Agri-Food System of India – Problems and Prospects

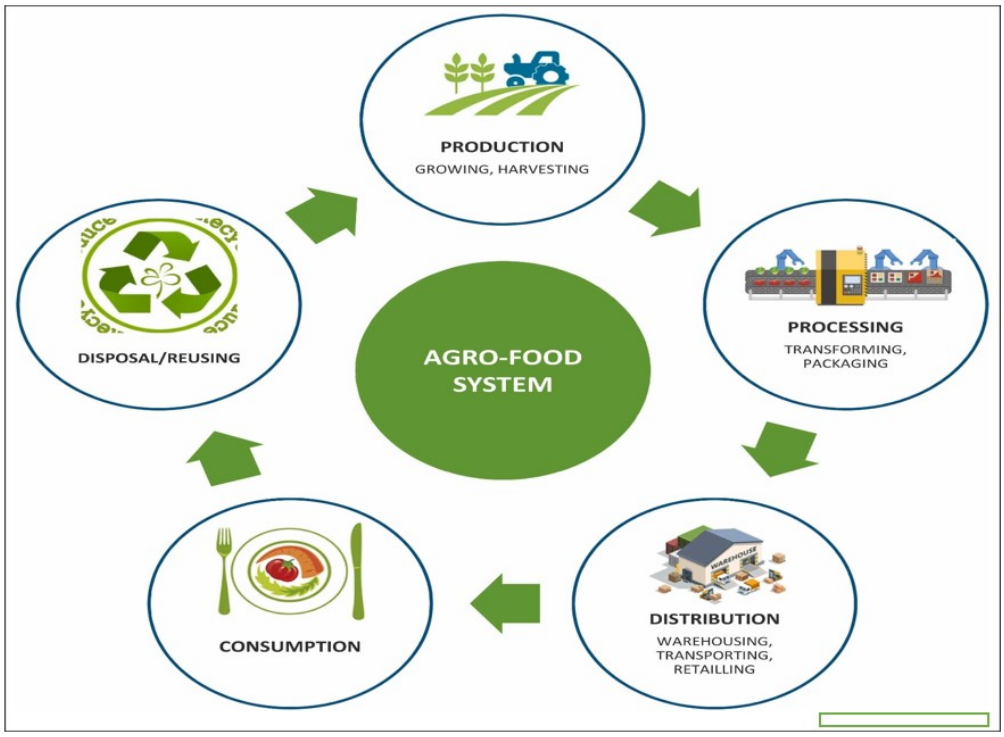
Mains: *GS III - Food Processing and Related Industries in India- Scope' and Significance, Location, Upstream and Downstream Requirements, Supply Chain Management*

Why in News?

As India embarks on its transformative journey towards becoming a developed nation by 2047, no challenge is more fundamental than reimagining how we produce, process, trade, and consume food.

What are agri-food systems?

- **Agri-food systems** – It is a complex network encompassing all activities from agricultural production *(crops, livestock, fisheries, forestry)* to consumption and disposal, including storage, processing, transportation, distribution, and marketing.
- **Components –** The components of agrifood systems are production, processing, distribution, consumption, disposal/reusing.



- **Global economic value** – The global agrifood system has significant direct economic value from agricultural output, which was approximately *$4.8 trillion in 2024-2025.*
- Beyond this, the system's reach extends much further, encompassing storage, processing, transportation, and retail, making it a foundational economic sector.

- **Hidden costs** – The value is *complicated by $10-$12 trillion* in annual hidden costs, mainly from unhealthy diets leading to diseases, that are not accounted for in traditional economic analyses.

What are the scenarios in India?

- **Total value** – The Indian food processing market is anticipated to reach $535 billion by 2025.
- The gross value of output from agriculture and allied sectors was ₹29.49 lakh crore in 2023-24, with continued growth anticipated.
- **Hidden costs** – A $1.3 trillion hidden cost associated with these systems, driven largely by unhealthy diets.
- **Total production of agro – foods**
  - **Food grains** – 354 million tonnes
  - **Horticulture** – 367 million tonnes
  - **Milk production** – 239.30 million tonnes
- **Exports** – $51.91 billion in exports
- **Challenges** – Significant *nutritional deficiencies* persist particularly among *children under 5 years and women of reproductive age*.
- This paradox of being food secure while remaining nutritionally vulnerable illustrates why incremental reforms are insufficient.

What are the legacy of green revolution?

- **Focus on rice and wheat** – For over five decades, India's agricultural policy has been optimised for maximum yields and price stabilisation through public procurement of rice and wheat.
- **Associated challenges** – While achieving food security, this approach created today's challenges
  - Soil degradation in one-third of agricultural land,
  - Water stress in more than half the country's districts,
  - Critically low soil organic carbon levels, and increasing market risks for farmers.
- Climate change further exacerbates these challenges.
- Despite surplus production, nutritional deficiencies persist across all income groups.
- **Government initiatives** – Schemes such as the
  - Pradhan Mantri Krishi Sinchayee Yojana (**PMKSY**)
  - Pradhan Mantri Dhan-Dhanya Krishi Yojana (**PMDDKY**)
  - National Mission on Natural Farming (**NMNF**)
- These policies , are in the right direction and intend to optimise resource use and prioritise livelihoods and sustainable agriculture,however, there is a long way to go

Why there is a need for agri-food system framework?

- **Increased non-farm employments** – The average non-farm sector income is more than twice that of farming, high yield gaps, and a food surplus in most commodities.
- India needs a complete transformation from production-focused agriculture to comprehensive agrifood systems.

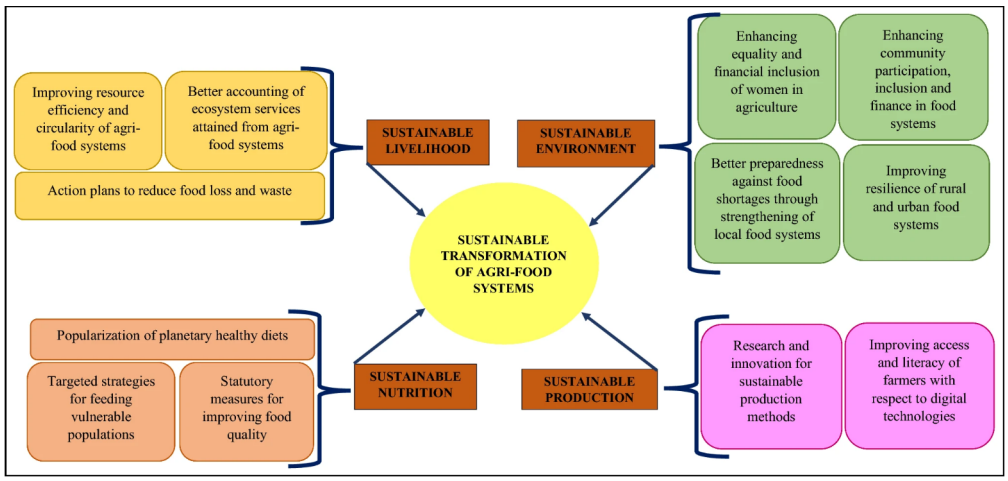
- **Offers a shift** – The agrifood systems framework offers a paradigm shift away from single-metric optimisation.
- **Provides optimization** – Instead of maximising only yields, it seeks to optimise simultaneously across three critical dimensions:
    - Economic viability for farmers,
    - Human health outcomes, and
    - Environmental sustainability.
- **Recognises our food systems** – This approach recognises that our food system encompasses the entire journey from farm to plate, not just production.

What are the triple challenge of 2047?

- **Triple challenges**
    - Guaranteeing food security – By 2047, India must feed 1.6 billion people
    - Ensuring adequate nutrition, not just calories.
    - Simultaneously reversing decades of environmental degradation and build resilience against escalating climate risks.
- **Restructuring** – This triple challenge demands fundamental restructuring.
    - **Economic optimization** – It means creating market-driven production systems that respond to consumer demand for diverse, nutritious, and sustainable foods rather than just staple grains.
    - **Health optimization** – It involves transitioning from "eating enough**"** to "eating well"—promoting nutritious commodities like millets, legumes, fruits, vegetables, fish, and dairy that provide essential nutrients.
    - **Environmental optimization** – It requires regenerative practices that improve soil health, conserve water, and reduce greenhouse gas emissions while maintaining productivity.

What can be the pillars of transformation?

- **Research Reorientation** – Programmes prioritising nutritional quality and regenerative systems alongside yield, and resource use efficiency
- Research optimising resource use, across entire watersheds and landscapes, and inclusive value chain innovations promoting inclusion and circularity within food systems.



- The future lies in research that treats farms as part of larger ecosystems, rather than isolated production units.
- **Digital innovations** — *Artificial Intelligence (AI), Machine Learning (ML), the Internet of Things (IoT),* and real-time integrated data dashboards can accelerate research outcomes and power efficient decision-making.
- **Policy Repurposing** – Agriculture subsidies should be repurposed from unsustainable practices toward sustainable practices, climate-resilient infrastructure, and market-driven incentives.
- Policy reforms are needed to attract increased private investments into agricultural supply chains.
- True cost accounting for heavily subsidised energy and water resources will help correct distorted production decisions.
- **Eco-labelling and green credit systems** – It can create market incentives for sustainable practices, making environmental stewardship economically attractive.
- The farmers must be compensated for the societal ecosystem services generated by agriculture.
- **Institutional Innovations** – The transformation requires new institutional arrangements that navigate complexity and foster collaboration.
- Farmer-producer organisations/companies (FPOs/FPCs) and women's SHGs (self-help groups), besides cooperatives, can become the vehicle of agricultural transformation.
- **Improving collaboration** – Aligning FPOs/FPCs with agri-tech start-ups and anchoring them to the National Agricultural Research and Extension System (NARES) could be a game-changer in nurturing innovations.
- **Encouraging entrepreneurship** – Agri-tech start-ups and agri-entrepreneurs who face inconsistent markets and high transaction costs need greater policy incentives like the *Production Linked Incentive (PLI)* scheme and NARES's support for domain knowledge.
- **Setting up of regional task forces** – We need district-level and state-level task forces for agri-food systems that bring together farmers, researchers, extension, policymakers, processors, retailers, and consumers to coordinate local food systems.
- **Awarness creation** – To mainstream the agri-food systems approach in planning and action, there would be a need to create sustained awareness of systems thinking and strengthen capacity across scales and ensure enabling governance.
- **Cross-sectoral Convergence** – Food system transformation requires unprecedented coordination across government departments.
- From agriculture and water resources to power, rural development, food processing, fertilisers, environment and climate change, and nutrition sectors coordination is essential.
- This convergence extends beyond government to include private sector actors, civil society organisations, and research institutions.
- The *Indian Council of Agricultural Research (ICAR)* could play the role of a catalyst in encouraging this cross-coordination.

What are the Implementation Imperatives?

- **Helps in policy making** – This data-driven approach enables evidence-based policymaking and helps navigate trade-offs between objectives.

- **Offers immediate benefits** – It includes reduced transportation costs, improved food freshness, and enhanced community resilience and nutrition.
- **Strengthens local food systems** – Contextualised innovations and business models can strengthen local food systems, improve nutrition, and create employment opportunities across rural areas.
- **Reduces income disparity** – It addresses the income disparity where *non-farm income is 2.5 times higher than farm income*.
- **Creates employment** – It can create millions of jobs across the food value chain while preserving natural resources for future generations.
- **Promotes waste to health** – This approach transforms agricultural residues into valuable resources—biofuels, compost, or other products—creating additional income streams while reducing environmental pollution.
- **Creates a cycle of sustainability** – Combined with good agricultural practices and robust food safety standards, this creates a virtuous cycle of sustainability and profitability.
- **Future prospects** – A successful agri-food systems transformation can position India as a global leader in sustainable food production while ensuring nutritional security for all citizens.

What lies ahead?

- As we work toward Viksit Bharat 2047, how we transform our food system will largely determine whether we achieve our vision of a developed, prosperous, and sustainable India.
- The choice is clear that continue with incremental changes or embrace a comprehensive transformation that our future demands.
- The time for systems thinking in agriculture is now and India's agri-food revolution awaits

Reference

Down To Earth| Agri Food System