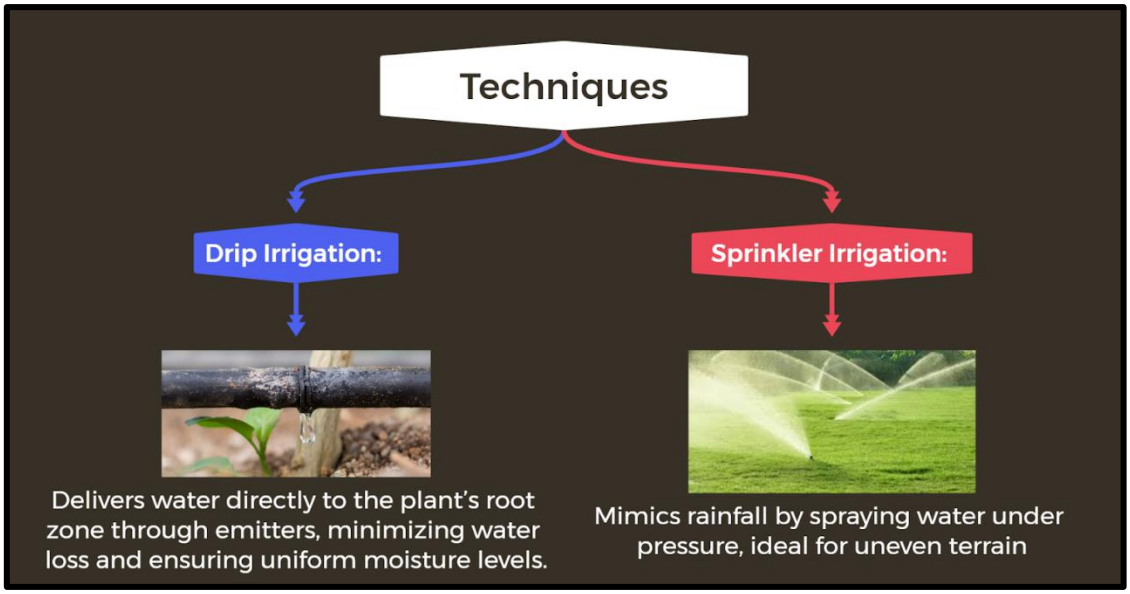
WELL AND TUBE WELL IRRIGATION

- It accounts for about 62% of India's net irrigated area.
- **Geographical Distribution:** Prominent in **Uttar Pradesh, Punjab, Rajasthan, and Gujarat,** where groundwater is available in sufficient quantities.
- **Mechanism**: Wells are dug to access groundwater, while tube wells are deeper and use pumps to lift water to the surface.
- **Benefits:** Wells and tube wells provide farmers with autonomy and are useful for regions lacking perennial rivers or efficient canal systems.

Well and tube well irrigation has revolutionized Indian agriculture by providing a reliable and flexible water source. However, the overreliance on groundwater has resulted in environmental concerns such as land degradation and falling water tables.

MICRO IRRIGATION

- It is gaining popularity due to its efficient water usage, with an average penetration of 19% in India as of 2021.



- ***Advantages:*** *Increases crop yield by ensuring water is efficiently distributed, reduces soil erosion, and helps conserve water.*

Micro-irrigation, particularly drip and sprinkler systems, is a sustainable solution to the water scarcity problem in India. However, these systems require proper maintenance and suitable economic conditions to be truly effective for small-scale farmers.

TRADITIONAL IRRIGATION METHODS

- *Johars, Baolis, Kuhls, and other traditional systems, still practiced in rural India, especially in regions with limited access to modern irrigation systems.*
- ***Working:*** *These systems often rely on natural water sources like streams or rainwater harvesting techniques.*
- ***Advantages:*** *Low cost and reliance on natural systems.*

Traditional methods are culturally significant and provide localized solutions for irrigation in rural areas. However, they are increasingly less viable for large-scale agriculture due to water scarcity and climate uncertainties.

ANALYSIS RELATED TO THE WATER MANAGEMENT

CHALLENGES IN WATER AVAILABILITY

- ***General Scarcity****: India has* ***4% of global water resources*** *but supports* ***18% of the world's population*** *and* ***15% livestock****.*
- ***Rainfed Agriculture****: About* ***52% of cultivated land*** *depends on rainfall, making it vulnerable to weather fluctuations.*
- ***Regional Imbalance****: The Ganga-Brahmaputra basin accounts for* ***50% of total water availability****, while southern and western regions receive only* ***15% each****.*

- **Sub-Optimal Utilization**: Poor maintenance of irrigation systems, changing land use patterns, and delayed development affect water availability.
- **Poor Irrigation Efficiency**: Efficiency in India (~38%) is lower than developed countries (60-70%).
- **Water Quality Issues**: Contaminated water dissolves organic carbon, making it unavailable to plants.

MEASURES TAKEN FOR WATER MANAGEMENT

Measure	Description

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY, 2015)	• Aims to provide **assured irrigation** and improve **water-use efficiency**.
	• **Components include**:
	  ○ **Accelerated Irrigation Benefit Programme (AIBP)**: Focuses on faster completion of **irrigation projects**.
	  ○ **Har Khet Ko Pani**: Provides **end-to-end irrigation supply solutions**.
	  ○ **Per Drop More Crop**: Promotes **micro-irrigation** using **drip** and **sprinkler systems**.

Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)	Utilizes **70% of funds** for creating small **irrigation infrastructure** and **water conservation**.
Rashtriya Krishi Vikas Yojana (RKVY)	Provides funds for **water conservation** and **management activities**.
Atal Bhujal Yojana	Focuses on **sustainable groundwater management** with **community participation**.

WAY FORWARD FOR WATER MANAGEMENT

1. **Groundwater Management**: Promoting artificial recharge and conjunctive use of surface water and groundwater.
2. **Irrigation Development in Eastern and Northeastern Regions**: Addressing underutilization of groundwater and high rainfall in these areas to improve rice productivity.
3. **Conservation Agriculture**: Improve **in-situ moisture conservation** and soil properties to optimize rainwater usage.
4. **Crop Alignment and Diversification**: Promote **low water-intensive crops** like pulses and oilseeds in line with agro-climatic conditions.
5. **Enhancing Water-Use Efficiency**: Expand micro-irrigation systems like drip and sprinkler irrigation to save up to **40% water**.

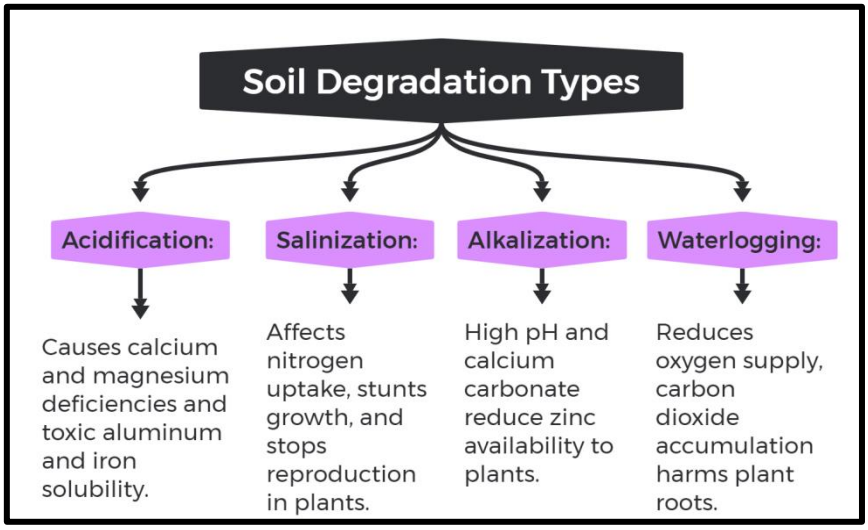
SOIL

- *Soil supplies essential nutrients, water, oxygen, and root support necessary for plant growth.*
- *Healthy soil is critical for sustainable agriculture and food security.*

ANALYSIS RELATED TO THE SOIL HEALTH

CHALLENGES WITH SOIL HEALTH

- ***Decline in Soil Organic Matter (SOM)**: Intensive cropping depletes SOM, reducing biological activity and soil hydraulic properties.*
- ***Poor Soil Fertility**: Deficiency of essential nutrients impairs crop productivity.*
- ***Decline in Soil Physical Conditions**: Degradation in soil structure, stability, water-holding capacity, and aeration affects nutrient availability and microbial activity.*



- ***Nutrient Deficiencies**: Fertilizer schedules in some states focus only on **NP or NPK** despite deficiencies in **secondary and micronutrients** like sulphur, zinc, and boron.*

MEASURES TAKEN FOR SOIL HEALTH MANAGEMENT

Measure	Description
Soil Health Card Scheme (2015)	• *Monitors soil health and recommends nutrient application for better management.* • *Includes steps like **distribution of micronutrients** and setting up **micro-soil testing labs**.*
Rashtriya Krishi Vikas Yojana (RKVY)	*Promotes **soil fertility improvement** and sustainable **land and water management**.*
NABARD Loan for Soil & Water Conservation	*Provides **financial assistance** for soil and water conservation under the **Rural Infrastructure Development Fund (RIDF)**.*

Other Initiatives	• ***Subsidized supply*** *of biofertilizers and micronutrients under the* ***National Food Security Mission***. • *Promotion of* ***organic farming*** *and* ***Integrated Nutrient Management (INM)*** *under the* ***National Horticulture Mission***. • *Setting up* ***biofertilizer and biopesticide units*** *under the* ***National Mission for Sustainable Agriculture (NMSA)***. • ***Reclamation of problem soils*** *under* ***RKVY*** *to restore soil productivity.*

WAY FORWARD FOR SOIL MANAGEMENT

1. ***Revamping Soil Testing Services***:
    - *Modernize soil testing labs (STLs) with improved technology and trained personnel.*
    - *Use* ***ICT tools*** *for real-time monitoring and soil health assessments.*
2. ***Strengthening Soil Health Card Scheme***:
    - *Expand testing parameters to include* ***water testing*** *and integrate* ***best management practices***.
3. ***Promoting Balanced Fertilizer Use***:
    - *Revise fertilizer recommendations under* ***Nutrient-Based Subsidy (NBS)***.
    - *Explore newer approaches like* ***site-specific nutrient management*** *and incentivize* ***crop residue recycling***.
4. ***Precision Nutrient Management (PNM)***:
    - *Ensure* ***right rate, source, time, and method*** *for nutrient application to improve efficiency.*
5. ***Farmer Awareness Programs***:
    - *Educate farmers about the risks of extractive farming and the benefits of long-term soil health improvement.*
6. ***Community-Level Composting***:
    - *Promote mechanized composting as a small-scale industry to provide quality compost.*
7. ***Conservation Agriculture***:
    - *Focus on* ***minimum soil disturbance****, crop residue retention, and crop rotations to enhance productivity.*

PESTICIDES

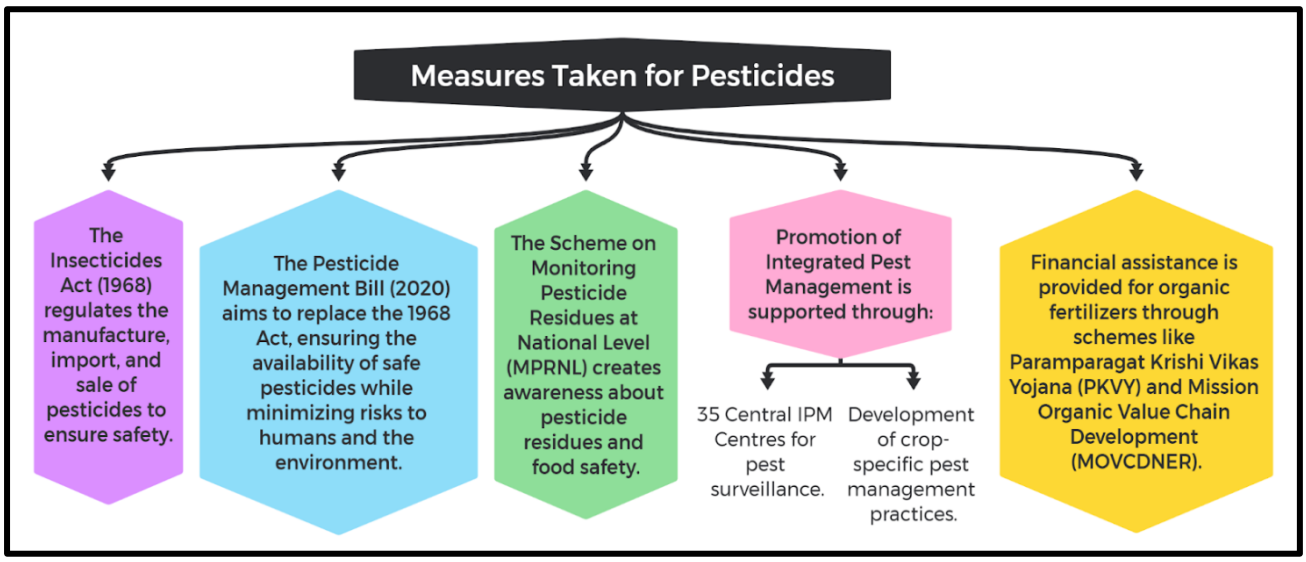
- *Pesticides play a crucial role in protecting crops from pests, diseases, and weeds, enabling higher productivity on less land.*

- *They maximize the benefits of other agricultural inputs like high-quality seeds, fertilizers, and water resources.*

ANALYSIS RELATED TO THE PESTICIDES MANAGEMENT

CHALLENGES IN PESTICIDE MANAGEMENT

- *The presence of **spurious and fake pesticides** compels farmers to use excessive quantities, which increases costs and harms crops and the environment.*
- *The price of pesticides, both branded and generic, remains unregulated and market-driven, increasing farmers' expenditure.*
- *Farmers lack awareness about the proper use of pesticides due to insufficient training and poor extension services.*
- ***Integrated Pest Management (IPM)**, which promotes cultural, mechanical, and biological techniques, has limited reach due to a lack of quality IPM inputs and awareness.*

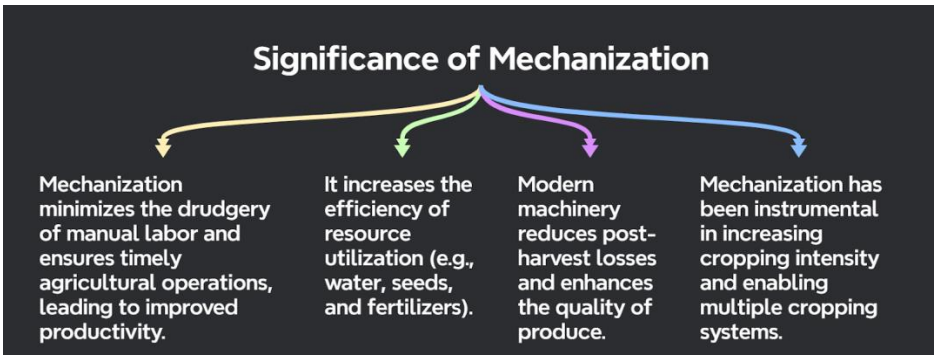


WAY FORWARD FOR PESTICIDE MANAGEMENT

1. *Farmers need **training and awareness** programs in regional languages for the effective and safe use of pesticides.*
2. ***Decentralized production** of bio-agents through SHGs and cooperatives should be promoted.*
3. *Eco-friendly alternatives like **Silver Hydrogen Peroxide** must be developed and promoted.*
4. *Time-bound **registration of pesticides** is essential to avoid monopolies and promote safe alternatives.*
5. *Regular **monitoring and surveillance** should identify fake and banned pesticides in markets.*

AGRICULTURAL MECHANIZATION

- *Mechanization in agriculture is the use of machinery and equipment to perform agricultural tasks, ranging from basic hand tools to sophisticated motorized equipment.*
- *The **mechanization of agriculture** improves productivity, reduces labor dependency, and optimizes resource utilization.*



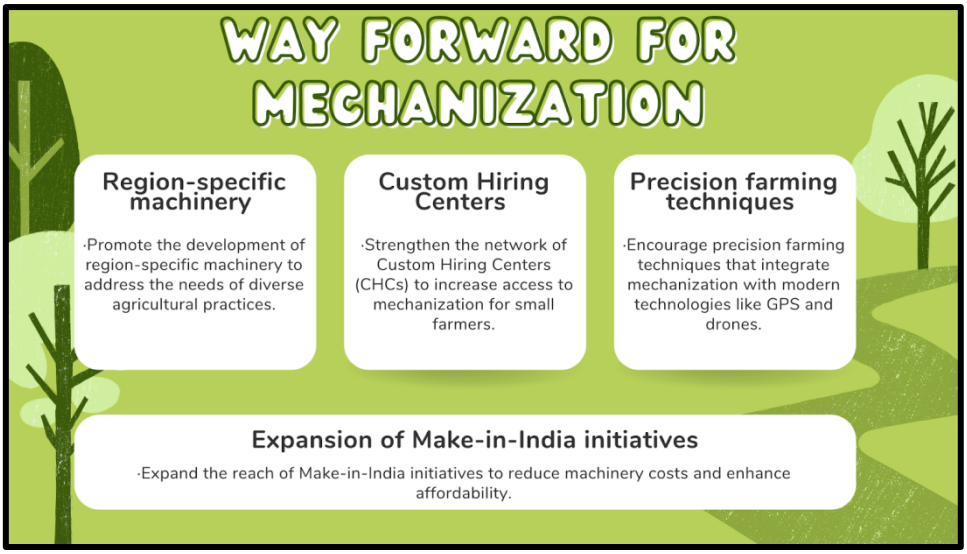
ANALYSIS RELATED TO THE FARM MECHANIZATION

CHALLENGES IN AGRICULTURAL MECHANIZATION

- ***Small and Fragmented Landholdings**: The average landholding size in India is shrinking, making it economically unviable for small farmers to own expensive machinery.*
- ***High Cost of Machinery**: The cost of advanced equipment like combine harvesters and tractors is prohibitive for many farmers.*
- ***Lack of Custom Hiring Centres (CHCs)**: Insufficient availability of CHCs for renting machinery, especially in rural areas.*
- ***Inadequate Infrastructure**: Poor rural roads and lack of storage facilities hinder the effective use of mechanization.*
- ***Regional Imbalance in Mechanization**: Northern states have higher mechanization levels compared to eastern and north-eastern states.*

MEASURES TAKEN FOR PROMOTING MECHANIZATION

- ***Sub-Mission on Agricultural Mechanization (SMAM)**: Aims to promote mechanization through financial assistance for purchasing equipment and establishing CHCs.*
- ***Custom Hiring Centers (CHCs)**: Provide small and marginal farmers access to expensive machinery at affordable rates.*
- ***Promotion of Make-in-India Equipment**: Encourages the manufacture of affordable and locally suitable machinery.*
- ***Kisan Credit Cards (KCCs)**: Enable farmers to purchase equipment by providing easy access to credit.*
- ***Agricultural Infrastructure Fund (AIF)**: Offers support for creating infrastructure for mechanization, including CHCs and processing units.*



AGRICULTURAL CREDIT

- *Credit is the backbone of modern agriculture, enabling farmers to adopt mechanization and improved practices.*
- *Institutional credit reduces the dependency on informal moneylenders, who often charge exorbitant interest rates.*
- *Access to credit facilitates investment in:*
    - *High-quality seeds.*
    - *Advanced irrigation systems.*
    - *Fertilizers and pesticides.*

ANALYSIS RELATED TO THE FARM MECHANIZATION

CHALLENGES IN AGRICULTURAL CREDIT

- **Inadequate Credit Flow to Small Farmers:** Small and marginal farmers receive limited institutional credit, forcing them to rely on informal channels.
- **High Non-Performing Assets (NPAs):** Rising NPAs in the agricultural sector burden financial institutions and restrict future lending.
- **Limited Penetration of Financial Institutions:** Banks often hesitate to extend credit to farmers due to perceived risks.
- **Complex Loan Application Processes:** Tedious procedures discourage farmers from seeking institutional loans.

MEASURES TAKEN FOR AGRICULTURAL CREDIT

- **Kisan Credit Card (KCC) Scheme:** Simplifies credit access for farmers and enables them to meet their short-term financial needs.
- **Interest Subvention Scheme (ISS):** Offers interest subsidies on crop loans to reduce farmers' financial burden.
- **Agricultural Credit Targets:** The government sets annual credit targets for banks to increase credit flow to the agricultural sector.
- **Financial Inclusion Programs:** Initiatives like Pradhan Mantri Jan Dhan Yojana (PMJDY) aim to bring more farmers into the formal banking system.

WAY FORWARD FOR CREDIT MANAGEMENT

- *Simplify loan application processes and reduce procedural barriers to encourage farmers to seek institutional credit.*
- *Promote **digitization of credit** through mobile banking and online platforms for faster disbursal of loans.*
- *Introduce **risk-sharing mechanisms** to reduce the burden of non-performing assets on banks.*
- *Enhance the role of Farmer Producer Organizations (FPOs) in negotiating better credit terms for small farmers.*

AGRICUTURE MARKETING

- *Agricultural marketing refers to the process of managing the flow of agricultural produce from the farm to the ultimate consumer.*
- *It encompasses all activities involved in gathering produce, storing, transporting, processing, packaging, and selling it, ensuring farmers receive fair compensation while consumers access quality products at reasonable prices.*
- ***Current Scenario and Challenges***
    - ***Fragmented Supply Chains:** Multiple intermediaries reduce efficiency and inflate costs, leaving farmers with a smaller share of profits.*
    - ***Lack of Infrastructure:** Insufficient cold storage, transportation, and market linkages result in post-harvest losses of 15-20% annually.*
    - ***Limited Access to Markets:** Farmers often rely on local markets, where they face cartelization and low price realization.*

- **Policy Constraints:** Regulated markets under the APMC Act have created monopolies, limiting competition and innovation.

AGRICULTURAL PRODUCE MARKETING COMMITTEE (APMC)

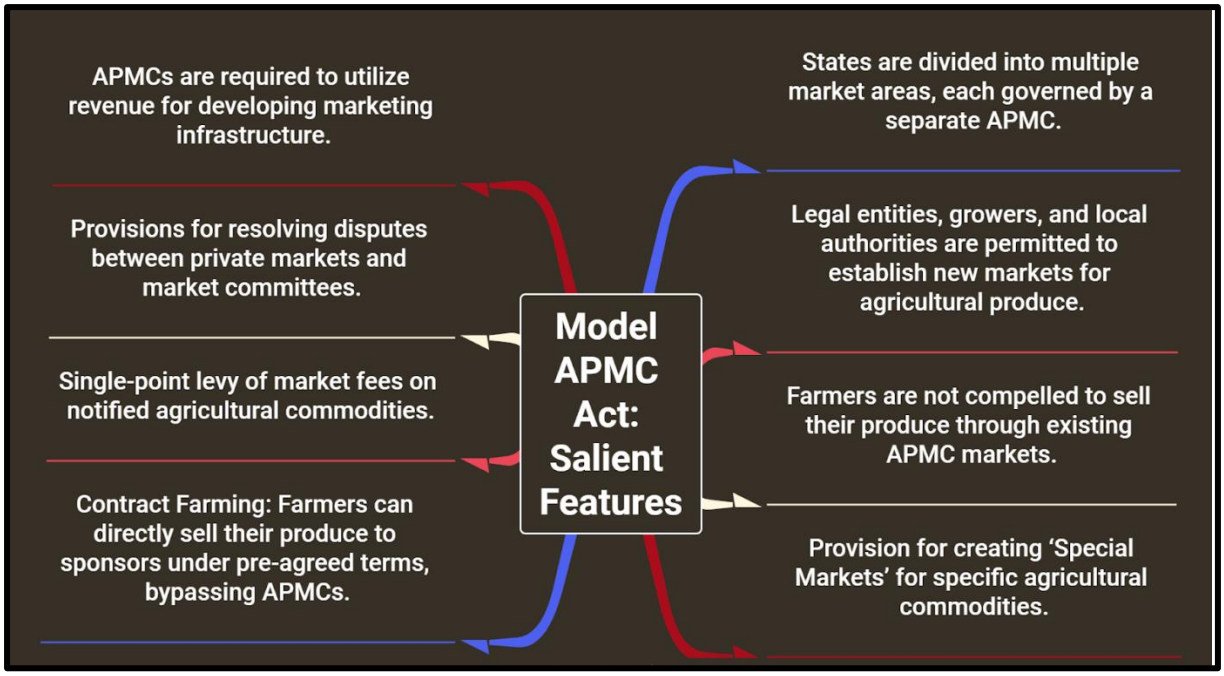
- The wholesaling of agricultural produce is regulated by the Agricultural Produce Marketing Acts enacted by various State Governments.
- The APMC Act authorizes State Governments to:
  - Notify commodities.
  - Designate markets and market areas where regulated trade occurs.
  - Establish Agricultural Produce Marketing Committees (APMCs) accountable for the market's functioning.
- States are divided into market areas, with each governed by a Market Committee formed by the respective State Government.

OBJECTIVES OF APMC

- Develop an **efficient marketing system** for agricultural produce.
- Promote **agri-processing** and **agricultural exports**.
- Establish procedures and systems to develop effective infrastructure for agricultural marketing.

SHORTCOMINGS IN THE CURRENT APMC SYSTEM

- **Monopoly of APMC:** APMC monopolies in trade deprive farmers of better customers and prevent consumers from accessing original suppliers.
- **Cartelization:** Agents within APMCs often form cartels, restraining from higher bidding. Further, the produce is procured at artificially low prices and sold at higher prices, benefiting the cartel but leaving farmers in distress.
- **Entry Barriers:** High license fees and shop rents restrict competition and limit farmers' participation. Often, only village or urban elites operate within the APMC framework.
- **Conflict of Interest:** APMCs act as both regulators and market participants, leading to conflicts of interest. Members and chairpersons, often agents themselves, prioritize trade interests over regulation.
- **High Costs for Farmers:** Farmers are burdened with commission fees, marketing fees, and APMC cess, inflating costs.



ALTERNATE MARKETING CHANNELS

DIRECT MARKETING

- *The APMC model act promotes direct marketing, allowing farmers to sell goods outside APMC-regulated markets.*
- *Benefits:*
    - *Eliminates middlemen, narrowing the price gap between farmers and consumers.*
    - *Numerous successful examples include:*
        - ***Apni Mandi (Punjab)***
        - ***Rythu Bazar (Andhra Pradesh)***
        - ***Uzhavar Sandhai (Tamil Nadu)***
        - ***Krushak Bazaar (Odisha)***
        - ***Kisan Mandi (Rajasthan)***.
- *The Central Government supports the* ***Agricultural Marketing Infrastructure, Grading & Standardization Scheme*** *to develop infrastructure for direct marketing.*

CONTRACT FARMING

- *Benefits:*
    - *Reduces income uncertainty for farmers.*
    - *Ensures better prices.*
- *However, Results have been mixed, as big corporations often dominate these contracts.*

NEGOTIABLE WAREHOUSE RECEIPTS

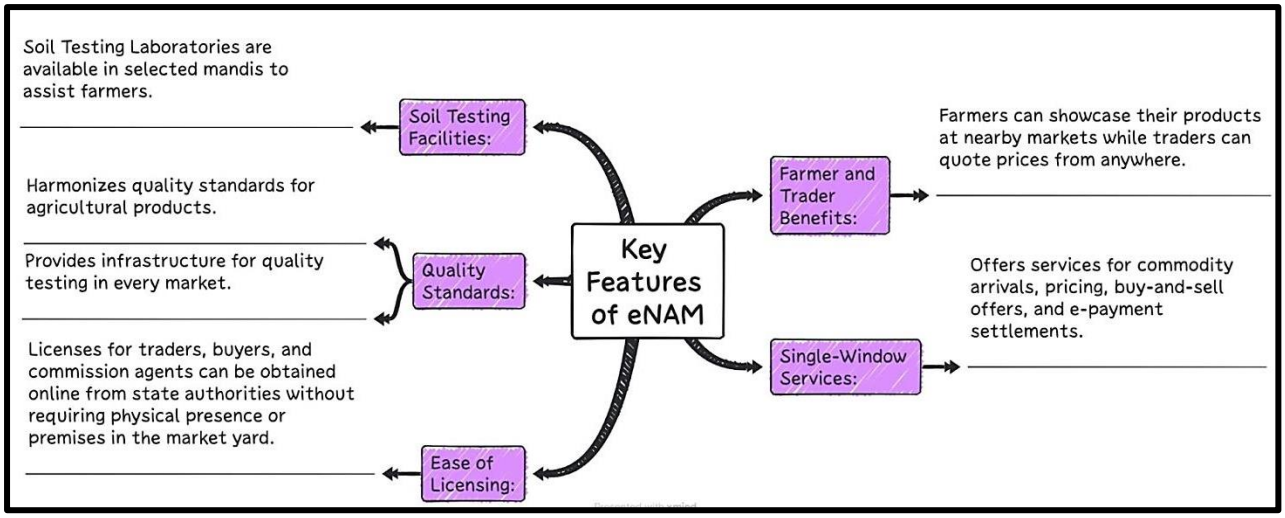
- *The Negotiable Warehouse Receipt (NWR) system was launched in 2011, allowing the transfer of ownership of a commodity stored in a warehouse without requiring its physical delivery.*
- *NWRs are issued in a negotiable form, making them eligible as collateral for loans.*
- *The system was introduced under the Warehouse (Development and Regulation) Act, 2007, which enabled the financing of warehouse receipts.*
- *The entire NWR system is regulated by the Warehousing Development and Regulatory Authority (WDRA).*
- *Farmers deposit produce in certified warehouses and receive an NWR as acknowledgment.*
- *Benefits:*
    - *The receipt can be used for loans, payments, or claim settlements.*
    - *Safeguards financial institutions against risks in credit extension.*

WAREHOUSING DEVELOPMENT AND REGULATORY AUTHORITY (WDRA)

1. ***WDRA*** *was constituted in* ***2010*** *under the* ***Warehousing (Development and Regulation) Act, 2007****.*
2. *It operates under the* ***Department of Food and Public Distribution (DFPD)****.*
3. *WDRA is responsible for:*
    - *Regulating warehouses and the issuance of NWRs and e-NWRs.*
    - *Ensuring standardization and transparency in warehousing practices.*

ENAM (NATIONAL AGRICULTURE MARKET)

- ***eNAM*** *is an* ***online trading platform*** *for agricultural commodities in India.*
- *Launched on* ***April 14, 2016****, it is fully funded by the* ***Government of India****.*
- *The platform is implemented by the* ***Small Farmers Agribusiness Consortium (SFAC)*** *under the Ministry of Agriculture and Farmer's Welfare.*
- ***Objective****: To create better marketing opportunities for farmers by providing a competitive and transparent price discovery system along with an* ***online payment facility*** *for buyers.*
- *The* ***NAM portal*** *connects existing APMC (Agricultural Produce Marketing Committee) markets, private markets, and unregulated markets to unify all nationwide agricultural markets.*



BENEFITS OF ENAM FOR STAKEHOLDERS

- ***Farmers***:
  - *Access to **transparent online trading** and better market reach.*
  - ***Real-time price discovery** for stable and enhanced price realization.*
  - *Reduced dependency on intermediaries and better access to buyers.*
  - *Direct **online payment** to their bank accounts, ensuring timely and hassle-free transactions.*
- ***Buyers and Traders***:
  - *Lower **transaction costs** and improved access to quality produce.*
  - *Real-time updates on commodity prices via the **eNAM mobile app**.*
  - *Details of transactions (price and quantity) are sent via SMS for record-keeping.*
- ***Farmer Producer Organizations (FPOs)**, Processors, and Exporters:*
  - *Access to a **more efficient supply chain** and warehouse-based sales.*
  - *Availability of **quality-certified commodities**, ensuring higher buyer trust.*

MINIMUM SUPPORT PRICE

- *The Minimum Support Price (MSP) is a predetermined price set by the government to ensure farmers receive a fair price for their produce.*
- *It acts as a safety net, protecting farmers from price fluctuations in the market.*
- *MSPs announced for **23 crops** which includes:*
    - *7 cereals (e.g., wheat, paddy).*
    - *5 pulses (e.g., gram, moong).*
    - *7 oilseeds (e.g., mustard, soybean).*
    - *4 commercial crops (e.g., sugarcane, cotton).*
- ***Responsible Authority:***
    - *MSP recommendations are made by the **Commission for Agricultural Costs & Prices (CACP) under the Ministry of Agriculture and Farmers Welfare.***
    - *Final decisions are taken by the **Cabinet Committee on Economic Affairs (CCEA).***

OBJECTIVE OF MSP:

- ***Income Security:** Ensure farmers receive a minimum price for their crops, providing financial stability and reducing income uncertainties.*
- ***Price Stabilization:** Prevent drastic price fluctuations in the market, shielding farmers from market volatility.*
- ***Encouraging Production:** Encourage farmers to produce essential crops by offering a guaranteed minimum price, promoting agricultural self-sufficiency.*
- ***Risk Mitigation:** Act as a safety net for farmers against the risks associated with unpredictable weather conditions, pests, and market forces.*

HOW MSP IS DETERMINED?

1. ***A2 (Actual Paid-Out Costs):** Includes costs directly incurred by the farmer in cash and kind, covering seeds, fertilizers, pesticides, hired labour, leased-in land, fuel, and irrigation.*
2. ***A2+FL (Actual Paid-Out Costs + Imputed Value of Unpaid Family Labour):** Extends A2 to include an imputed value for unpaid family labour.*
3. ***C2 (Comprehensive Cost):** A more inclusive cost, factoring in rentals and interest forgone on owned land and fixed capital assets, in addition to A2+FL.*

***The Swaminathan commission** had advised the central government to raise the MSP to at least 50% above the weighted average cost of production. Also known as the C2+50% formula, it includes the input cost of capital and the rent on the land (called 'C2') to give the farmers 50% returns.*

Issues with the Current MSP Regime

Procurement Focus:
MSP functions more as a procurement price for schemes like the National Food Security Act (NFSA) rather than a universal safety net.

Dominance of Wheat and Paddy:
Overemphasis on wheat and rice leads to their overproduction, discouraging crop diversification.

Limited Reach:
According to the Shanta Kumar Committee (2015), only 6% of farmers benefit from MSP, leaving 94% without direct support.

Skewed Procurement:
Government procurement is limited, covering only one-third of wheat and rice and 10%-20% of pulses and oilseeds.

COMMITTEES

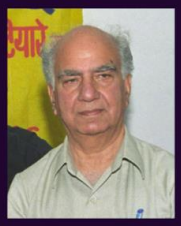
ON THE MINIMUM SUPPORT PRICE (MSP)

SWAMINATHAN COMMISSION

The commission strongly recommended that the government should set MSP at 50% above the cost of production (C2 formula), ensuring that farmers receive a fair and adequate return for their produce.

SHANTA KUMAR COMMITTEE

The committee suggested reducing government procurement and focusing on targeted MSP implementation for the crops that are most essential for food security.



ASHOK DALWAI COMMITTEE

The committee emphasized price stabilization and income support for farmers, suggesting that the government should expand the coverage of MSP

RECOMMENDATIONS AND WAY FORWARD IN THIS REGARD

1. **Legal Guarantee for MSP**
    a. *To ensure consistent support, a legal guarantee for MSP could be implemented, providing farmers with assured prices and reducing distress during price fluctuations.*
2. **Expanding Crop Coverage**
    a. *Broadening the MSP system to include a more diverse range of crops would reduce the dominance of rice and wheat, ensuring that farmers growing other essential crops like pulses and oilseeds are also supported. This would also align MSP policies with dietary requirements and nutritional security goals.*
3. **Improved Procurement Systems**
    a. *Strengthening procurement infrastructure, including reducing middlemen involvement and enhancing government procurement facilities, would ensure that more farmers benefit from MSP. Streamlining the system and introducing digital platforms could also reduce inefficiencies and exclusion.*
4. **Environmental Sustainability**
    a. *Encouraging the cultivation of less resource-intensive crops under MSP, coupled with sustainable farming practices, would help mitigate environmental damage. Policies could incentivize organic farming and water-efficient crops.*
5. **Targeted Approaches**
    a. *The MSP system should focus on regions and crops crucial to food security and farmer welfare. Targeted interventions would improve resource allocation and ensure that the benefits of MSP reach those who need it most.*

FOOD INFLATION

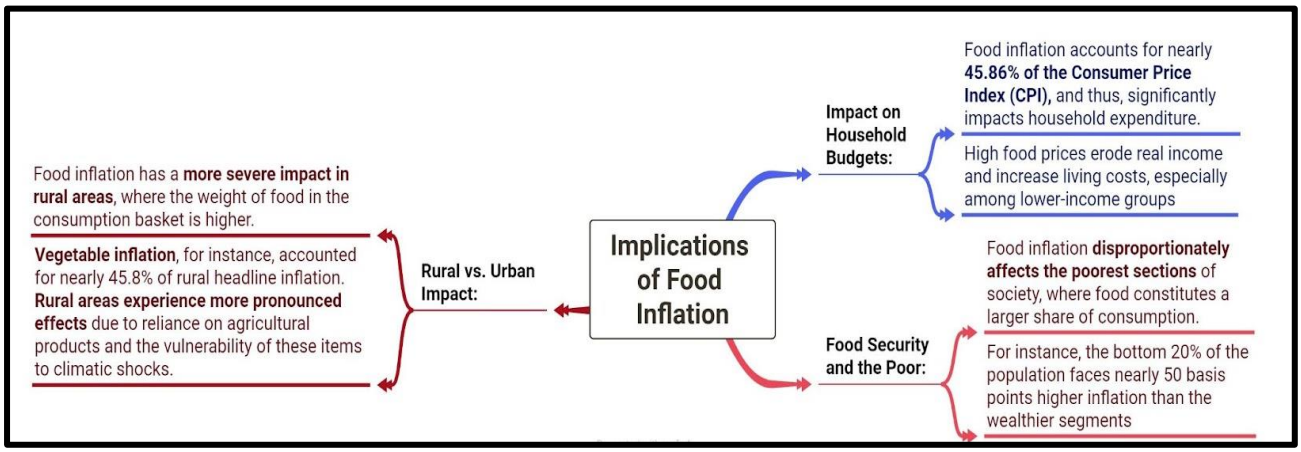
- ***Food Inflation*** *refers to the rise in the prices of food products over time, which leads to an increase in the overall cost of living. It is often measured through the* ***Consumer Price Index (CPI)****, specifically the food and beverages component, which tracks the*

price changes of essential food items like cereals, vegetables, fruits, oils, and dairy products.

- *In October 2024, Food inflation in India surged to double digits for the first time in 14 months, reaching 10.87%, as reported by the National Statistical Office (NSO).*
- *This marks a significant rise compared to 9.24% in September and 6.61% in October 2023. The increase is driven by several factors impacting both supply and demand in the food sector, with supply side issues taking a central role.*

CAUSES OF FOOD INFLATION IN INDIA

- ***Climate Change and Extreme Weather Events:*** *Climate change has intensified weather unpredictability, causing heatwaves, unseasonal rains, and extreme temperatures that disrupt crop yields. These environmental shocks lead to shortages, especially in crops like tomatoes, onions, and potatoes, which further escalate prices. Reports by economists like Dharmakirti Joshi and Rajani Sinha highlight how events like El Niño in 2023 and unseasonal rains have worsened inflation.*
- ***Global Price Volatility:*** *India's dependence on imports for commodities such as edible oils and pulses makes it vulnerable to global price fluctuations.*
- ***Global Supply Disruptions:*** *The COVID-19 pandemic and ongoing geopolitical conflicts have disrupted global supply chains, further escalating food prices by creating export shortages and increasing transportation costs.*
- ***Structural Weaknesses in Domestic Supply Chains:*** *Inefficiencies in agricultural supply chains, including logistical constraints, storage issues, and market access, lead to price volatility.*
- ***Government Policies:*** *Measures like Minimum Support Prices (MSP), import/export restrictions, and export bans on key food items have both positive and negative impacts. While they aim to stabilize domestic prices, they can also distort market signals and lead to inflationary pressure.*



MEASURES TO CONTROL FOOD INFLATION

- ***Minimum Support Price (MSP):*** *The government announces higher MSP for essential crops to encourage production and stabilize prices. This ensures a steady supply but may sometimes cause market distortions.*
- ***Price Stabilization Fund (PSF):*** *This fund is aimed at controlling price volatility, especially for essential agricultural commodities.*
- ***Export/Import Restrictions and Stock Limits:*** *The government imposes stock limits and export duties on certain commodities to curb speculation and ensure adequate domestic supply. Bans or restrictions on exports have been imposed on wheat and rice to stabilize prices.*
- ***Hoarding and Black Marketing Control:*** *Advisories against hoarding and black marketing are issued to ensure fair pricing, and the government enforces the Essential Commodities Act to curb excessive profiteering.*

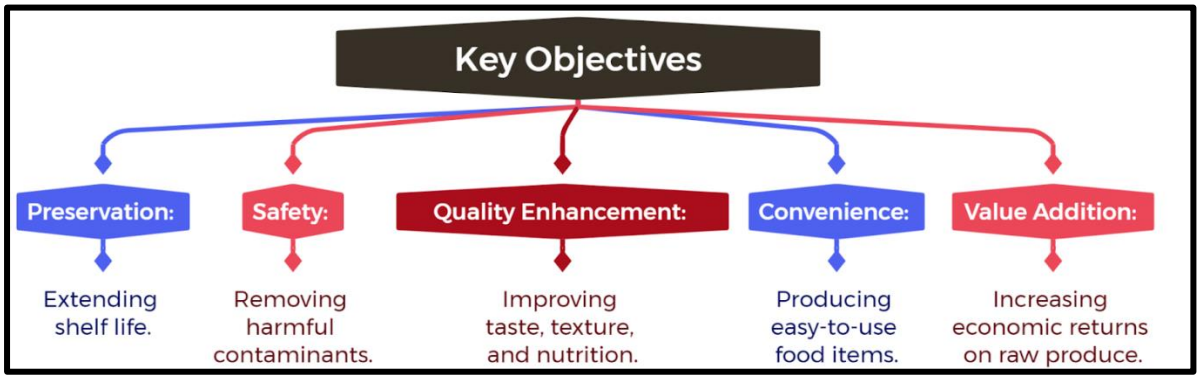
WAY FORWARD

- *There is a need for a more climate-resilient agricultural policy that can mitigate the impact of changing weather patterns on food production.*
- *Upgrading irrigation, storage, and transportation infrastructure will help reduce logistical constraints and minimize food wastage.*
- *Investment in agricultural R&D is crucial for developing climate-resilient crops and improving yields.*
- *As the demand for edible oils increases, efforts to boost domestic production of oilseeds like sunflower and mustard, as well as non-conventional oils like rice bran and corn oil, can help reduce reliance on imports and stabilize prices*

FOOD PROCESSING

- *Food processing involves transforming raw agricultural and animal materials into edible, safe, and value-added products. This process ranges from basic cleaning and grading to sophisticated methods producing ready-to-eat items.*

- ***Levels of Processing:***
    - ***Primary Processing:*** *Basic cleaning, grading, and packaging (e.g., cleaning rice).*
    - ***Secondary Processing:*** *Conversion of ingredients into consumable products (e.g., wheat to flour).*
    - ***Tertiary Processing:*** *Production of ready-to-eat or convenience foods (e.g., frozen meals).*



DRIVERS OF GROWTH IN FOOD PROCESSING

1. ***Demographic and Economic Factors:***
    - *Growing population, urbanization, and rising incomes fuel demand for processed foods.*
    - *The Indian processed food market is expected to grow to USD 470 billion by 2025.*
    - *Lifestyle changes among the youth population (65% under 35 years) boost the popularity of ready-to-eat products.*
2. ***Technological Integration:***
    - *Digital platforms to connect farmers to processors, improving efficiency.*

- Agri-tech startups enhance raw material quality via AI and satellite monitoring.
- Blockchain ensures food traceability, and IoT monitors storage and transport conditions.

3. **Government Support:**
   - **Production Linked Incentive Scheme (PLISFPI):** A ₹10,900 crore initiative for capacity building and exports.
   - 100% FDI approval under automatic route fosters foreign investment.
   - Initiatives like **Pradhan Mantri Kisan Sampada Yojana** and **PM Formalisation of Micro Food Enterprises Scheme** provide financial and infrastructural support.
4. **Product Innovation:**
   - Increasing demand for health-conscious and functional foods drives innovation (e.g., ITC's preservative-free frozen foods).
   - Revival of traditional ingredients like millets in modern formats appeals to global and domestic markets.

CHALLENGES IN THE FOOD PROCESSING SECTOR

1. **Fragmented Supply Chains:**
   - Over 86% of farmers are smallholders, complicating aggregation and supply.
   - Farmers in India receive only 30-35% of their produce's final value compared to 65-70% in developed nations.
2. **Infrastructure Gaps:**
   - India loses 25-30% of its fruits and vegetables annually due to insufficient cold storage and transport infrastructure.
   - The estimated post-harvest loss stands at ₹92,651 crore.
3. **Regulatory Complexity:**
   - Multiple overlapping regulatory frameworks (FSSAI, APEDA, BIS) increase compliance costs.
   - Absence of a single-window clearance system delays operationalization.
4. **Quality and Standards:**
   - Frequent quality rejections in export markets (e.g., EU flagged 527 Indian food products from 2020-2024).
   - Non-alignment with international standards limits market access.
5. **Skill Deficit:**
   - Only 3% of the workforce in food processing is formally trained, affecting quality and innovation.
6. **Funding Constraints:**
   - MSMEs face high-interest rates and stringent lending norms due to perceived risks, limiting technology adoption and expansion.

WAY FORWARD

1. ***Infrastructure Strengthening:*** *Expand cold chain facilities and transport networks to reduce post-harvest losses.*
2. ***Regulatory Simplification:*** *Introduce a single-window clearance system for all approvals.*
3. ***Technology Adoption:*** *Encourage IoT, AI, and blockchain for end-to-end supply chain efficiency.*
4. ***Export Ecosystem:*** *Develop export-specific zones and harmonize standards with international norms.*
5. ***Skill Development:*** *Collaborate with academia to offer specialized training programs in food safety and R&D.*
6. ***Sustainability Focus:*** *Promote biodegradable packaging and renewable energy use in processing units.*

ANIMAL HUSBANDRY

- *Animal husbandry involves the management, breeding, and care of livestock such as cattle, goats, sheep, poultry, and fish. It focuses on enhancing the genetic qualities, health, and productivity of animals, which contributes significantly to rural livelihoods and the national economy.*

ECONOMIC CONTRIBUTION

1. ***Livelihood Dependency***:
    - *Livestock supports the livelihoods of around* ***20.5 million people****.*
    - *It provides income to* ***two-thirds of rural communities****, with around* ***16% of small farm households' income*** *deriving from this sector.*
2. ***Contribution to GDP and foreign exchange earnings***:
    - *Accounts for* ***4.11% of India's GDP*** *and* ***25.6% of agricultural GDP****.*
    - *Rapid growth:* ***7.9% CAGR*** *over the last five years (Economic Survey 2020).*
    - *The* ***fisheries sector*** *significantly contributes to foreign exchange earnings, with India being a leading seafood exporter.*

TRENDS IN LIVESTOCK SECTOR

AS PER 20TH LIVESTOCK CENSUS:

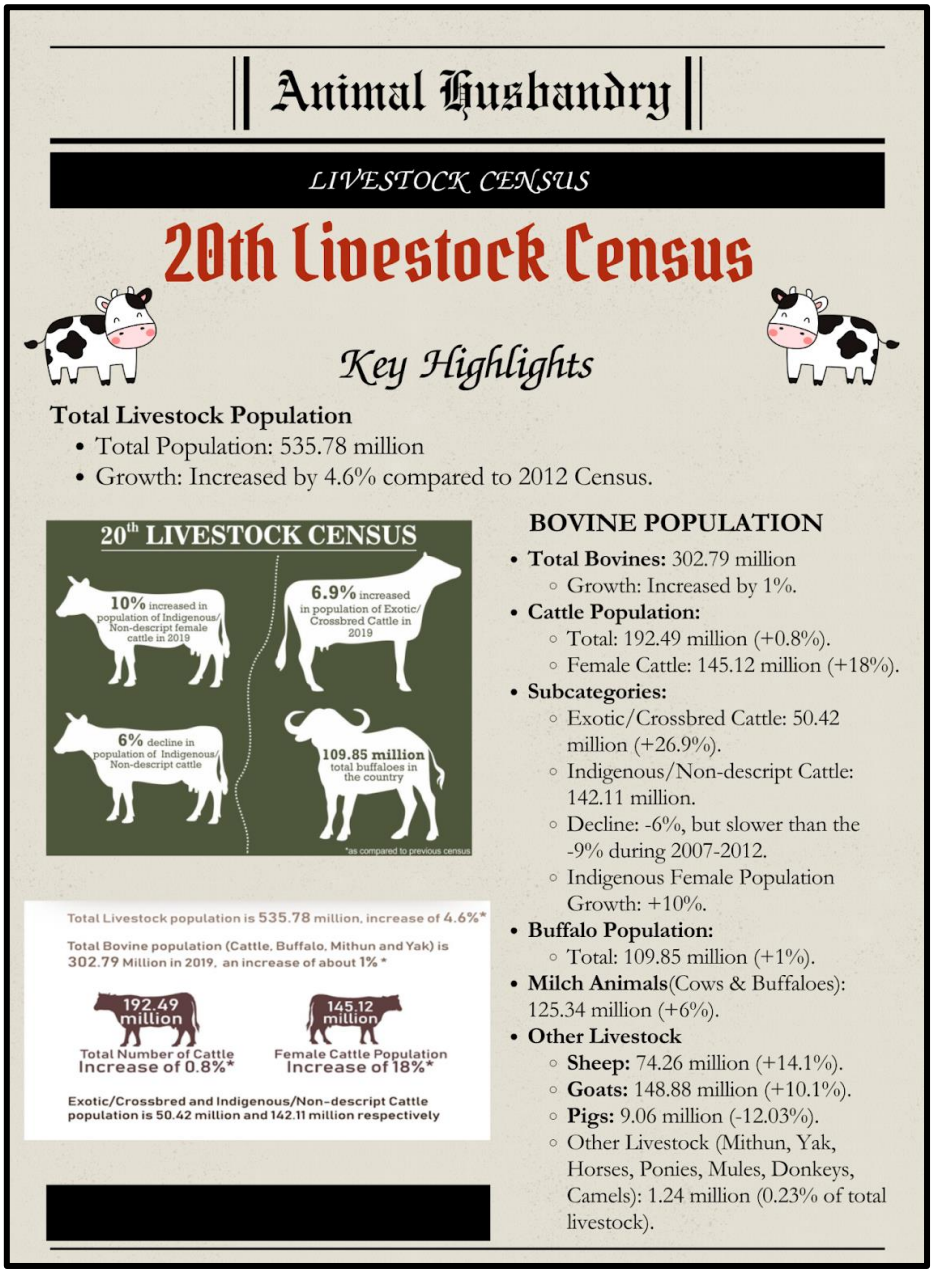
- ***Population Statistics:***
    - *Total livestock population: 535.78 million (+4.6% from 2012).*
- ***Poultry population:*** *Increased by 16.8% to 851.81 million, driven by backyard poultry growth.*
    - *Decline in indigenous cattle by 6%, while cow population increased by 18%.*
- ***Species Contribution:***

- Cattle: 35.94%, Goats: 27.80%, Buffaloes: 20.45%, Sheep: 13.87%, Pigs: 1.69%.

- **Global Rankings:**
  - First: Buffalo population (109.85 million).
  - Second: Goat population and fish production.
  - Third: Sheep population.

ABOUT LIVESTOCK CENSUS

- Initiated in **1919-20**, the Livestock Census has been conducted periodically to account for all domesticated animals in the country.
- A total of **19 censuses** had been conducted before the **20th Livestock Census (2019)**.
- The census includes participation from **State Governments and Union Territories** and covers both rural and urban areas.



SOCIO-ECONOMIC ROLE

1. **Income Generation**: Regular income from milk, meat, and wool. Further, animals act as "mobile banks" for rural families, especially during emergencies.
2. **Employment**: Provides year-round employment to the landless and less-educated rural population. Further, women contribute over 75% of labor in livestock activities.
3. **Food and Nutrition Security**: Supplies essential protein via milk, eggs, and meat.
4. **Cultural and Social Importance**: Integral to religious and social customs. Further, ownership symbolizes social security and status.
5. **Draft Power and Transport**: Bullocks and pack animals still crucial for agricultural and logistical operations in rural and hilly areas.
    - **Sustainable Agriculture**: Livestock manure serves as fuel and organic fertilizer.

CHALLENGES IN ANIMAL HUSBANDRY

- Low Productivity: Average cattle productivity in India: 1,777 kg/year, compared to the global average of 2,699 kg/year; frequent disease outbreaks like Foot and Mouth Disease reduce productivity.
- Access to Resources: Only 4% of agricultural loans are allocated to livestock, limiting access to credit; Farmers rely on informal markets, leading to exploitation and low profits.
- Degrading Resources: Shrinking pastures and fodder shortages hinder livestock growth and sustainability.
- Veterinary Challenges: Insufficient infrastructure for timely diagnosis and treatment.
- Limited veterinary labs and professionals.
- Breed Preferences: Indigenous breeds, resilient to local conditions, are neglected in favor of exotic breeds, reducing biodiversity.

CERTAIN GOVERNMENT INITIATIVES IN INDIAN AGRICULTURE

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)	• Aims for 'Har Khet ko Pani' and 'More crop per drop'. • Objectives: Attract irrigation investments, water use efficiency, on-farm efficiency, and sustainable water practices.
Paramparagat Krishi Vikas Yojana (PKVY)	• Encourages organic farming through farmer groups. • Objectives: Commercial organic production, pesticide residue-free produce, higher income for farmers.
Pradhan Mantri Fasal Bima Yojana (PMFBY)	• Crop insurance against natural calamities, pests, and diseases. • Objectives: Income stabilization for farmers, encouragement of modern farming practices, ensuring credit flow to the agriculture sector.

Micro Irrigation Fund (MIF)	• Aims to bring more land under micro-irrigation to boost agriculture production. • A fund established by NABARD to offer financial support to states in order to encourage the adoption of micro-irrigation systems
Farm Bills (2020)	• Farmers' Produce Trade and Commerce Act: Expands trade areas, allows electronic trading, and prohibits certain levies. • Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Act: Facilitates pre-arranged contracts and dispute resolution. • Essential Commodities (Amendment) Act: Removes stockholding limits on essential commodities except under specific circumstances.
Co-operative Farming	• When a farmers come together with small land holding for farmers. As it benefit in Cheap loan, better use of resources etc. • Aim to maximize profits, while cooperatives prioritize maximizing benefits for their members, often operating at zero-profit.
Atal Bhujal Yojana	• The primary goal is to promote sustainable groundwater management and address the declining water table in identified areas. • ATAL JAL focuses on community participation, decentralized governance, and the use of technology for efficient water resource management. • It provides financial support for community-led activities, infrastructure development, and capacity building to ensure effective groundwater resource management.
Kisan Credit Card Scheme	• The Kisan Credit Card scheme enables farmers to access formal credit to meet their agricultural needs, including crop production, post-harvest expenses, and consumption requirements.
Land Consolidation	• Land consolidation involved the reorganization of fragmented landholdings to create large and productive plots of land. To improve agricultural productivity and reduce the fragmentation of land.
Improving Agriculture Marketing	• Elimination of the middlemen, giving better access to agricultural mandis and awareness generation among farmers.

Interest Subvention Scheme	• The Government had decided to ensure that farmers receive short term credit at 7% with an upper limit of Rs. 3.00 lakh on the principal amount. The policy came into force with effect from Kharif 2006-07.
Neem coated Urea	• Urea coated with neem oil to reduce solubility rate of urea and improve crop production.
Swamitva Scheme	• The scheme was launched in 2020. It aims to provide a solution to integrated property validation for rural India.