



# Evidenced Food Systems Transformation Policies in the Context of Viksit Bharat

7 April 2026

Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



# Broad Overview of Price Policies, Climate Change and Trade

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(with support from Ritika Juneja)

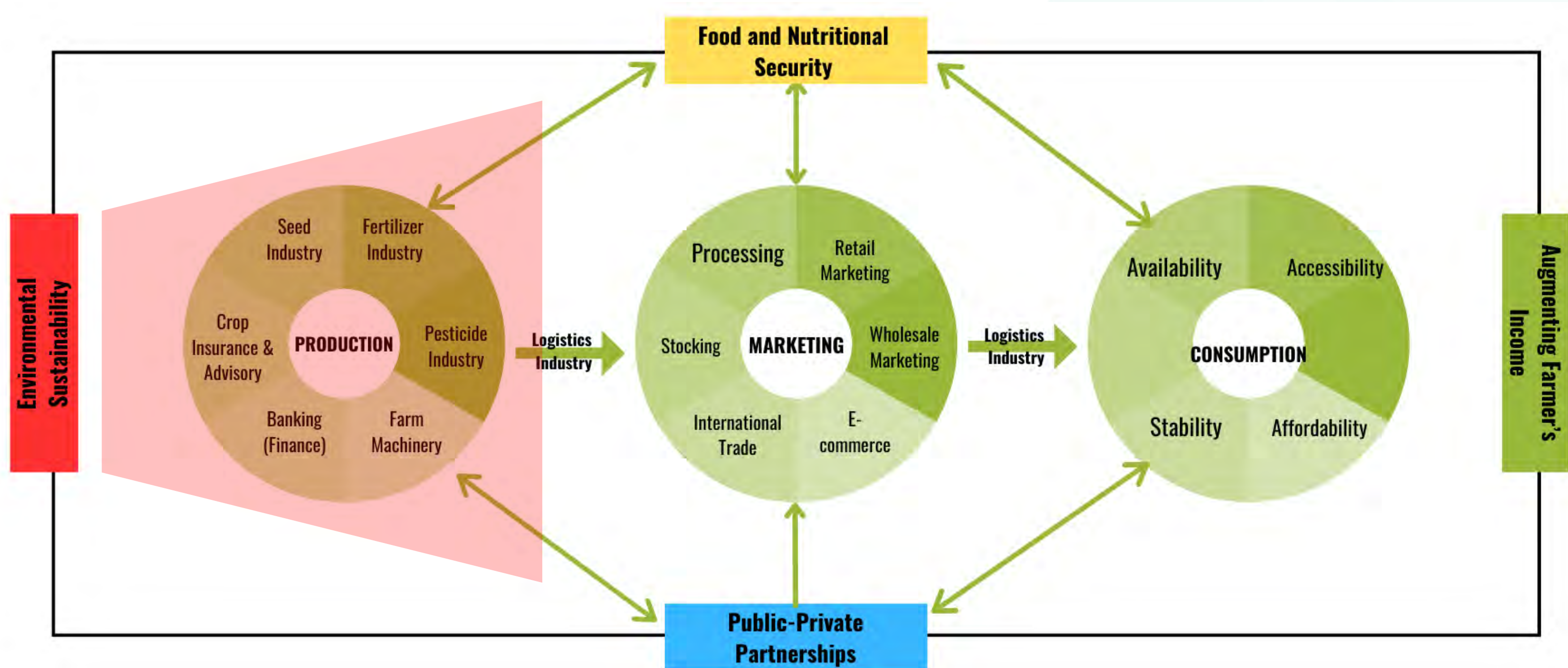
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# Overview of Pillars of Agri-Food Systems

Agriculture is not just production of food, but a full food system that stretches from production to marketing to consumption.



# Why is there a need to transform Agri-food Systems?

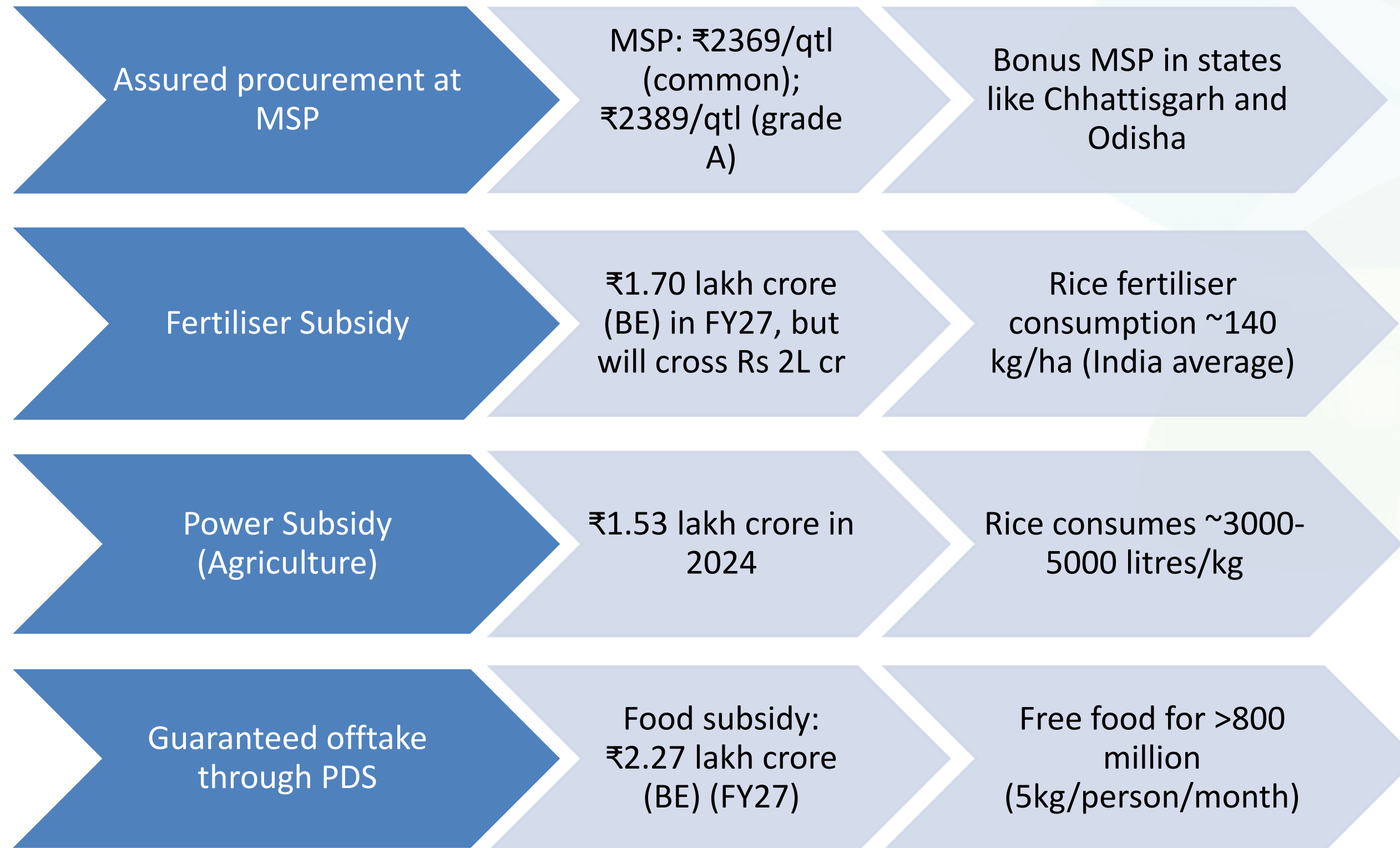
- **Increasing number of mouths to feed** – By 2030, global population is going to be 8.5 billion .. And by 2050, it will be 9.7 billion... (UN Population projections);
- **Increasing urbanization** - 68% of the global population is projected to live in urban area by 2050 (UN, 2018);
- **Increasing fragmentation of land holdings;**
- **Extreme weather events due to climate change** - Global surface temperatures rose above pre-industrial levels (1850-1900) by **+1.1 °C** in the last century (IPCC, 2024)
- **Soil, Water, Air, and Biodiversity (SWAB) are under pressure**

# Overview of Output Price Policy:

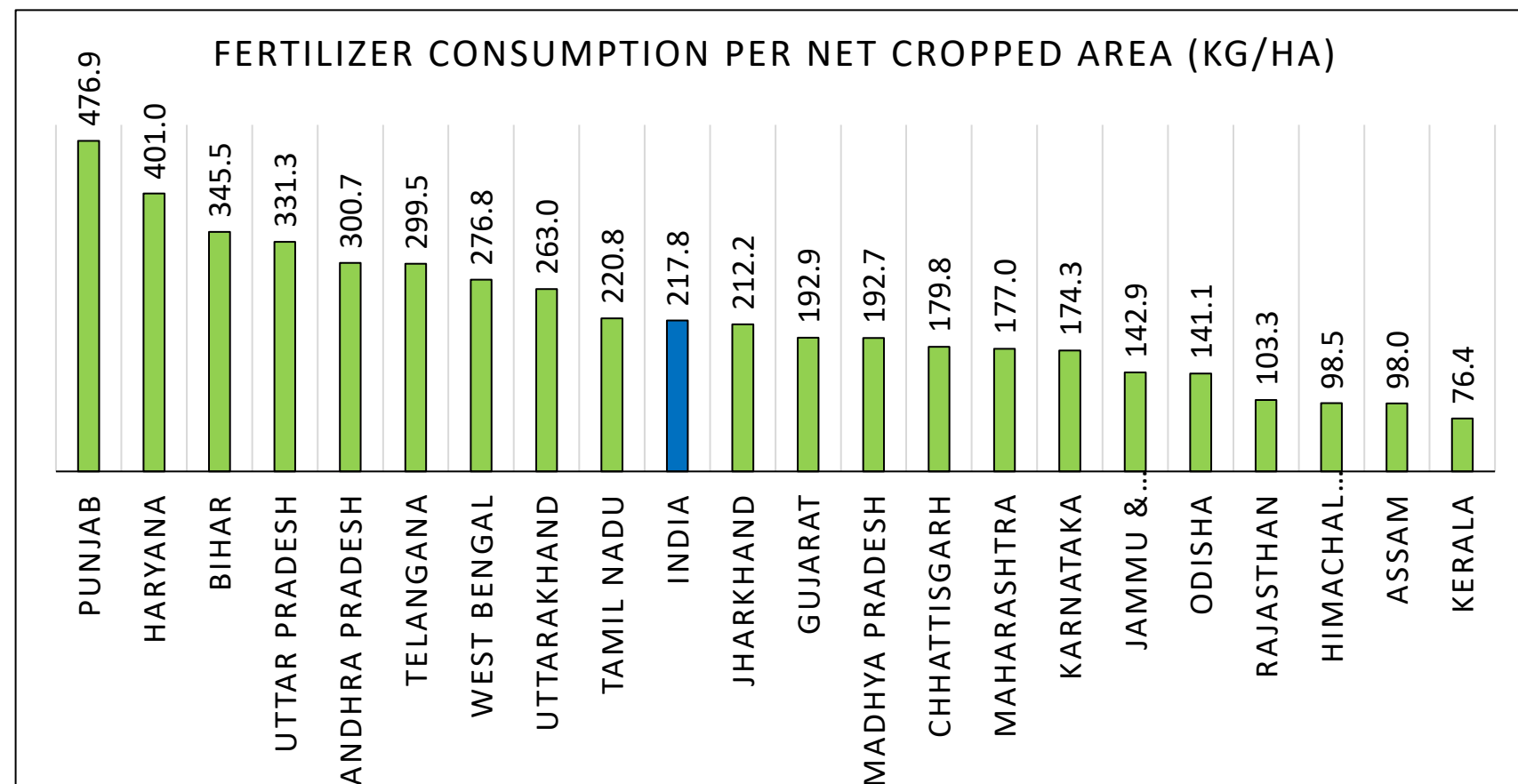
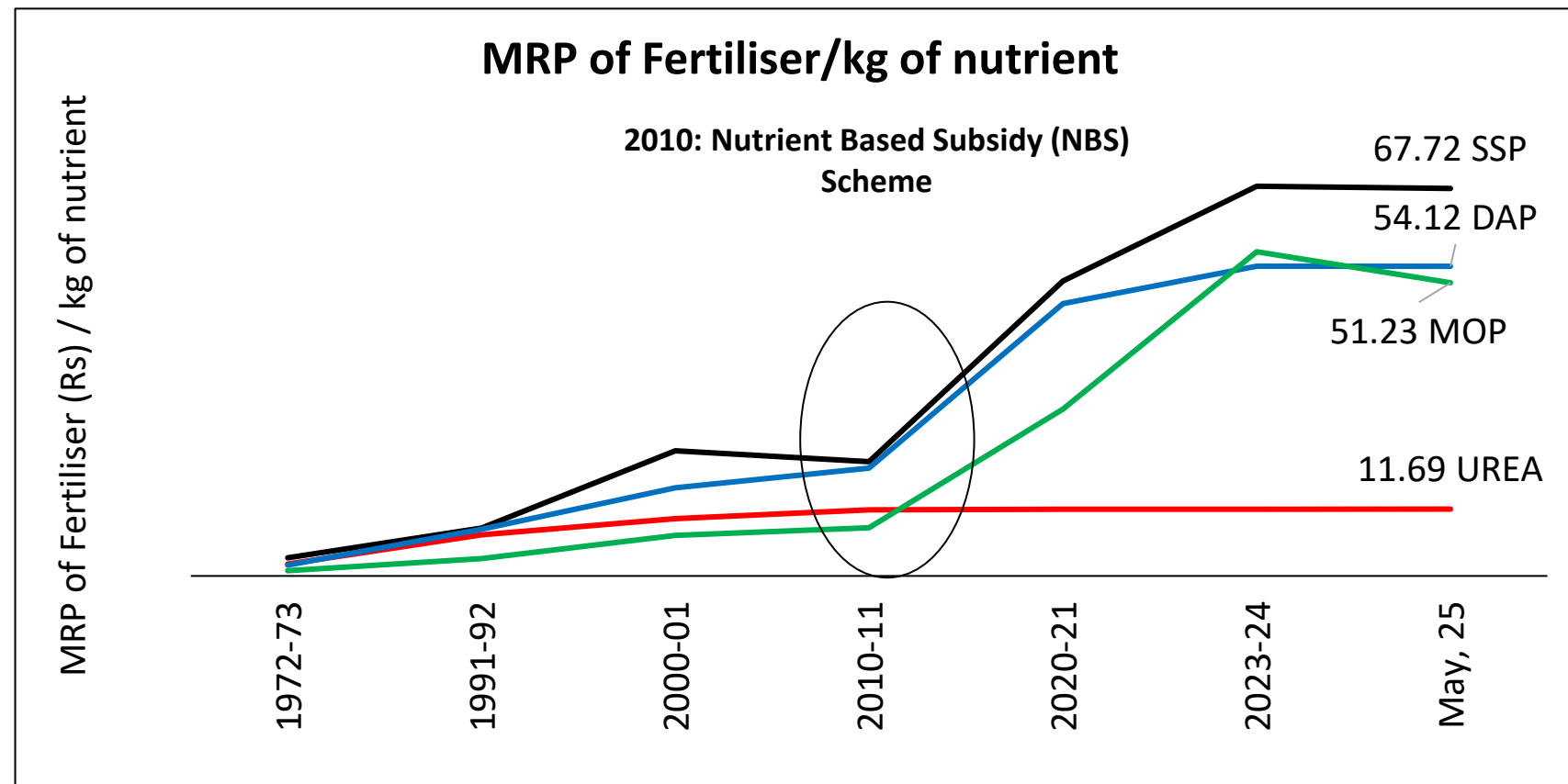
MSP for 23 crops, but effective mainly for wheat and paddy

- India's is the world's second largest producer of wheat (118 mt) and largest of rice (152mt)
- Wheat Production : 1965: 10 MMT and in 2025: 118 MMT (almost 12 times increase)
- Rice Production: 1965: 31 MMT; 2025- 152 MMT (5 times increase)
- India is the largest exporter of rice: 25 MMT in a global market of 63 MMT (40%) in 2025;
- Exporting Rice (backed by subsidies) means virtual export of water of ~50 billion m<sup>3</sup>
- Bulging stocks even after distributing free rice and wheat (5kg/capita/month) to more than 800 million people
- Rice stock on Jan 1<sup>st</sup>, 2026 (68mt) almost 9 times the buffer stock norm (7.6mt).
- FCI's economic cost for rice is about Rs 43/kg, selling for ethanol at Rs 23/kg
- Food Subsidy Bill (Budgeted for 2026-27) – INR 2.27 lakh crores

# MSP with open-ended procurement, and highly subsidized fertilizers and power, create skewed incentives towards Rice vis-à-vis other Kharif Crops



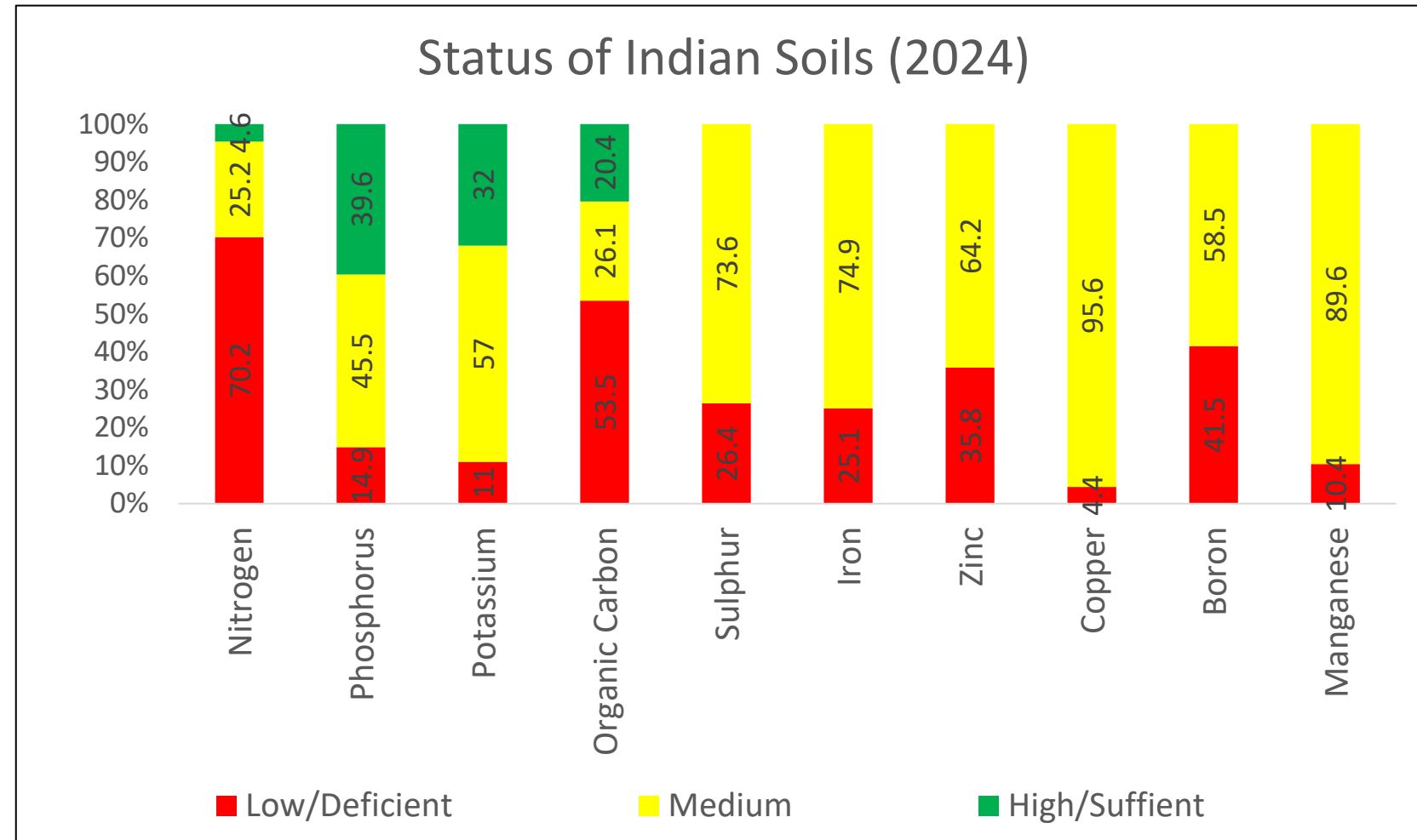
# Overview of Input Price Policy: Fertiliser Subsidy



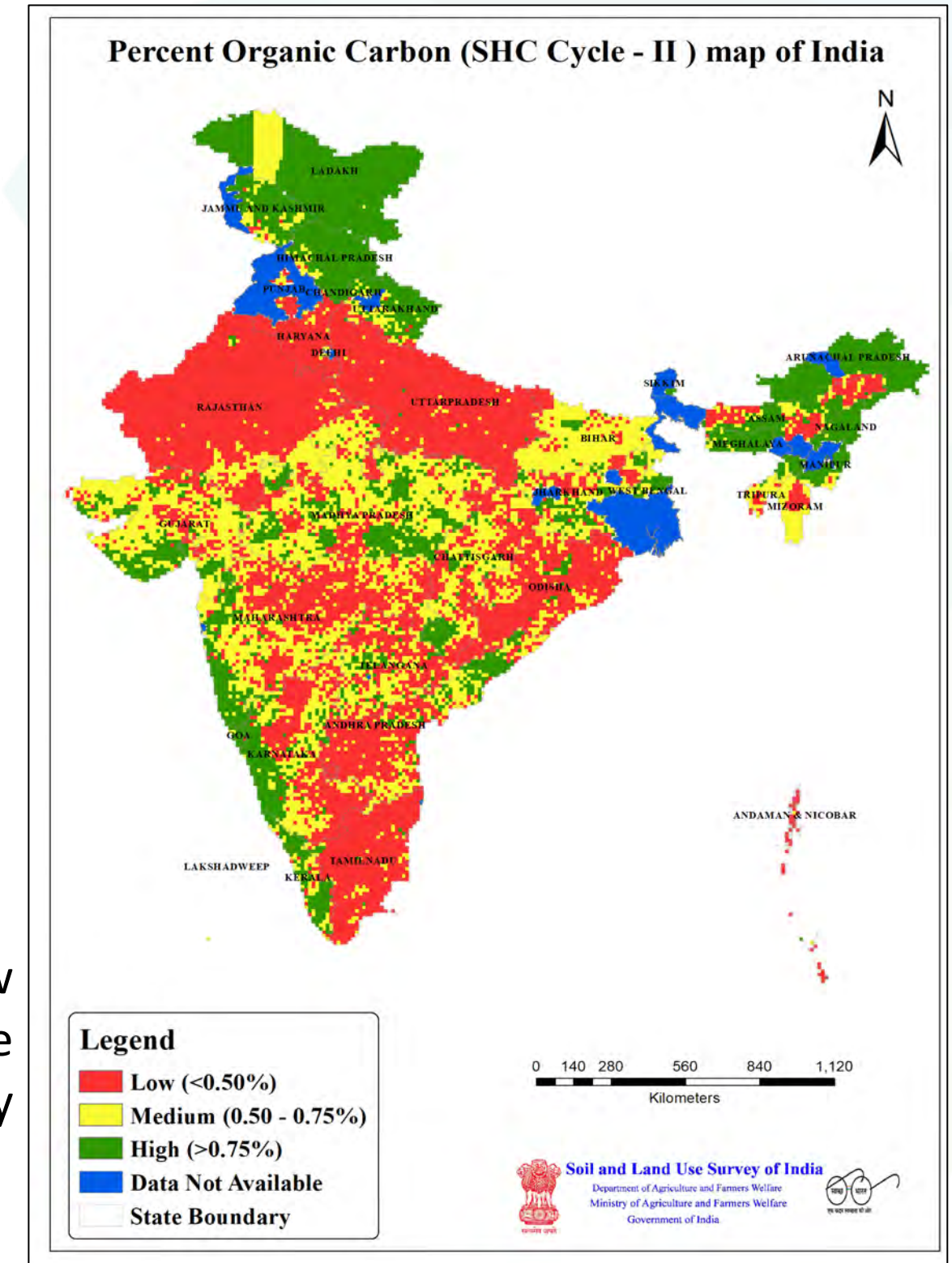
- Fertiliser Subsidy and the Retention Price Scheme (RPS) were introduced in 1970s following the global oil crisis;
- Urea prices are stagnant since 1970s. It only covers 15-20% of cost of production or import.
- DAP prices more than tripled & MOP prices soared by 6 times after NBS scheme in 2010
- Heavy subsidisation of nitrogen (~85%), leads to excessive use, leading to environmental havoc (only 35-40% is absorbed), as well as diversion for non-agricultural purposes and beyond borders
- Phosphate and Potash fertilizers are regulated under NBS scheme - there is a fixed subsidy on P (44%, Kharif 2025 ) & K fertilizer products (only 5%), and retail price is decontrolled
- Thus, overuse of N, underuse of P and K => Imbalanced Fertilisation
- Punjab leads with highest fertilizer consumption at 476.9 kg/ha, followed closely by Haryana at 401 kg/ha, and Bihar at 345.5 kg/ha, among others

# Impact on Soils:

Imbalanced use of fertiliser consumption (NPK) has degraded soils

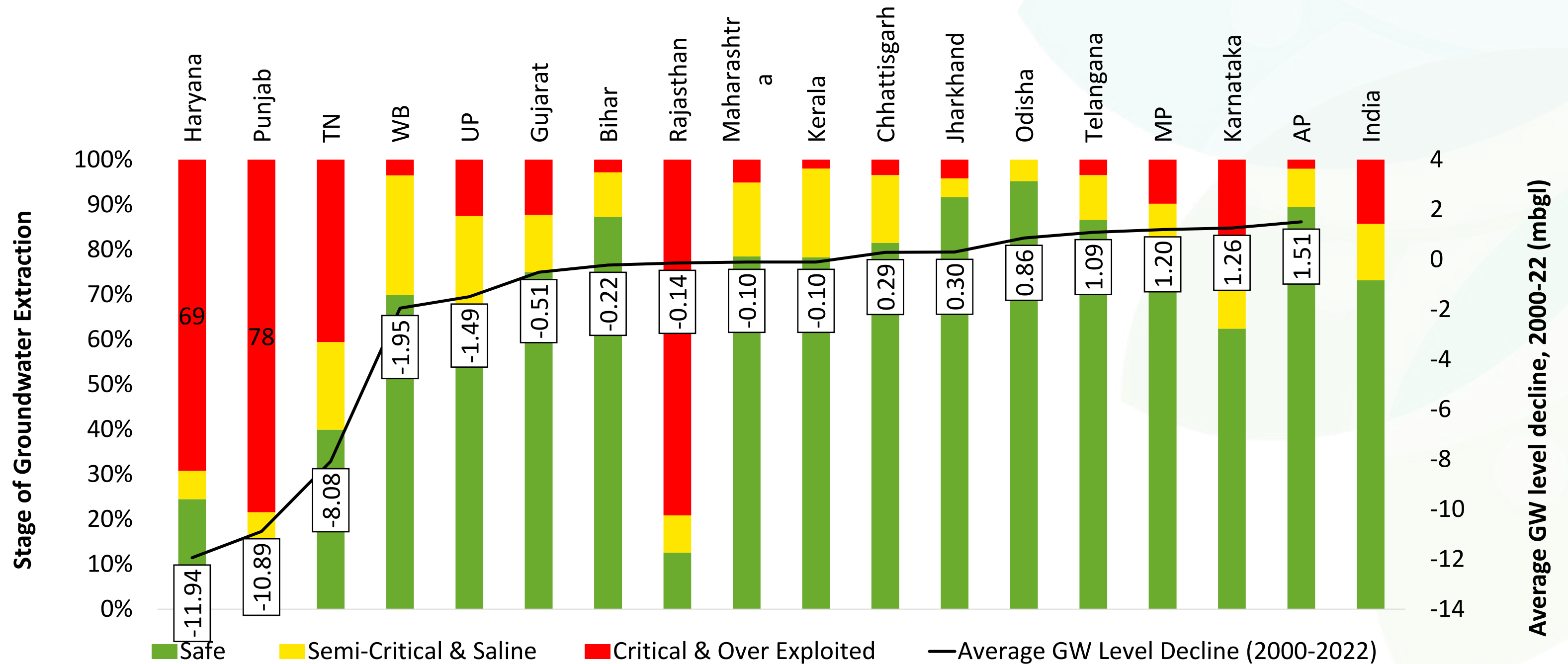


- Based on SHC 2024-25, out of 8.9 million samples analysed, 53% soil samples are low in soil organic carbon (SOC) (<0.5%) & >75% are <0.75%; only 5% soil samples have adequate N (> 560 kg/ha); only 39.6% samples has adequate P (>25 kg/ha) and only 32% contain adequate K (>280 kg/ha)
- 36% samples are deficient in zinc; 25% in iron, 41% in boron and 26% in sulphur



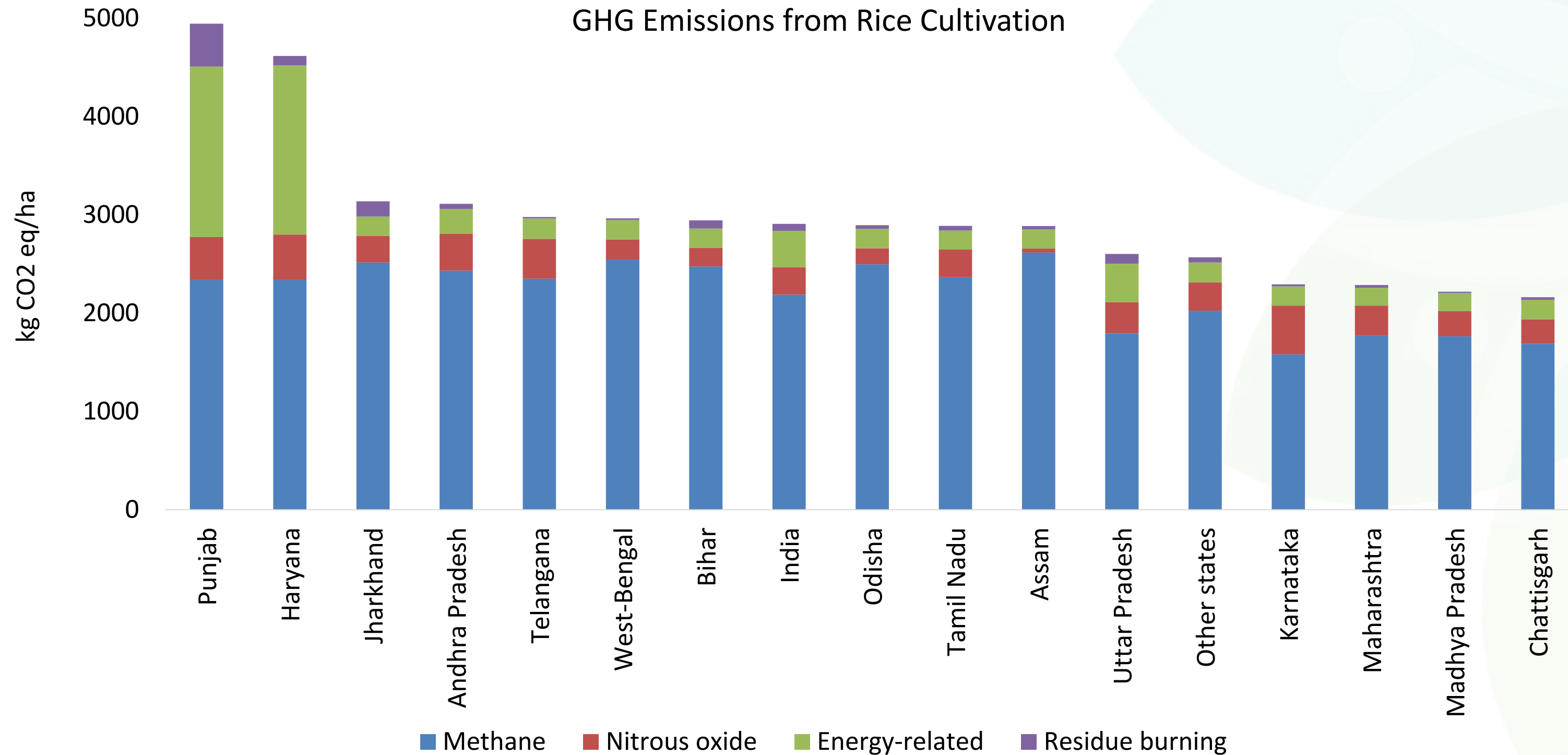
# Impact on Water:

Free/highly subsidised power for irrigation depleting groundwater levels in Punjab and Haryana by 1.7 ft annually (2000-2022; CGWB)



# Impact on Air:

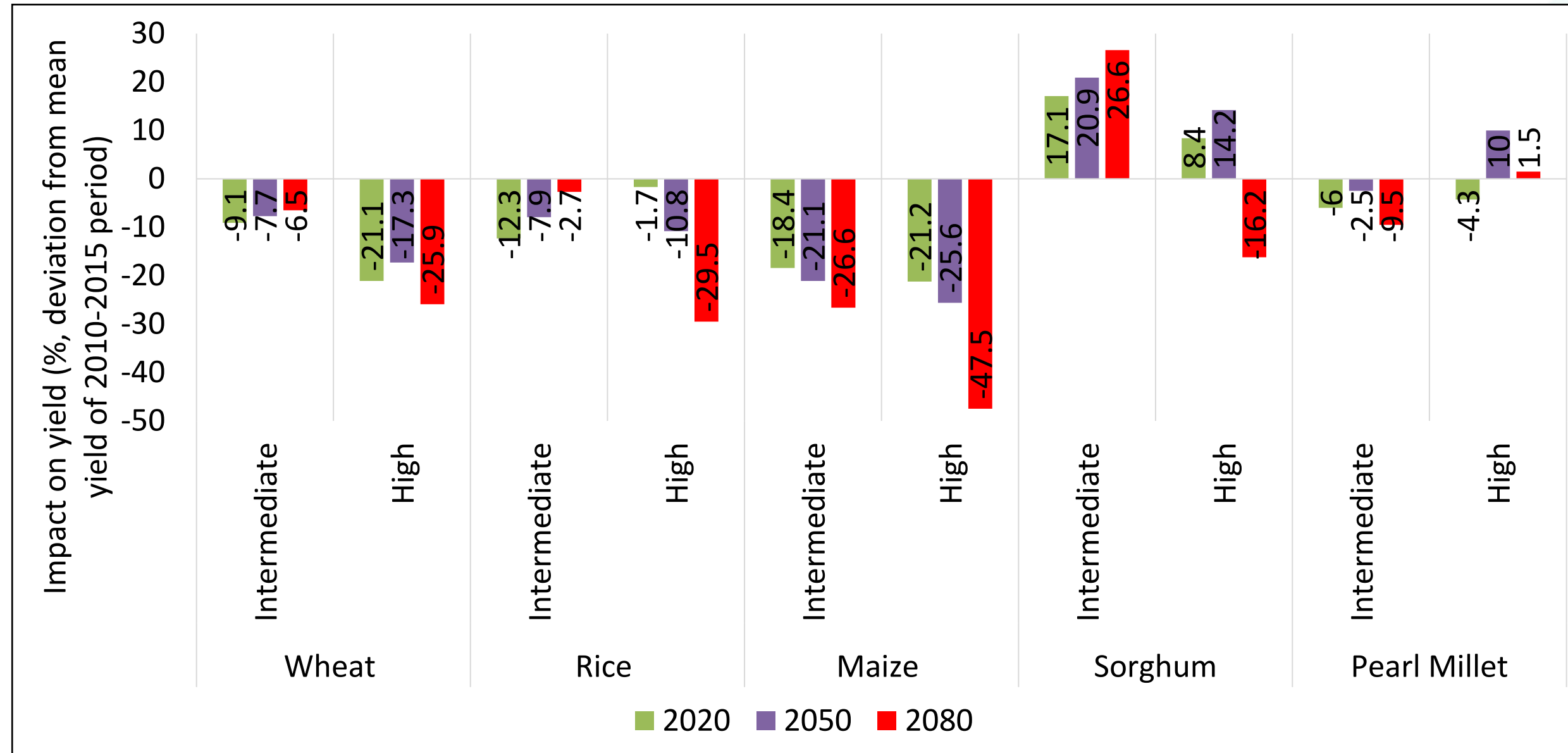
Punjab and Haryana have the highest GHG emissions from rice cultivation: ~5 t/ha



Source: Singh & Gulati, 2025

# Indian agriculture is both a victim of climate change and a contributor to it..

## Projected impacts of climate change on cereals and millets



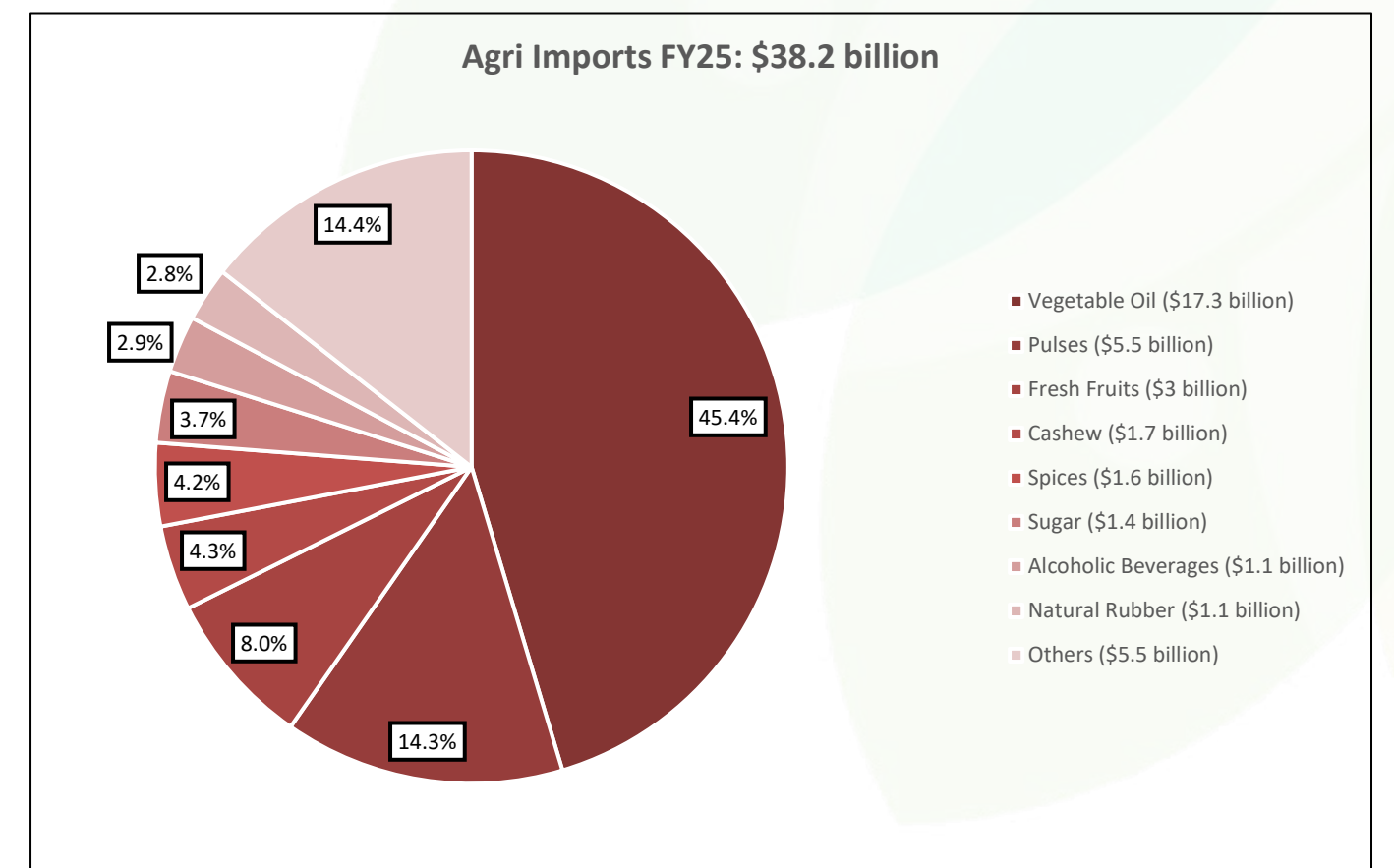
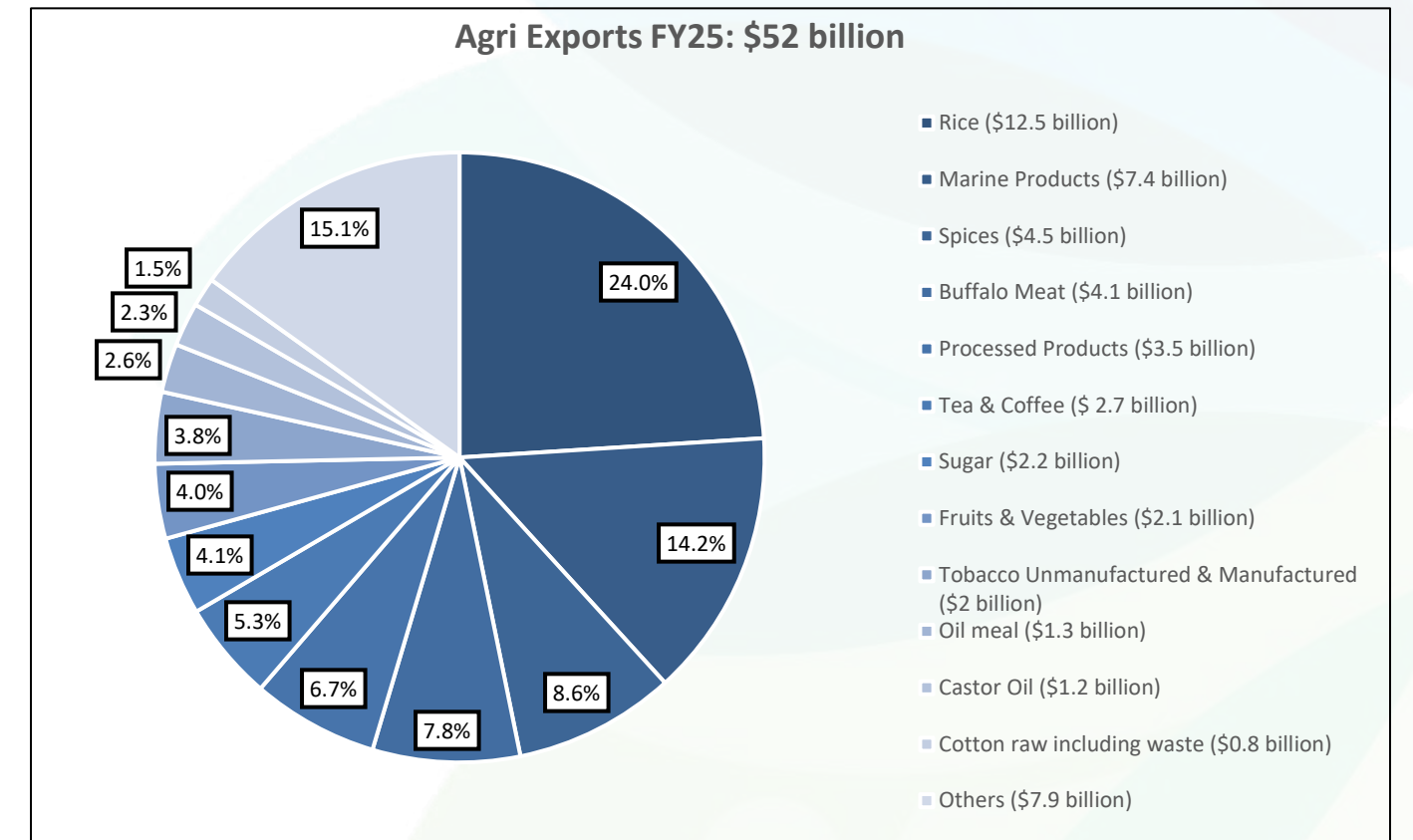
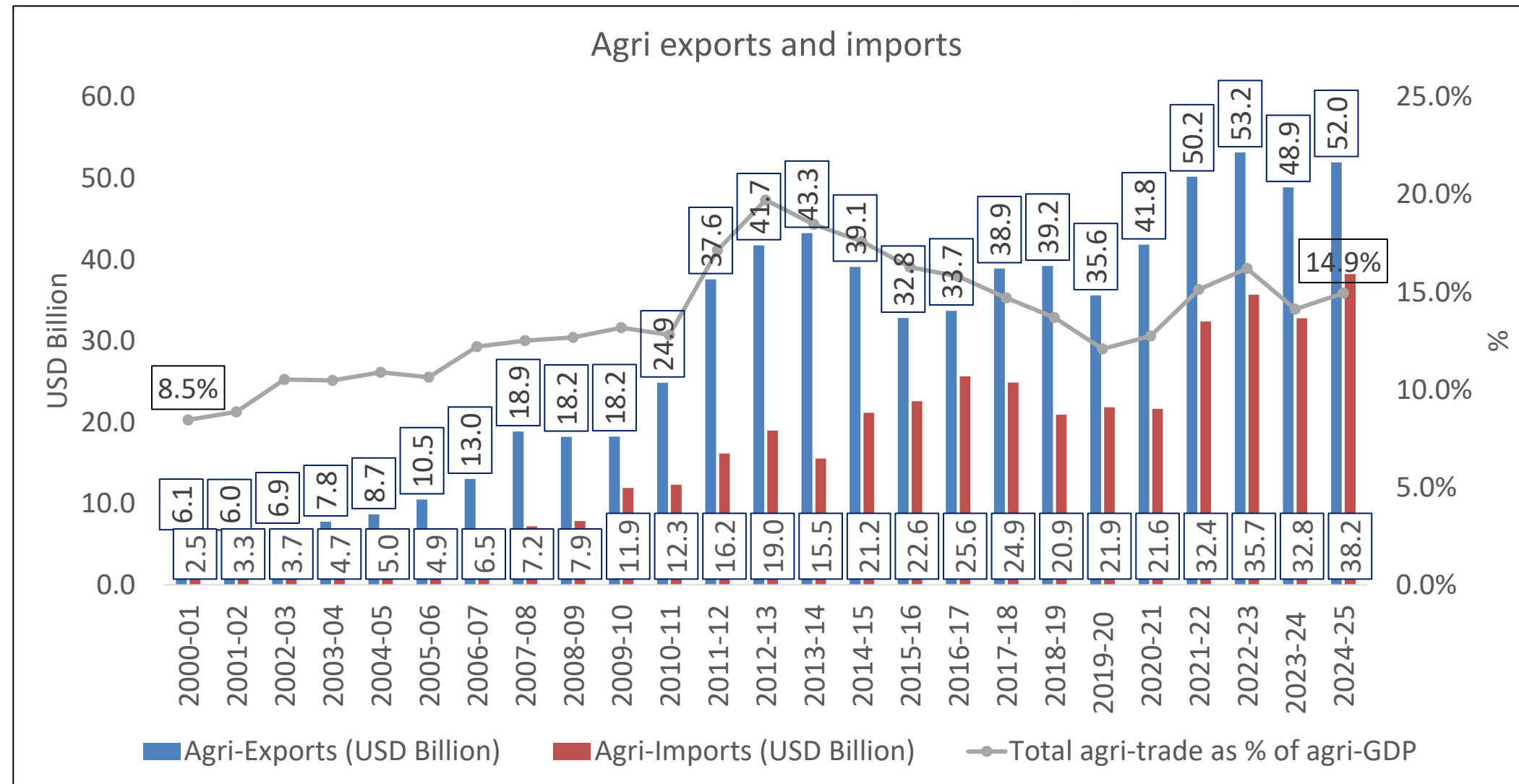
Projected economic value of crop loss in India due to climate change impacts (MoEFCC 2023):

- USD 28.6 to 54.8 billion during 2030–2050 & USD 612 to 1,014 billion during 2050–2100 (under intermediate emission scenario)
- USD 70.0 to 122.9 billion during 2030–2050 & USD 1,436–2,691 billion during 2050–2100 (under high emission scenario)

Note: Based on different emission scenarios (ICAR)

- Increase in the minimum temperatures by 0.95 - 4.07°C in 2020 to 2080 period over baseline (1976- 2005 period) in *Kharif*; and by 1.09-4.65°C in *Rabi*.
- Increase in maximum temperatures by 0.74 - 3.53°C (2020 to 2080) during *Kharif* and by 0.88 - 4.01°C in *Rabi*.

# India is still a net exporter of agricultural produce...



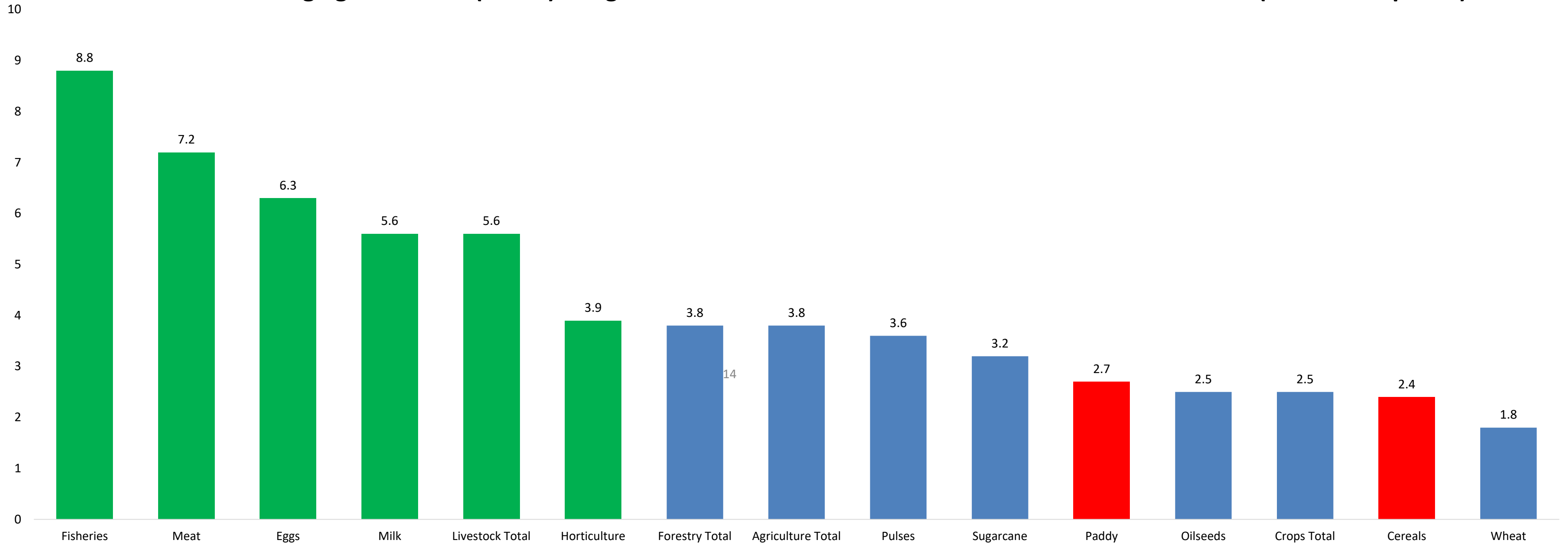
- Rice accounts for 24% share in agri-exports (FY25). It's a water guzzler and subsidised heavily through cheap/free power for irrigation as well as fertilizers, especially urea.
- Vegetable oil is most prominent import item, accounting for about 45.4% share (at USD 17.3 billion). Thus, making India the largest importer of edible oil

## Way Forward: Need to target food subsidy-Vajpayee formula

- India's poverty has come down substantially, thus, food policy needs to be revisited. Free to Antyodaya but 50% of MSP to BPL and 90% to APL- Vajpayee formula ...better move towards direct income transfers to PDS beneficiaries to reduce PDS leakage.
- The Shanta Kumar Committee Report recommends gradually reducing coverage from 67% to 40% to 25%.
- Convert at least 20% of FPS into nutrition hubs, with pulses, oilseeds, milk, eggs, fruits & vegetables, more nutritious than just wheat and rice. Beneficiaries can be given food coupons (e-wallet) to buy diversified food.
- Move towards 'crop neutral incentives': shift 5mha of paddy to pulses, oilseeds, and F&V (Rs 35,000/ha for shifting away from paddy in Punjab-Haryana belt for at least 5 years)
- Streamline and structure a stable trade policy regime - "farm-to-foreign" strategy where exports can be augmented and imports can be compressed, based on "comparative advantage" principle.
- Investment in building global value-chains, backend infrastructure with storage and processing facilities - **Improve farmers' capabilities**
- Make best use of digital economy (ICT): **Delivery of knowledge till the last mile**

# Move away from cereals, especially rice, and align to demand based production of high-value agriculture

Annual average growth rate (AAGR) of agriculture and allied sub-sectors from 2014-15 to 2023-24 (at 2011-12 prices)



*Horticulture includes Fruits, Vegetables, Spices, and Floriculture*

## Way Forward: Re-orient fertilizer and power subsidy policy for higher productivity and sustainability?

- Either put **quantitative restrictions** on Urea – rationing. (Eg: LPG Cylinders)
- Or **deregulate the system & compensate farmers through Direct cash transfers on pe ha basis**: top up with PM KISAN. This will allow farmers to decide whether to opt for natural farming, use biofertilizers, biochar or continue with chemicals as well as plug leakages!
- **Or at least bring urea under NBS**
- Most important operational challenge will be identifying the tenants. *NITI Aayog says 35-40% tenancy is there.*
- This will need massive triangulation of data from different sources – PM Kisan, Land records, KCC, Fertilizer sales, SHCs, Space Technology using AI-ML
- To rationalise Power subsidy - Free up input prices to market levels or charge at least full cost pricing for power, and canal waters fees (*State subject*)

# Way Forward: From food security to nutritional security

- Zinc deficiency in Wheat and Rice leads to Zinc deficient diets which leads to Stunting (35% of children under 5 years are stunted in India, NFHS 5 (2019-21))

## Biofortification - breeding micronutrients into staple crop

- In India, 109 biofortified varieties of Field and Horticultural crops released by the Prime Minister through ICAR on 11<sup>th</sup> August 2024 in PUSA, New Delhi.
- Of these 23 were for cereals – 9 zinc and iron rich rice varieties and 2 zinc and protein rich wheat varieties
- **Rice varieties:** CR Dhan 416, CR DHAN 810, CR Dhan 108, CSR 101, *Swarna PurviDhan 5 (iron 13.1 ppm)*, DRR Dhan 73, DRR Dhan 74, DRR Dhan 78 , and KKL (R) 4
- **Wheat Varieties:** Pusa Gehun Sharbati and Pusa Gehun Gaurav – Higher zinc (41.1 ppm), iron, protein content (~12%)

Globally, **HarvestPlus (CGIAR)** has released the following biofortified seeds:

- **India:** Iron pearl millet, Zinc rice & wheat, Vitamin A orange sweet potato, Iron/Zinc cowpea, lentil, sorghum
- **Bangladesh:** Zinc rice and Zinc wheat, Vitamin A orange sweet potato, Iron/Zinc Lentil
- **China:** Vitamin A orange sweet potato
- **Indonesia:** Zinc rice and Vitamin A orange sweet potato
- **Pakistan:** Zinc wheat
- **Nepal:** Zinc wheat, Iron/Zinc Lentil
- Future – Genome sequencing and genetic modification

Indicators	NFHS 3 (2005-06)	NFHS 4 (2015-16)	NFHS 5 (2019-21)
Children under 5 years underweight	43.5	35.8	32.1
Children under 5 years stunted	48	38.4	35.5
Children under 5 years wasted	19.8	21	19.3
Women with below normal Body Mass Index	36	22.9	18.7



# Futuristic Agriculture Policy and Food System

- Needs to be demand driven and globally competitive;
- Should be climate resilient;
- Should ensure nutritional security - Bio-fortification and women education, along with access to better sanitation and immunisation;
- Fertilize soils appropriately to feed India and beyond..
- Augment farmer's income through holistic development of value chains and processing.



# Evidenced Food Systems Transformation Policies in the Context of Viksit Bharat *-An Odisha Experience*

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# Odisha's Roadmap: Goals and Pathways

## Session 1: Food System Prioritization in Viksit Bharat

**Sri Shubhranshu Mishra**

Additional Secretary

Department of Agriculture and Farmer's Empowerment

Government of Odisha

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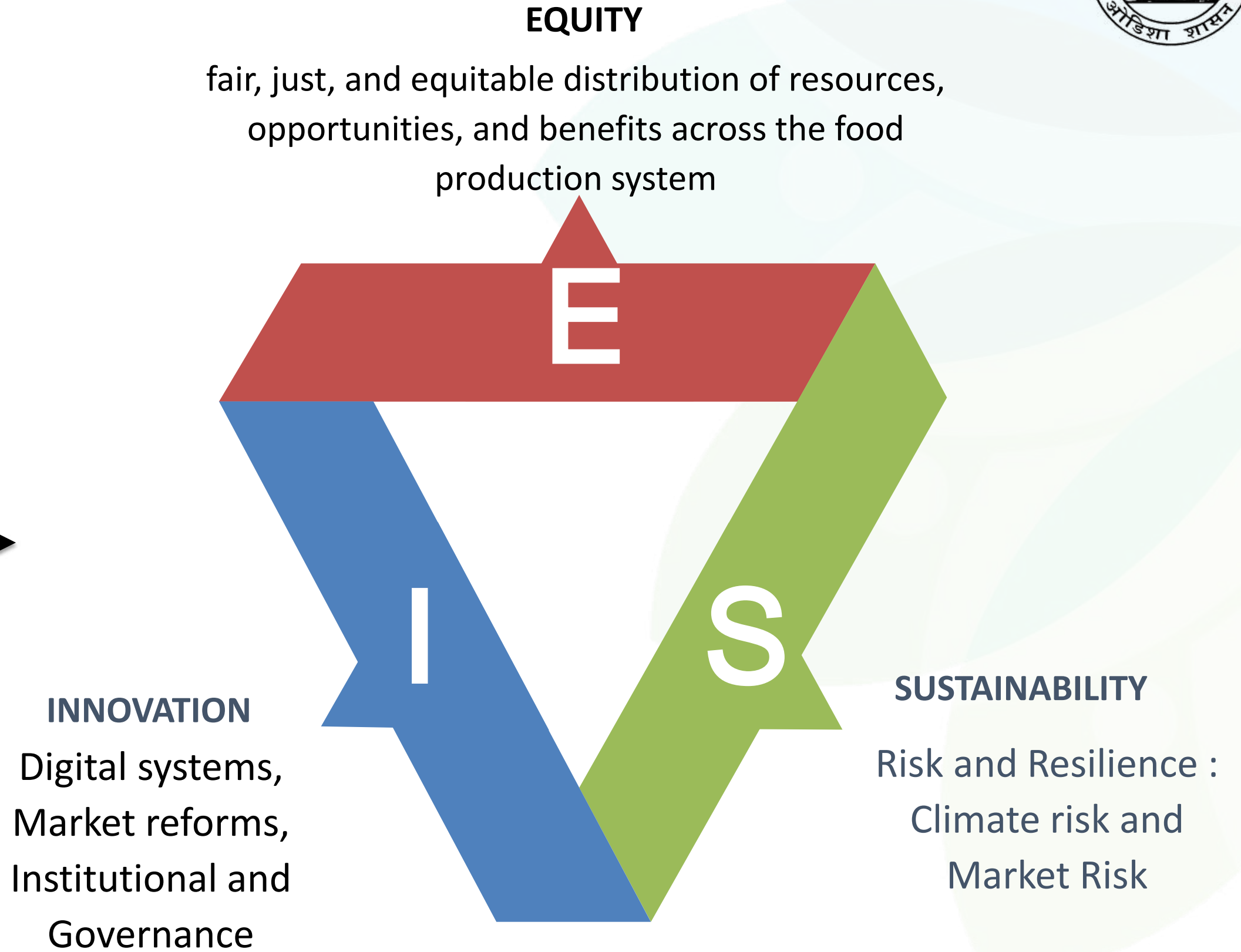
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# Odisha focuses on

## Three Pillars of Inclusive & Sustainable Agriculture





# Ensuring Equity: Equity as a Growth Multiplier – (1/3)

## 1. Shree Anna Abhiyan (SAA) : Millets for Nutrition, Farmers, and Markets

- Reviving millets as a **nutrition-smart and climate-resilient crop**
- Strengthening the full chain: **production, procurement, value addition, and consumption**
- Enabling **processing, branding, and market access**
- Advancing Odisha's vision to become the **Millet Hub of India**

Equity Lens: Supports smallholders, dryland farmers, and nutritionally vulnerable households

- ✓ **8 lakh quintals**  
*Millets procured in 2024–25*
- ✓ **1.52 lakh farmers**  
*Registered on MPAS portal*
- ✓ **5.93 lakh quintals of Ragi**  
*Approved for PDS distribution*
- ✓ **160 WHGS** involved in Millet Activities

## 2. Mukhyamantri Krushi Udyog Yojana (MKUY) & Agriculture Entrepreneurship Promotion Scheme (AEPS) : Promoting Women as Growth Catalysts

- Expanding access to **capital, subsidy, and enterprise opportunities**
- Supporting **first-generation rural entrepreneurs**
- Creating a **stronger agri-enterprise ecosystem**

Equity Lens: Involving women at higher end of value chain – Entrepreneurship

- ✓ **₹145.23 crore**  
*Subsidy support extended to women*
- ✓ **₹188.34 crore subsidy Disbursed**  
*For 3400+ agri-enterprises*
- ✓ **58 cold storages across Odisha**  
*Supporting 5,000+ entrepreneurs across 117 enterprise types*

# Ensuring Equity: Equity as a Growth Multiplier – (2/3)



## 3. Building Gender-Responsive Institutional Foundations: Gender Responsive Cell (GRC)

- Institutionalizes **gender-responsive agriculture** across policy design, programme implementation, and monitoring in Odisha
- Functions as an **analytical hub** to generate and use **gender-disaggregated data and gender budgeting**
- Strengthens **monitoring, evaluation, and learning systems** with technical support from IFPRI

Equity Lens: Embedding gender considerations within agricultural institutions to ensure women farmers are recognized, measured, and supported in policy and programmes.

## 4. Agriculture Production Cluster (APC): Women-Led Agricultural Transformation

- Promotes **collective farming and value chain development** through women SHG farmers across APC blocks
- Strengthens **community-owned institutions** for production, aggregation, and market access
- Supports **high-value crop cultivation, mechanization, irrigation, and post-harvest management**
- Encourages **sustainable practices including chemical-free and regenerative agriculture**

Equity Lens: Strengthening women-led producer institutions and collective farming to improve incomes, market access, and bargaining power of women and small holder farmers.

- ✓ Gender Responsive Cell operationalized – 29 Nov 2025
- ✓ Gender-Sensitive Machine Development SOP notified and under implementation

- ✓ 3.83 lakh women SHG farmers covered across 100 blocks in 16 districts
- ✓ 2,662 Producer Groups and 63 Producer Companies formed with 2.98 lakh women members
- ✓ 1.45 lakh women farmers cultivated 46,515 ha of high-value crops (2025–26)
- ✓ 12,018 ha under chemical-free farming by 65,053 farmers

# Ensuring Equity: Equity as a Growth Multiplier – (3/3)



## 5. Women SHGs as Drivers of Inclusive Agricultural Value Chains

- **Women SHGs engaged across the agricultural value chain**—from mechanization and custom hiring to processing, value addition, and market-linked enterprises.
- Through **Custom Hiring Centres and agri-machinery operations**, women SHGs are expanding access to mechanization while generating local livelihoods.
- Women SHGs are also leading **processing and value-addition enterprises** such as dal mills, oil extraction units, rice mills, millet processing units, and food outlets.
- In horticulture, women SHGs are participating in **vegetable cultivation, mushroom production, floriculture, and spice value chains**, strengthening income diversification.

**Equity Lens:** Strengthening women's leadership across the entire agricultural value chain- mechanization, production, processing, and market enterprises to enhance income, agency, and economic participation of rural women.

- ✓ *11,948 WSHGs in Agriculture sector*
- ✓ *11,831 WSHGs are engaged in Agri-machinery and Custom Hiring Centres*
- ✓ *A total of ~31000 WSHGs are involved in Horticulture*
- ✓ *~5400 WSHGs are in Soil Conservation Sector*
- ✓ *₹145 Cr turnover generated in agriculture value chains*
- ✓ *₹218 Cr turnover generated in horticulture value chains*

# Covering for Risks: Sustainability and Climate-Resilient Agriculture- (1/3)



## 1. Comprehensive Rice Fallow Management (CRFM): Utilizing Rice Fallow Lands

- Promotes **cultivation of pulses and oilseeds** on rice fallow lands through a package of scientific practices
- Improves **soil health, cropping intensity, and farm incomes** through regenerative agriculture
- Provides **eco-friendly inputs** including quality seeds, bio-fertilizers, micronutrients, and biological pest control

**Sustainability / Resilience Lens:** Utilizes rice fallow lands to promote pulses and oilseeds cultivation, improving soil health and strengthening climate-resilient farming systems.

### Key Achievements

- ✓ 4.5 lakh ha rice fallow land covered under CRFM
- ✓ 3.5 lakh ha targeted under CRFM in Rabi 2025–26

## 2. Institutional Foundation: Climate Resilience Cell (CRC)

- Established to **integrate climate resilience into agricultural policies and programmes** in Odisha
- Assesses **climate risks and vulnerabilities across districts** and supports climate-smart agriculture (CSA) pilots
- Develops **indicators and analytical frameworks** to monitor climate risks in agriculture

**Sustainability / Resilience Lens:** Strengthens institutional capacity to assess climate risks and guide climate-resilient agricultural planning.

- ✓ Climate Resilience Cell operationalized – September 2024
- ✓ Automated digital dashboard under development with 62+ indicators from 20+ data sources for monitoring & evaluation
- ✓ Focus on identifying vulnerable districts and piloting CSA practices



# Covering for Risks: Sustainability and Climate-Resilient Agriculture- (2/3)

## 3. Climate Advisory Services & Weather-Indexed Risk Mapping

- Provides **climate-based advisories** to farmers through the 'Krushi Samrudhi' helpline, enabling timely farm decisions
- Integrates **weather information and risk mapping** to support climate-resilient crop planning
- Aims to **localize advisories at the village level and automate the system using AI**

**Sustainability / Resilience Lens:** Strengthens farmers' ability to anticipate weather risks and adopt climate-informed agricultural practices.

- ✓ **Statewide climate advisory service operational through 'Krushi Samrudhi' helpline**
- ✓ **AI-based automation and village-level advisory localization under development**

## 4. Pradhan Mantri Fasal Bima Yojana (PMFBY): Crop Risk Protection

- Provides **crop insurance against yield loss** due to natural calamities, pests, and diseases
- Implemented across **all 30 districts of Odisha**, covering both loanee and non-loanee farmers
- Strengthens **financial protection and risk mitigation** for farmers facing climate and production shocks

**Sustainability / Resilience Lens:** Enhances farmers' resilience to climate and production risks by providing financial protection against crop losses.

- ✓ **22.7 lakh farmers covered (13.9 lakh ha) in Kharif 2025**
- ✓ **1.24 lakh farmers covered (1.21 lakh ha) in Rabi 2025–26**
- ✓ **State bears farmer premium up to 2 ha**

# Covering for Risks: Sustainability and Climate-Resilient Agriculture- (3/3)



## 5. Innovative Agro-Forestry for Food & Nutrition Security

- Promotes **system-based agroforestry models** integrating trees with crops for sustainable farming
- Enhances **climate resilience, farm diversification, and nutrition security**
- Supports **nursery development and seedling production** through SHGs and government nurseries

**Sustainability / Resilience Lens:** Promotes tree-based farming systems that enhance ecological sustainability, diversify farm incomes, and strengthen climate resilience.

- ✓ 8 nurseries planned for development in 2025–26
- ✓ 1.04 lakh trees to be planted under agroforestry models
- ✓ ₹10 crore allocation for implementation

## 6. Jaladhara: Farm Ponds for Water Security

- Promotes **construction of farm ponds** to improve on-farm water availability for irrigation, livestock, and domestic use
- Supports **climate-resilient agriculture and Integrated Farming Systems (IFS)** by enabling irrigation for high-value crops
- Enhances **income diversification and resilience to extreme weather events**

**Sustainability / Resilience Lens:** Strengthens water security and climate resilience by creating decentralized water harvesting structures that support sustainable farming systems.

- ✓ 1,277 farm ponds planned for construction in 2025–26
- ✓ ₹24.09 crore budget allocation covering 4 districts (Bolangir, Bargarh, Nuapada, Kalahandi)
- ✓ 120 farm ponds already excavated in Koraput and Malkangiri (till Jan 2026)

# Promoting Innovation – Digital systems, Market reforms, Institutional and Governance (1/3)



- 1. FPO-led Aggregation & Collective Marketing:** The State is strengthening farmer collectives through FPOs to improve aggregation, reduce transaction costs, and enhance farmers' bargaining power, enabling better price realization and expanded access to domestic and international markets.
- 2. Digital Farm Registry for Targeted Delivery:** A Digital Farm Registry has been developed to track farmer beneficiaries and enable targeted delivery of government schemes, improving transparency, reducing inefficiencies, and strengthening evidence-based policy planning.
- 3. Investment in Digital Public Infrastructure:** The State is strengthening data-driven agricultural governance through digital platforms such as the KO Portal, GO-SUGAM, and Krushi Samrudhi Helpline to improve service delivery and administrative efficiency.

## Key Achievements: FPOs-

- ✓ 1,791 FPOs with ~9 lakh farmer members
- ✓ 13–21% higher price realization for farmers through FPO marketing
- ✓ Exports to 10 markets in Europe and the Middle East

## Digital Farm Registry:

- ✓ ~14.5 lakh farmers registered in the Digital Farm Registry

**Innovation Lens:** Leveraging digital systems, market reforms, and institutional governance to improve farmer services, market integration, and efficient programme delivery.



## 4. Integrated Farming System (IFS): Diversified Farming Models

- Promotes **integrated farming by combining crops, livestock, fisheries, and horticulture** to improve resource efficiency and farm incomes
- Encourages **climate-friendly farming practices using 4R principles** (Reduce, Reuse, Recycle, Recover)
- Supports **diversified and site-specific farming models** suited to different agro-ecological conditions

**Innovation Lens:** Promotes **integrated and resource-efficient farming systems** that diversify farm enterprises and enhance sustainability

- ✓ 24 Integrated Farming System models developed
- ✓ 5,672 farmers adopted IFS models in 2025
- ✓ Higher subsidy (50%) provided to Women, SHGs, and SC/ST farmers

## 5. Rejuvenating Watersheds for Agricultural Resilience Through Innovative Development (REWARD)

- Promotes **scientific watershed management** to improve water conservation and strengthen agricultural resilience
- Supports **climate-resilient farming through advisories, extension services, and farmer engagement**
- Strengthens **community institutions and value chains** through watershed committees and FPO development

**Innovation Lens:** Introduces **science-based watershed planning and community-led resource management** to improve climate resilience and agricultural productivity.

- ✓ Implemented in 17 watershed clusters across 5 districts covering 1.01 lakh ha
- ✓ 57,708 ha treated through scientific watershed interventions
- ✓ 169 Watershed Committees formed
- ✓ 15 FPO business plans prepared



## 6. Cold Storage Policy: Strengthening Post-Harvest Infrastructure

- Introduced to **expand cold storage infrastructure across Odisha's sub-divisions**, improving storage and market access for farmers
- Aims to **reduce post-harvest losses and distress sales** while enabling value addition and better price realization
- Provides **capital subsidy, interest reimbursement, and electricity tariff support** to encourage private investment

**Innovation Lens:** Promotes market infrastructure development and private sector participation to strengthen post-harvest management and agricultural value chains.

- ✓ Target to establish cold storage in all 58 sub-divisions of Odisha
- ✓ 9 cold storage projects approved by Jan 2026
- ✓ Cold Storage Conclave organized – Dec 2025
- ✓ Exposure visits conducted for entrepreneurs on modern cold storage technologies

## 7. GIAHS Initiative: Recognition of Traditional Agro-Ecological Systems

- Odisha has proposed **Gandhamardhan Hills and Mahendragiri** for inclusion under the **Globally Important Agricultural Heritage Systems (GIAHS)** framework.
- The initiative aims to **recognize and conserve traditional agro-ecological practices, biodiversity, and community-led farming systems**.
- The programme will be supported through **collaboration between government, FAO, civil society organizations, and local communities** for documentation and action planning.

**Innovation Lens:** Recognizes and safeguards traditional agricultural heritage systems that sustain biodiversity, climate resilience, and indigenous knowledge.



# Nine Innovative Projects

# Innovative Projects – (1/3)



## Biochar from Agricultural Residues

- Converts agricultural residues into **biochar through pyrolytic transformation** to improve soil fertility and nutrient recycling.
- Reduces **crop residue burning** while improving soil ecosystem and crop productivity.

1. Addresses declining soil fertility due to limited organic manure availability
2. Promotes in-situ nutrient recycling using biochar

## Gravity-Based Irrigation in Tribal Landscapes

- Introduces **gravity-based irrigation systems** to expand irrigation in forest-connected tribal landscapes.
- Integrates **water harvesting, crop diversification, and agroforestry** to improve resilience and livelihoods

1. Pilot implemented in Dalo and Nagira villages, Pallahara block (Angul district)
2. Focus on reducing water, energy, and carbon footprints

## Traditional Pulse Landrace Improvement

- Identifies and tests **traditional pulse landraces** with strong pest resistance and agro-climatic adaptability.
- Supports **sustainable pulse cultivation and improved nutritional quality.**

- 1.3–4 promising landraces selected for on-farm testing
2. Testing planned in mainland and rice fallow systems

# Innovative Projects – (2/3)



## Water Hyacinth Compost Enterprise

- Converts **water hyacinth biomass into high-quality compost** through aerobic composting.
- Creates **livelihood opportunities for women SHGs** through waste-to-wealth enterprises.

1. Pilot implemented in coastal district of Puri
2. Compost produced meets FCO quality standards

## SAFAR: Acid Soil Reclamation

- **SAFAR – Sustainable Utilization of Basic Slag and Fly Ash for Acid Soil Reclamation** promotes the use of industrial byproducts as soil amendments to restore soil fertility.
- Converts **basic slag and fly ash into productive inputs** for agriculture, supporting circular economy and improving crop productivity.

1. Helps reduce greenhouse gas emissions from agricultural fields through improved soil management
2. Converts basic slag and fly ash into value-added soil amendments for sustainable farming

## Carbon Standards for Regenerative Agriculture (CSIFRA)

- Develops **carbon standards and monitoring systems** to incentivize regenerative farming practices.
- Establishes **transparent Monitoring, Reporting and Verification (MRV) systems** to enable farmers to participate in carbon markets.

1. Promotes reduction of greenhouse gas emissions from rice cultivation systems
2. Enables generation of carbon credits through climate-smart farming practices
3. Supports access to climate finance and additional income opportunities for farmers

# Innovative Projects – (3/3)



## Bioinoculants for Rice-Based Cropping Systems

- Promotes **microbial biofertilizers** to reduce chemical fertilizer dependence.
- Improves **soil health and productivity in rice-based farming systems.**

1. Bioinoculants can reduce nutrient requirements by 25%.
2. Potential to increase yields by 10% and benefits up to ₹9,000/ha

## Urban & Rooftop Horticulture

- Promotes **rooftop gardening and peri-urban horticulture** to improve nutrition and urban greenery.
- Encourages **innovative horticulture technologies in urban environments.**

1. Project implemented in 5 cities
2. Cities include Bhubaneswar, Cuttack, Berhampur, Sambalpur, and Jeypore

## Aeroponic Potato Seed Production

- Establishes **aeroponic seed production systems** to strengthen the potato seed supply chain.
  - Supports **high-quality seed production and improved potato productivity.**

1. 1000 sq. m aeroponic facility planned at OUAT campus
2. Project implemented in 3 districts of Odisha



# Odisha's Vision for 2047 – Agriculture

01

Among top 5 states in terms of per capita income

02

90% + irrigated area with efficient, climate-smart water use

03

Leading producer of five high value cash crops

04

Resilient agriculture to drive sustainable livelihoods

05

50%+ of farmland ownership (sole or joint) with women

***“India’s agriculture must become a cornerstone of a developed India”***  
- The Hon’ble PM of India at Viksit Krishi Sankalp Abhiyan



# Measuring What Matters

Farmer Per Capita Income

Irrigation coverage with water use efficiency

Cropping Intensity

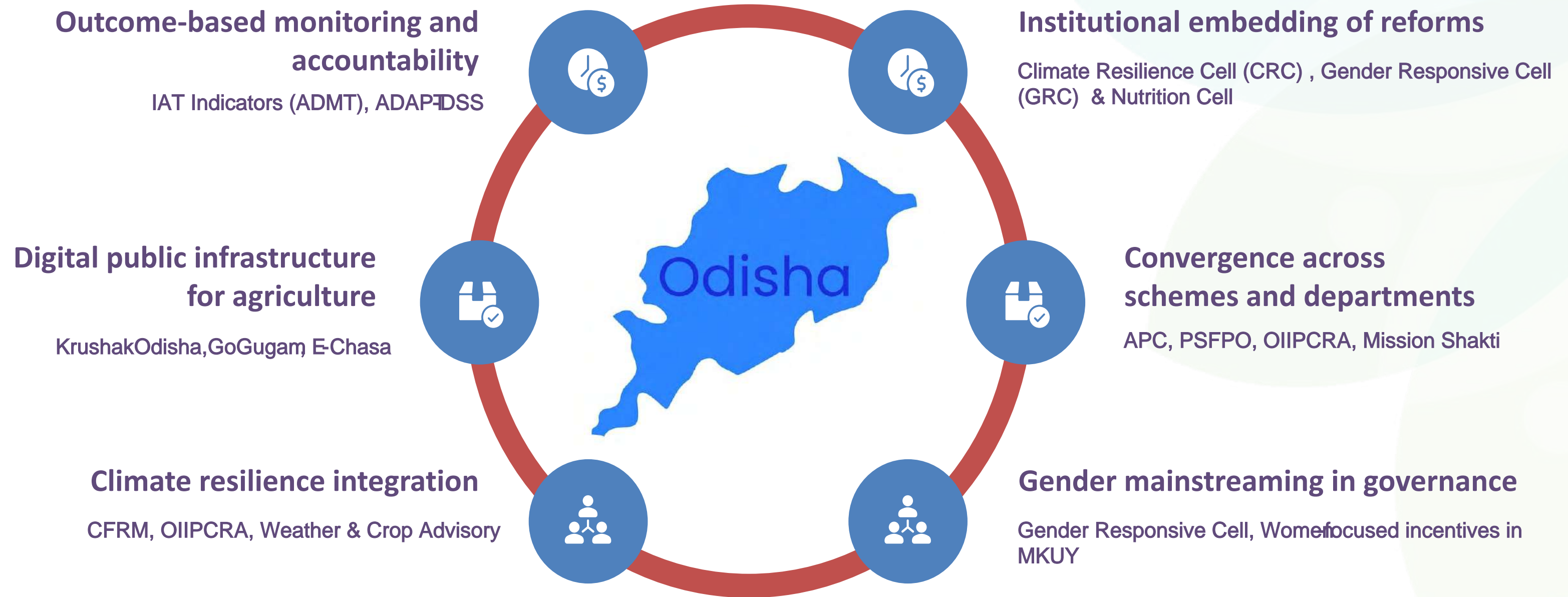
Farm Mechanization

Farmland ownership by women

Yield increment for major crops

Rice Export (at current price)

# Odisha Model: A Replicable Framework for Inclusive and Sustained Growth





**THANK YOU**



# Evidence-Led Food Systems Transformation Policies in the Context of *Viksit Bharat*

7 April 2026

Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



Author/Presenter

Organisation

Evidence-Led Food Systems Transformation Policies in the Context of Viksit Bharat

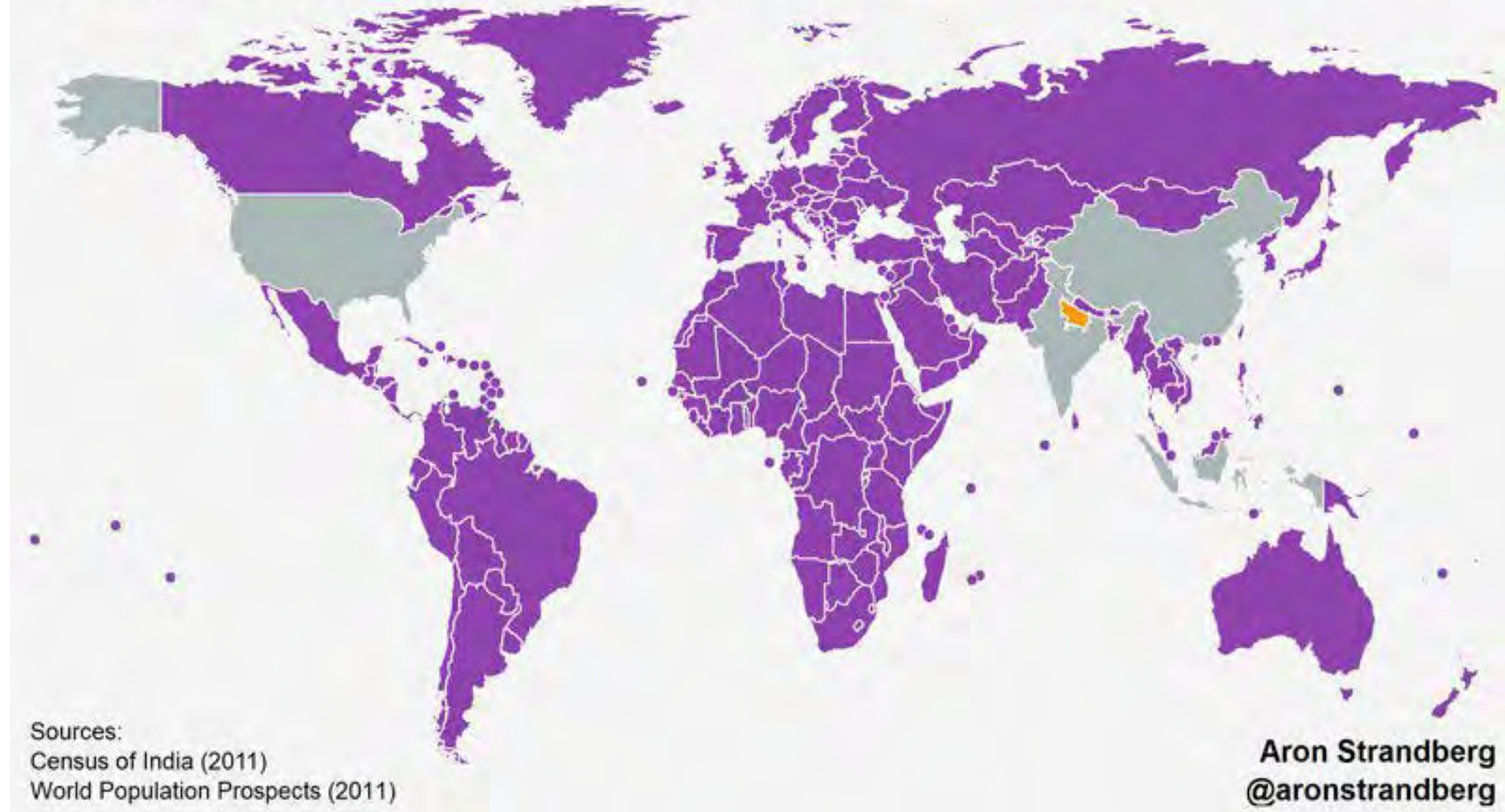
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# An order of Magnitude Problem in India

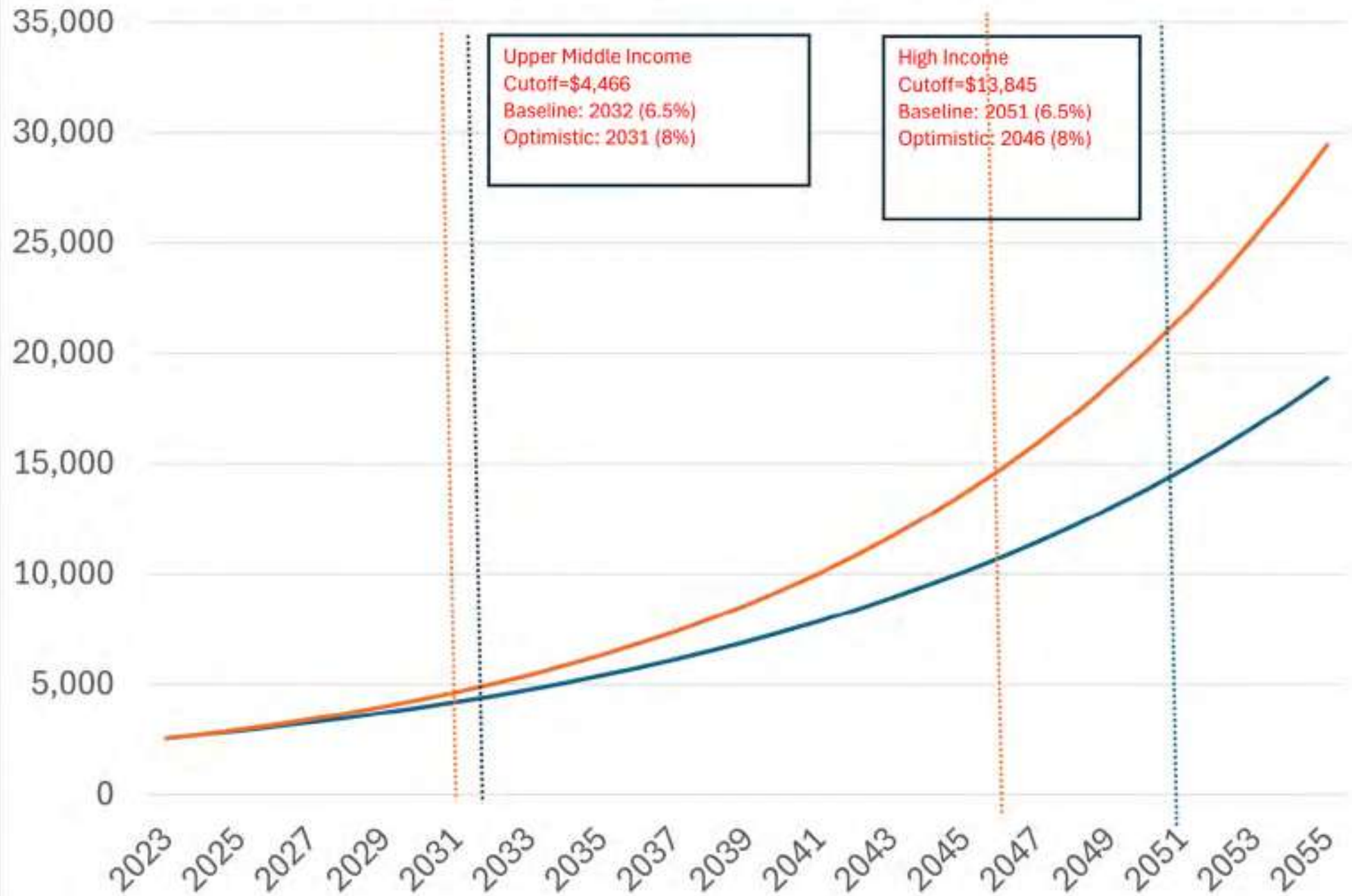
- 17% of world population
- 2.4 % of the land
- 4% of the Water Resources
- 1.3 bn population
- 28 states and 9 UTs with different social, economic, cultural, political and food environments with significant rural urban variations

Countries with a **smaller** population than **Uttar Pradesh**





# GDP per capita (GDP\_nominal\_pc\_usd)





# Viksit Bharat

- Viksit Bharat = Developed India
- ► Key Indicators:
  - ► Per Capita Income (PCY)
  - ► Size of the economy
  - ► Beyond PCY: Broad indicators of development
  - ► Inclusion
  - ► Jobs (quantity and quality)
- ► Timeline
- ► Ultimate goal: 2047

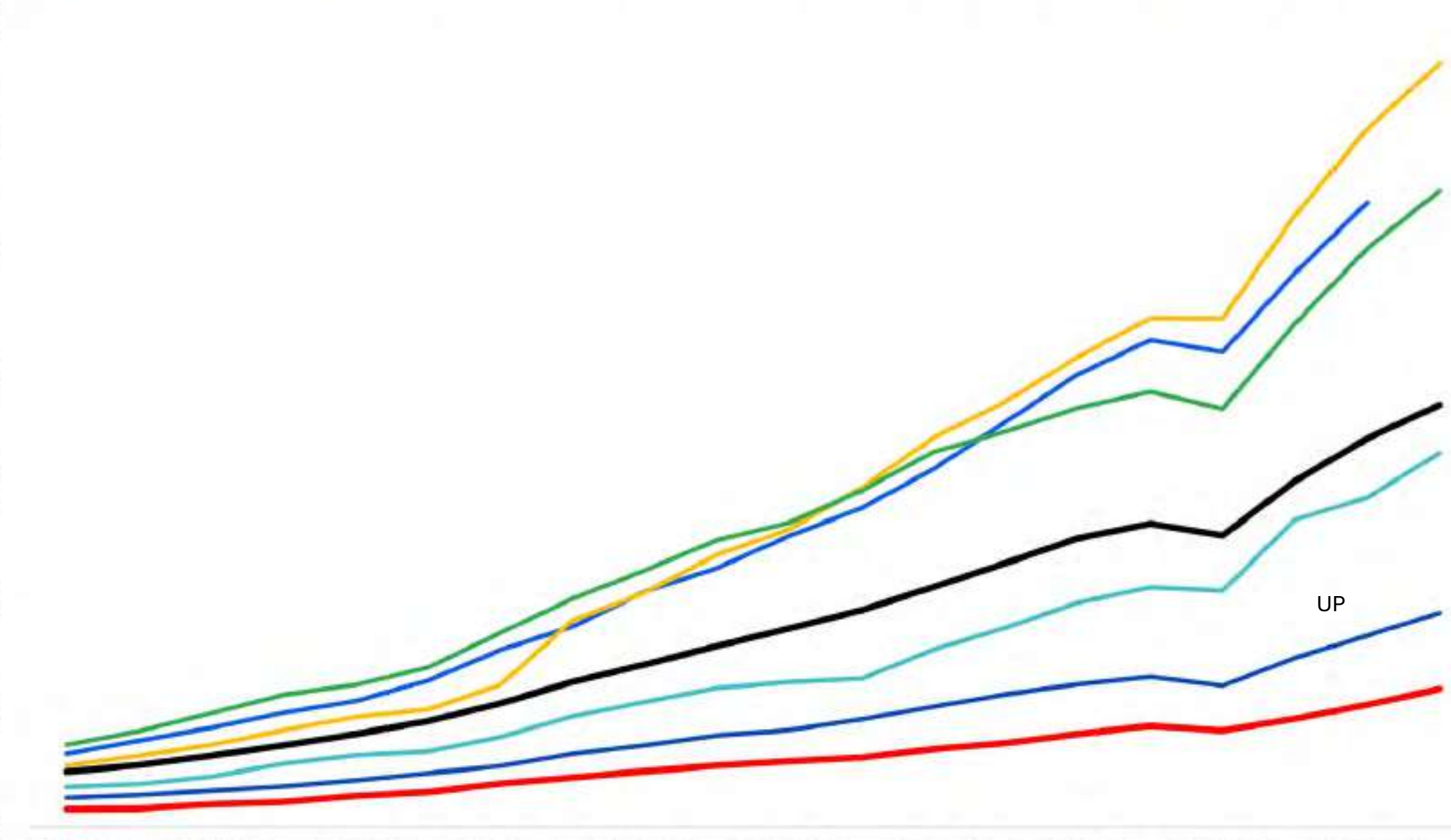
### Per capita income, Indian states, '000 INR

— Bihar — Gujarat — Karnataka — Maharashtra — India — Odisha — Uttar Pradesh

350  
300  
250  
200  
150  
100  
50  
0

2004-05 2006-07 2008-09 2010-11 2012-13 2014-15 2016-17 2018-19 2020-21 2022-23

UP





# Making of VB

- Cutoff \$13,485, 2024, WB Atlas method
- ► Standardized US\$, accounting for exchange rate smoothing and inflation
- adjustments
- ► Required: Sustained growth rate of 8% in nominal GDP per capita in current US\$

# Making of VB and VU

How to balance external orientation with strategic industrial policy?

Role of Agri food systems

High value, agro-industrialization

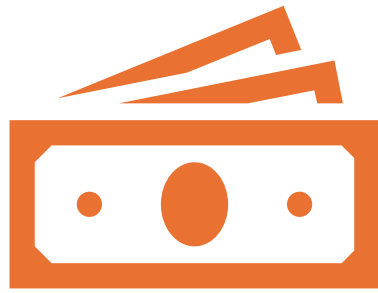
▶ Shift from domestic market development toward emerging markets especially the

untapped ones e.g. E.Europe

▶ Shift from value distribution to value creation



Tenets of transformation




Basically, an economic growth problem



Appended with other elements- public goods  
to achieve sustainable, healthy transformation



# Landscape

- **Economic growth challenge**
  - economic growth-Combination of two challenges.
  - (1) The “structural change challenge” focused on moving resources from traditional low productivity activities into modern, more productive industries.
  - (2) The “fundamentals challenge” faced by policy makers about how best to develop broad capabilities such as human capital and infrastructure.
  - While the two are inextricably linked, they are conceptually different, and making this distinction is important
- 



# Elements of growth

- Rapid structural change is based on an expansion in modern manufacturing but there is AVC too.
  - By contrast, most of UP's has been driven primarily by increases in within sector productivity.
  - Boosted growth in labor productivity largely a result of an expansion in the services sector.
  - Growth may come from investments in fundamentals.
  - Rapid structural changes may now be more difficult to achieve and investments in fundamentals may be key to sustaining growth for the aspirational districts
- 



*Second  
tradition for  
explaining  
growth:*

- Derives from growth model of Solow (1956)
- It presumes different types of economic activity are structurally same.
- Growth depends on incentives to save, accumulate physical and human capital, and (technological change) innovate by developing new products and processes (Grossman and Helpman 1991; Aghion and Howitt 1992).
- Two traditions offer complementary perspectives on growth.




*What do the  
two  
perspectives  
teach us?*

- In dual economy world, growth is just a matter of moving traditional farmers into modern industries where productivity is on a positive trajectory.
- Physical and human capital levels are low, Thus returns to accumulation should be high.
- Economic convergence should be the norm rather than the exception.
- However, convergence predictions have generally not been borne out by the data.

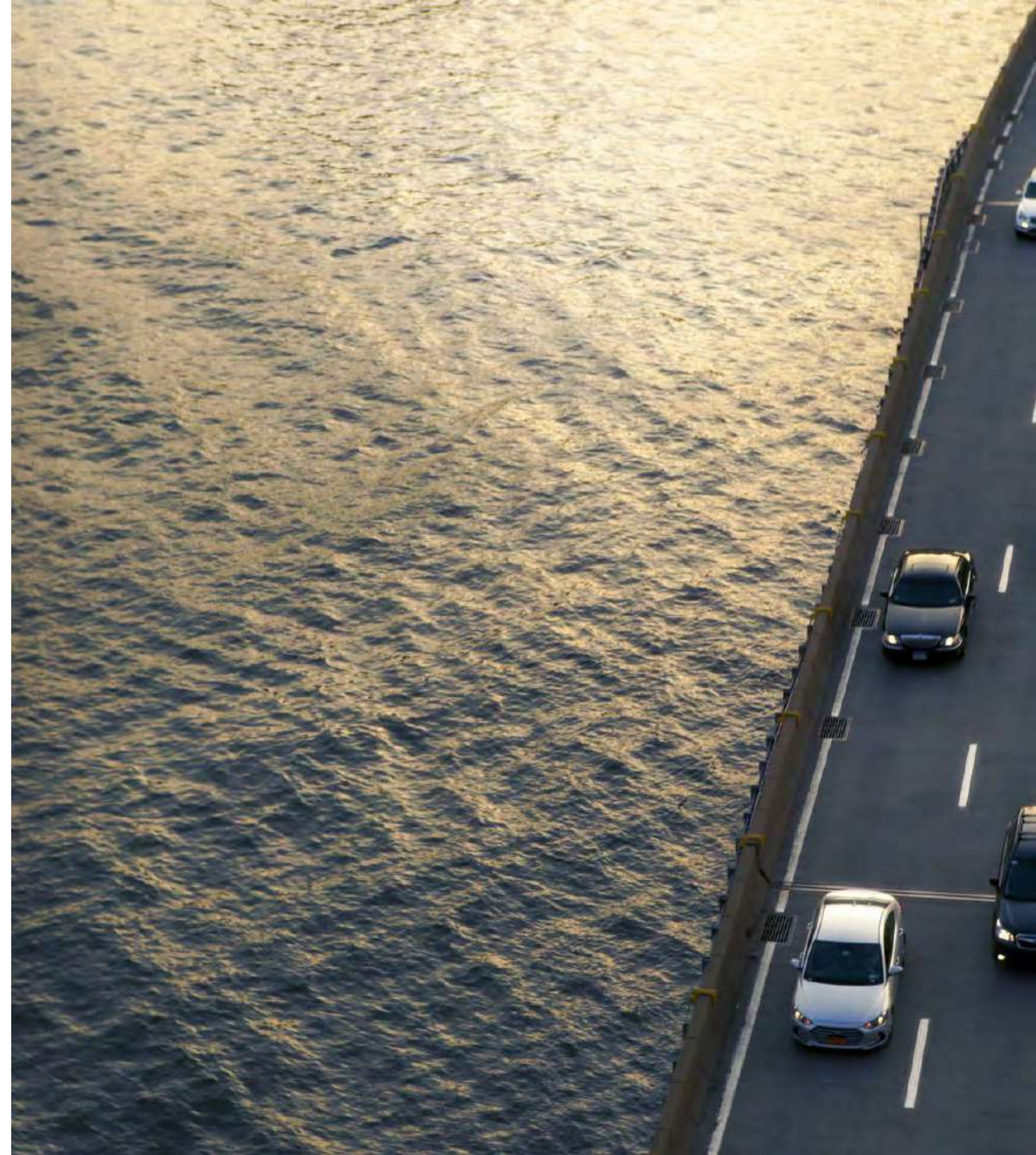


# Revisiting sources of growth – closed and open economies

- From theoretical perspective, within-sector productivity growth & structural change go hand in hand, but there is disagreement-where growth originates.
  - Schultz (1953) argued advances in agricultural productivity a precondition for growth-highlighted later in-Johnston and Mellor (1961), Johnston and Kilby (1975), and Timmer (1988).
  - Agriculture Role –prominent in work by non-economists, Jared Diamond (1997).
  - In contrast to Schultz (1953), Lewis (1954) - low marginal productivity of farm labor would persist until nonfarm employment expanded enough to absorb rural population growth.
  - Different links if open to trade
- 

# Tenets of VUP

- Viksit Uttar Pradesh 2047 is an ambitious, policy-driven roadmap aimed at transforming Uttar Pradesh into a \$6 trillion economy by 2047, starting with a \$1 trillion goal by 2030.



# VUP constituents

- Economic Strategy: Aim-16% annual growth rate, focusing on industrialization, strengthening MSMEs.
- Infrastructure & Logistics: Development of industrial corridors, expressways, and specialized manufacturing clusters (e.g., Gautam Buddha Nagar EMC) to attract investment.
- Digital Governance & Security
- Green Growth: Massive investment in renewable energy, including the 1,200 MW Jalaun Solar Park, to reduce carbon footprints.
- Agricultural Transformation: Investing in "smart agriculture" to boost crop productivity, aiming to reach top-tier global standards by 2047.
- Knowledge-Led Growth: Focus on education modernization, setting up smart schools, and digital learning platforms to build a skilled workforce.

# Implications for development practice



- Context shapes the development agenda (Be aware of the big picture and place development work within it.)
- Trends and potential disruptors: Global shift to favor returns to capital (including human), reduce returns to labor; technology--new biology, new material science, ICT; population and migration; markets and trade flows; global institutional arrangements for agriculture and development.

# Implications for development practice: continued

- New development agenda (shared prosperity, environmental and social responsibility, health and nutrition, reduction of downside risks due to conflict and climate change) compared to old development agenda (poverty reduction) requires a broader understanding of contribution of multifunctional agriculture to economic and social change.
- New research agenda: what do we need to know?
- New menu of interventions: what do we need to do?

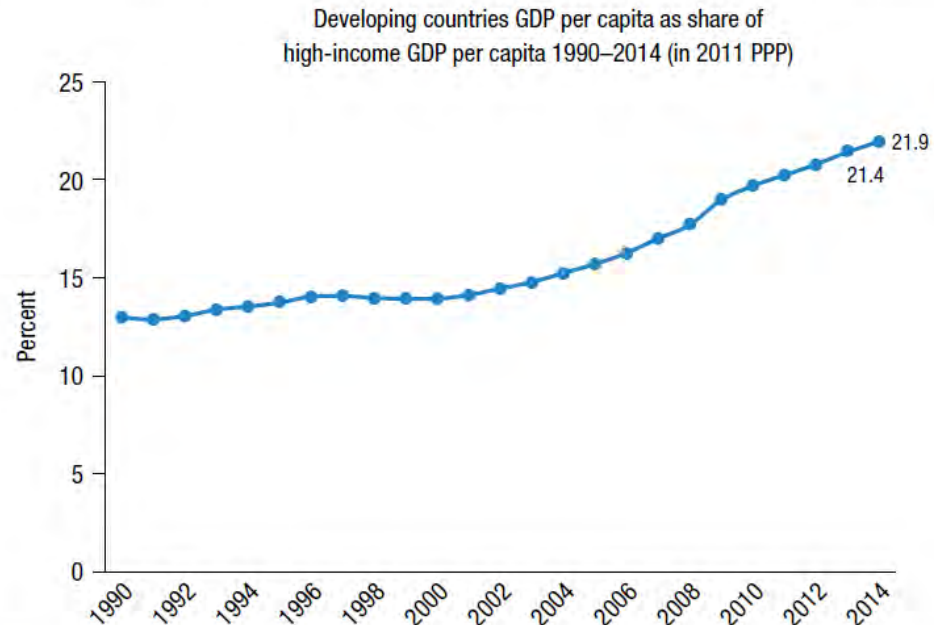


# Assumption of unlimited supplies of labor- open economy variation

- Assumption of unlimited supply of labour also ‘solved another problem that had bothered Lewis since undergraduate days: what determined the relative prices of steel and coffee?’ (Lewis 1984, p.132).
- The 1954 article contains a section on open economy which begins with an examination of the role of immigration and capital export as means of postponing turning point at which rising wages begin to undermine capitalist surplus signalling the end of the period of rapid capital accumulation.
- In Lewis’s open economy model, provided there is surplus labour in other countries, the capitalists can avoid this turning point by encouraging immigration or by exporting their capital to countries where there is still abundant labour at a subsistence wage.

# Convergence in 2000s - Narrowing gap process but slowing down across space

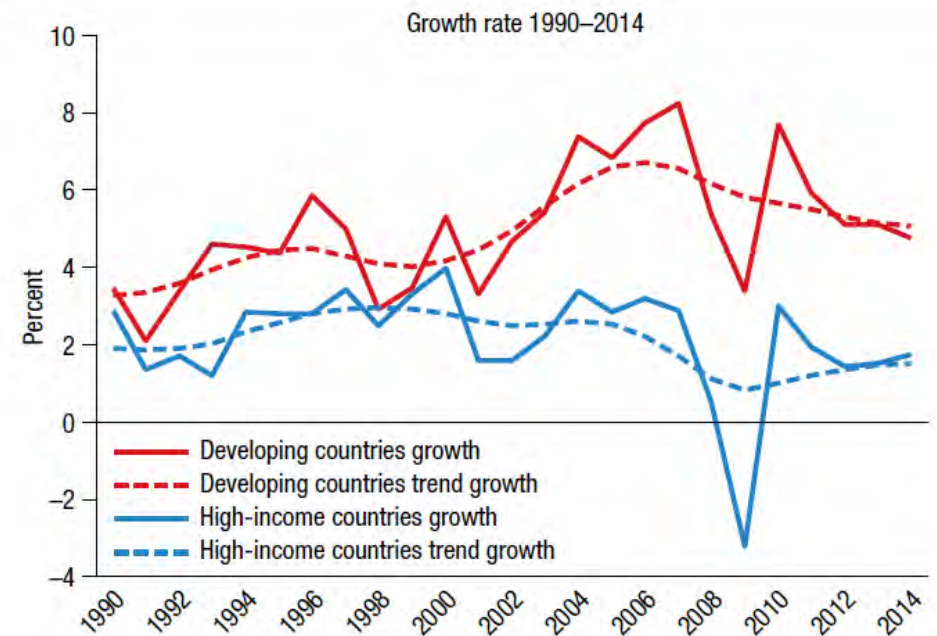
FIGURE 0.1b ... the income gap has been closing more rapidly than in the 1990s



Source: World Development Indicators database (World Bank, various years).

Note: The gross domestic product (GDP) trend was calculated using a Hodrick-Prescott filter with smoothing parameter equal to 6.25; PPP = purchasing power parity.

FIGURE 0.1a With advanced and developing country growth rate differentials narrowing in the 2000s ...



# *What do the two perspectives teach us?*

- Each perspective provides a distinct reason why growth in lagging regions should be not just feasible, but also easy and rapid.
- In dual economy world, growth is just a matter of moving traditional farmers into modern industries where productivity is on a positive trajectory.
- In neoclassical world, physical and human capital levels in developing countries are low and thus returns to accumulation should be high.
- Either way, economic convergence with rich nations should be the norm rather than the exception.
- However, convergence predictions have not been borne out by the data.
- Yet there is learning from the failures of these model to be informative about the obstacles that need to be overcome if VUP were to take place.

# Viet Nam's economic development



- Structural change:
  - 1990s – 70% of labor in agriculture and 1/3 of GDP is from agriculture → inefficiency in labor productivity
  - 2000s – 54% of labor in ag, 14% in manufacturing, 32% in services → Export-oriented industrialization and agriculture
- Fundamentals:
  - Investment in education and infrastructure
  - Improving institutions: State owned firms → private; Family farms/businesses → formal registered firms
  - Opening the country to foreign investment
- GDP per capita tripled in two decades (1990-2000s) and poverty fell sharply

Planetary  
boundaries  
are earth's  
health  
indicators –  
need policy  
innovation

- The six boundaries are
- climate change,
- biosphere integrity (genetic diversity and energy available to ecosystems), land system change,
- freshwater change (changes across the entire water cycle over land),
- biogeochemical flows (nutrient cycles), and
- novel entities (microplastics, endocrine disruptors, and organic pollutants).

# Why agriculture in VUP?

- Majority of population live in rural areas
  - Majority of population still live in rural areas despite growing urbanization
  - Still most rural dwellers rely on agriculture for their livelihoods





# Evidence-Led Food Systems Transformation Policies in the Context of *Viksit Bharat*

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# Entry Points for Crop Diversification and Advancing Millets and Pulses for Human and Environmental Well-being

**Shalander Kumar**

International Crops Research Institute for the Semi-arid Tropics

Evidence-Led Food Systems Transformation Policies in the Context of Viksit Bharat

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# Context

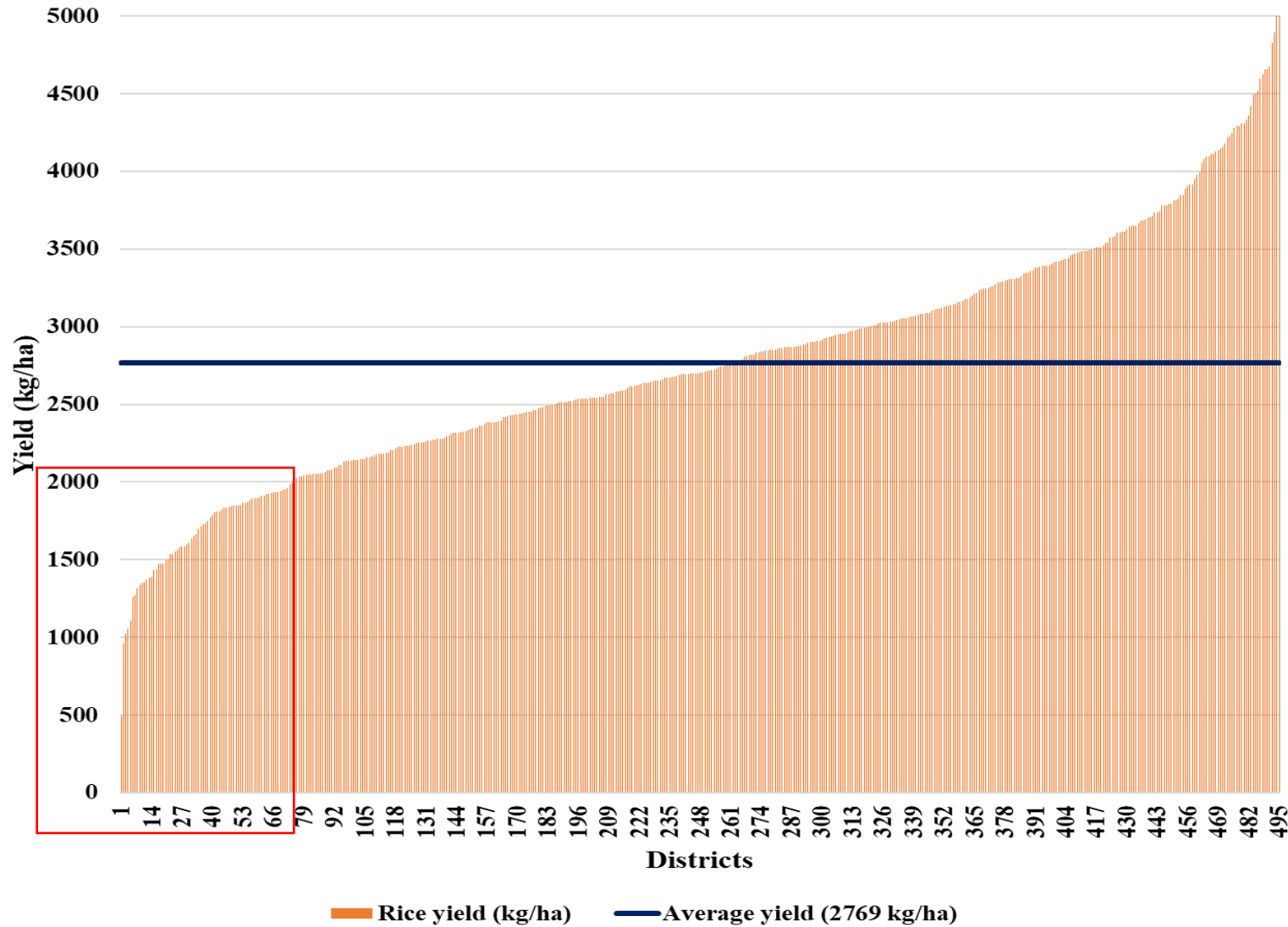
- **Buffer stock of rice is 5-9 times more than the actual requirement**
- **High Cost: Economic cost of PDS rice: Rs 41.73/kg**
- **>50% districts are water stressed, exacerbated by climate change: Sustainability?**
- **Resulting in increased risk to farmers, high subsidy cost- fertilizer, power**
- **Annual import of pulses: 5-6 million tons**
- **Annual import of edible oil: 16 million ton (~\$19 billion)**
- **60-70 % households are moderate to severely deficit in protein consumption**
- **High rate of child stunting, wasting and anaemia in children and women**

Diversification for addressing **risk, sustainability, nutrition and high fiscal cost**

**One size doesn't fit all: Regionally targeted diversification**

# Highly differentiated level of yields across major rice-producing districts

District wise average yield 2020-22 (kg/ha)



No of districts

495

Districts with yield <1.5 t/ha

20

Districts with yield 1.5-2 t/ha

55

Districts with yield 2-3 t/ha

245

Districts with yield more than 3 ton / ha

175

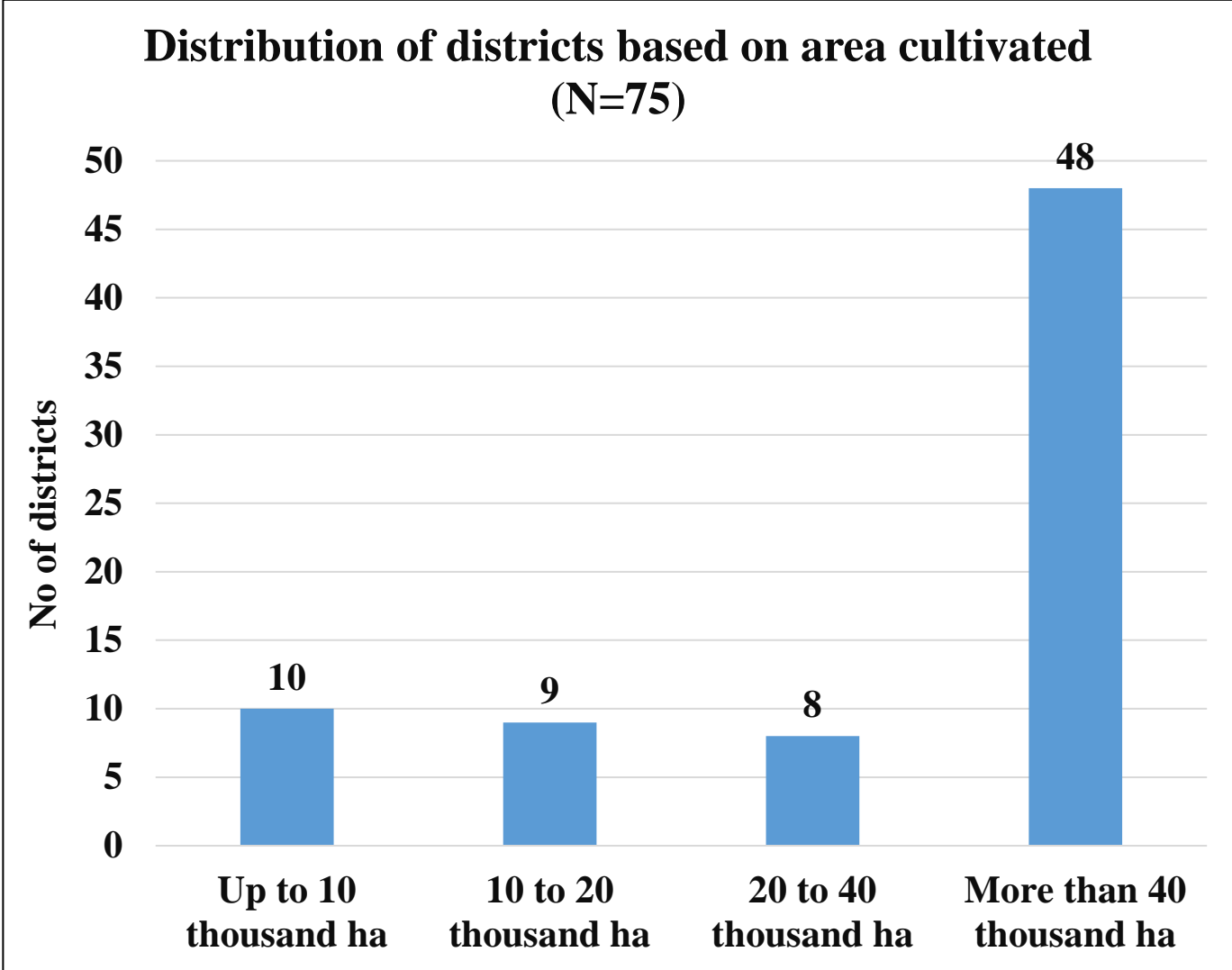
# Immediate Entry point for diversification and intensification:

Rice producing districts with 2 or less than 2 t/ha yield

<b>No of districts</b>	<b>75</b>
<b>Distribution of districts (13 states)</b>	<b>Bihar-19%, Uttarakhand-11%, Gujarat-8%, Maharashtra-8%, Rajasthan-4%, Jharkhand-3%, Karnataka-3%, Tamil Nadu-1%, Uttar Pradesh-1%)</b> <b>Chhattisgarh-17%, Assam-9%. Madhya Pradesh-8%, Odisha-8%,</b>
<b>Average yield (kg/ha)</b>	<b>1660</b>
<b>Average net return (INR/ha)</b> Net returns over variable cost without family labour cost	<b>2881</b>
<b>No of districts with negative net return</b>	<b>22 (28%)</b>

# Total area covered by low rice yielding districts (2t or less/ha)

**Total area covered  
5.86 million ha**



# Competing alternate crops for low rice yielding districts (up to 2t/ha)

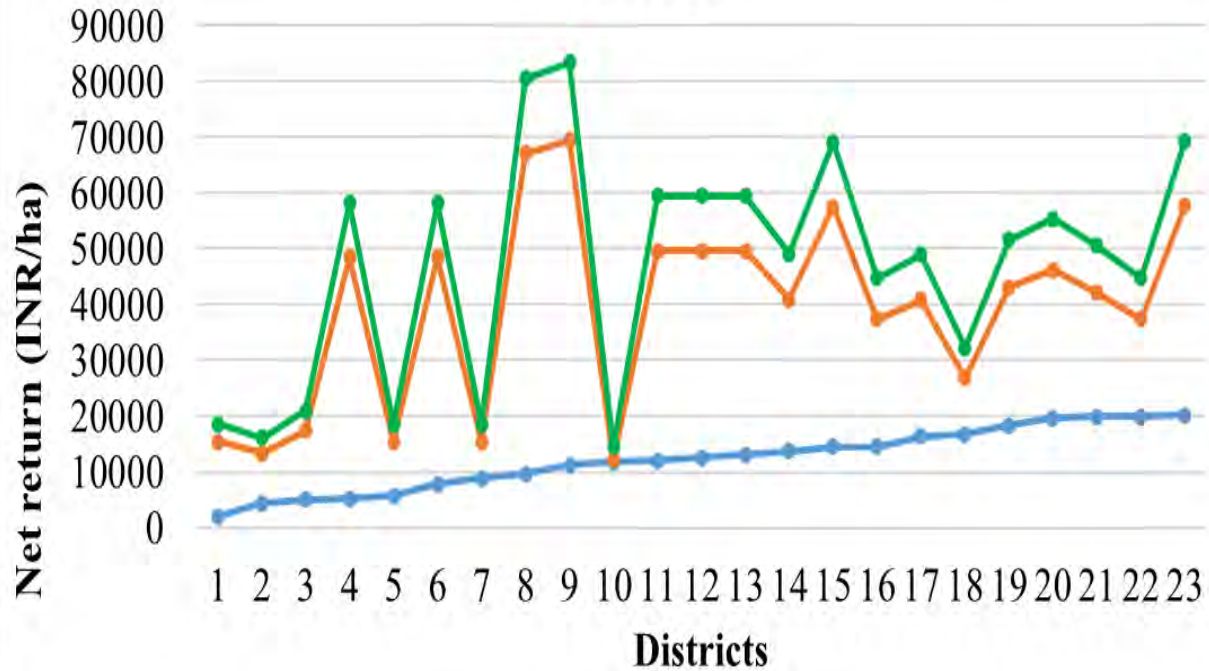
**These millets and legumes have comparative advantage at the current level of yields and net returns**

(mostly cultivated in relatively marginal land)

Competing Crop	No of Districts (N=75)	List of Districts
<b>Black gram</b>	<b>24</b>	Biswanath, Dhemaji, Golaghat, Kokrajhar, Lakhimpur, Tinsukia, Karimganj, Bhagalpur, Kishanganj, Madhubani, Purnia, Sitamarhi, Bastar, Bijapur, Dantewada, Kondagaon, Narayanpur, Pakur, Kendrapara, Almora, Chamoli, Pauri Garhwal, Pithoragarh, Uttar Kashi
<b>Pigeon pea</b>	<b>28</b>	Darbhanga, Gopalganj, Muzaffarpur, Purbi Champaran, Saharsa, Samastipur, Sheohar, Siwan, Vaishali, Jashpur, Kabirdham, Korba, Korea, Rajnandgaon, Surajpur, Surguja, Bharuch, West Singhbhum, Anuppur, Dindori, Umaria, Chandrapur, Gadchiroli, Banswara, Dungarpur, Udaipur, Mathura
<b>Ground nut</b>	<b>15</b>	Mahasamund, Dohad, Mahisagar, Dharwad, Haveri, Alirajpur, Datia, Jhabua, Amravati, Nandurbar, Balangir, Jajapur, Jharsuguda, Puri, Sundargarh
<b>Soybean</b>	<b>6</b>	Chhotaudepur, Narmada, Panch Mahals, Ramanathapuram, Ahmednagar, Dhule
<b>Finger millet</b>	<b>3</b>	Bageshwar, Champawat, Rudra Prayag

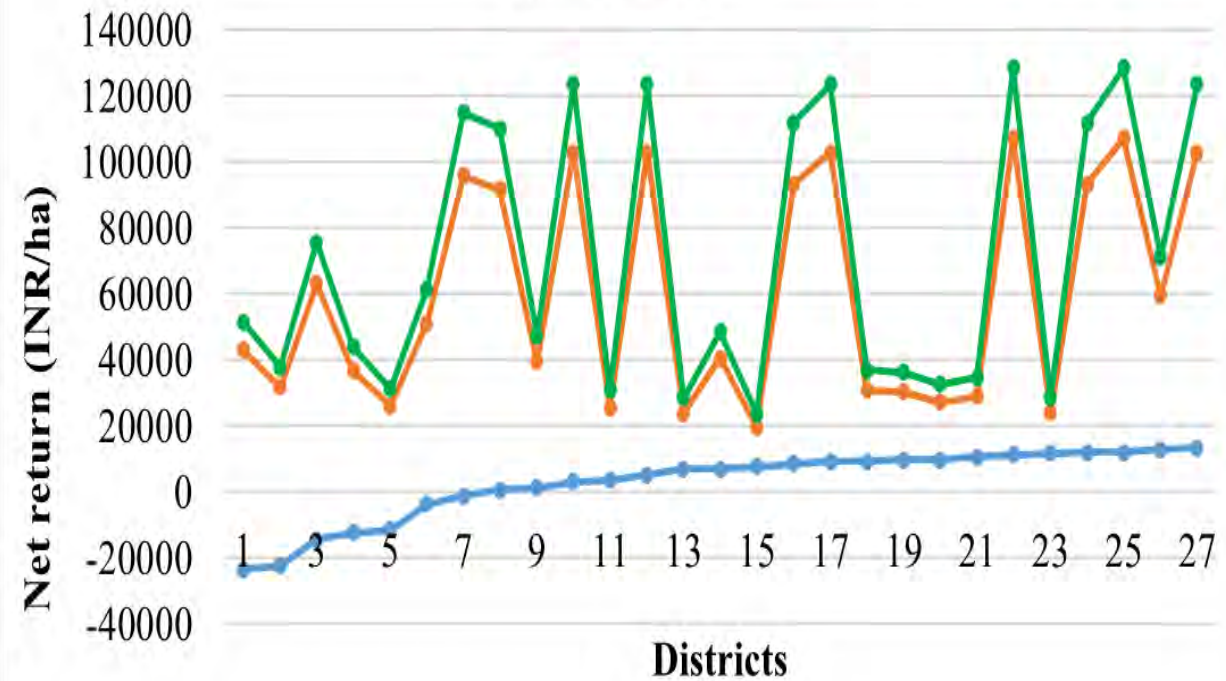
# Net return comparison: Rice (up to 2t/ha yield districts) vs. Competing crops

## Comparison of net return of rice vs blackgram (INR/Ha)



- Rice net return (INR/ha)
- Blackgram net return (INR/ha)
- Blackgram net return with 20% yield increase (INR/ha)

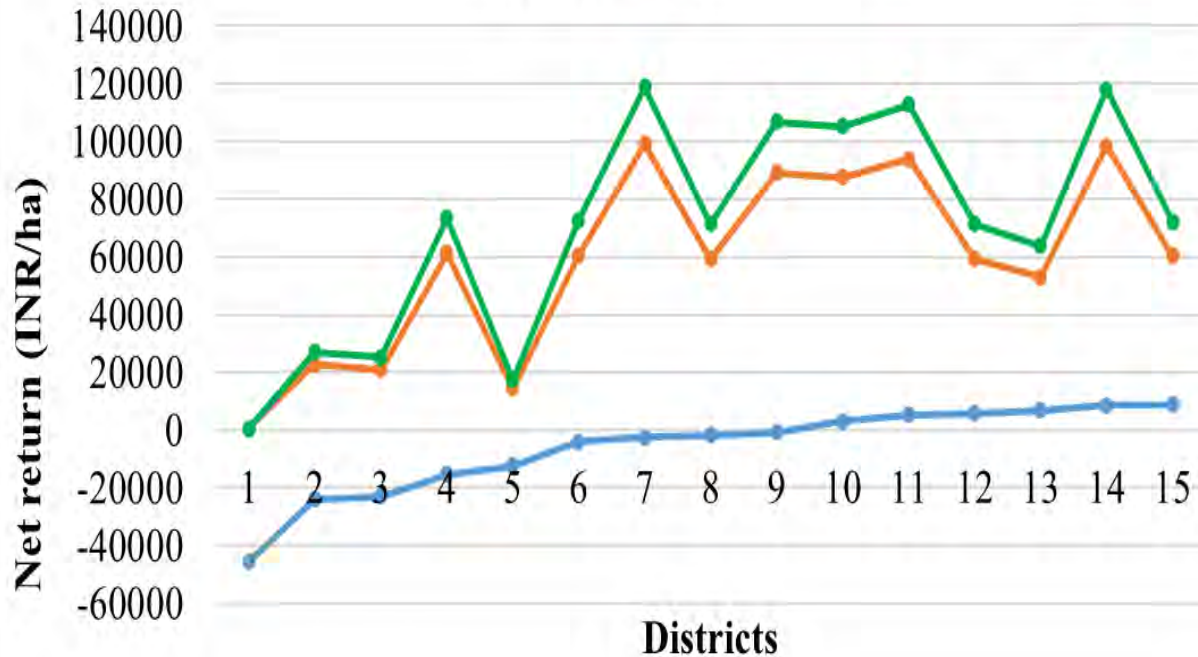
## Comparison of net return of rice vs pigeonpea (INR/Ha)



- Rice net return (INR/ha)
- Pigeonpea net return (INR/ha)
- Pigeonpea net return with 20% yield increase (INR/ha)

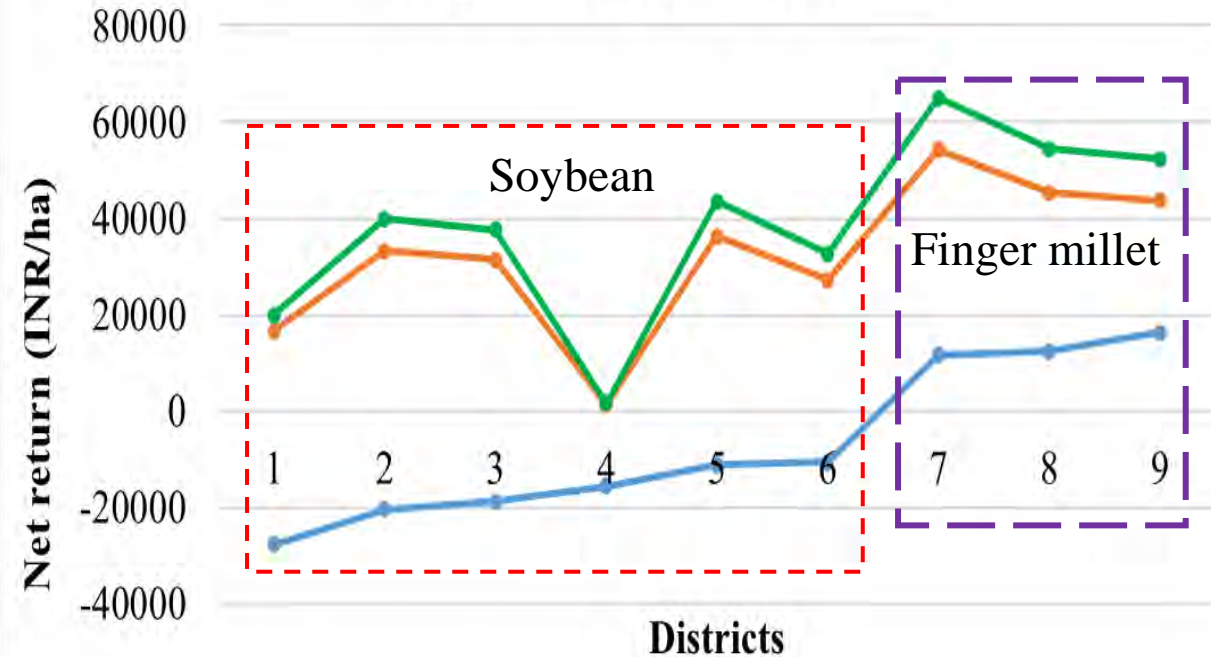
# Net return comparison: Rice (up to 2t/ha yield districts) vs. Competing crops

## Comparison of net return of rice vs groundnut (INR/Ha)



- Rice net return (INR/ha)
- Groundnut net return (INR/ha)
- Groundnut net return with 20% yield increase (INR/ha)

## Comparison of net return of rice vs soybean & finger millet (INR/Ha)



- Rice net return (INR/ha)
- Soybean & finger millet net return (INR/ha)
- Soybean & finger millet net return with 20% yield increase (INR/ha)

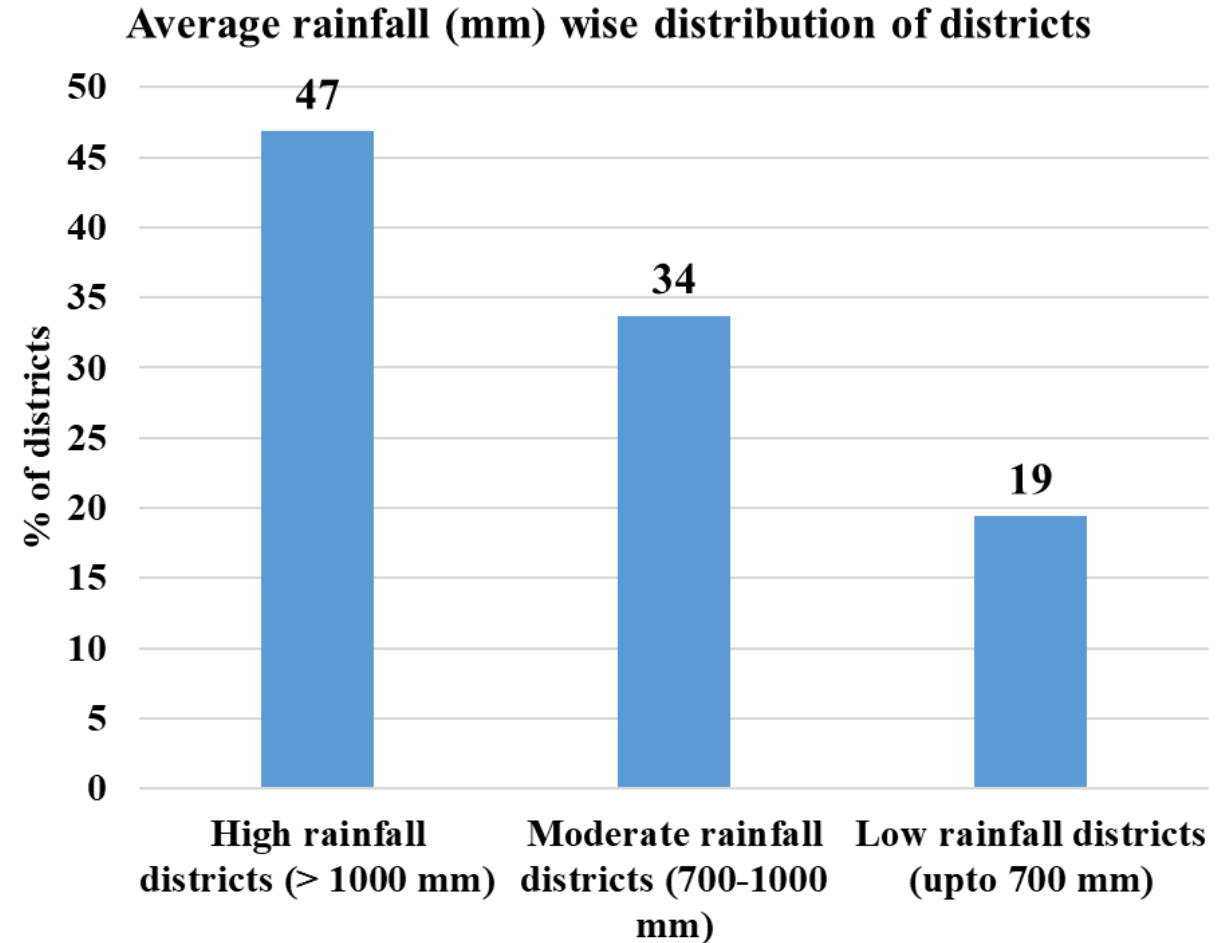
# Net return comparison: Rabi Rice vs. Competing crop



# Concerns in highly productive rice districts (> 3t/ha)

**There were 175 districts with yield more than 3 ton / ha**

<b>Average yield, ton/ha</b>	3.5
<b>Average net return (INR/Ha)</b>	30000
<b>Total area covered</b>	19.63 million ha



**There were 11 districts with up to 400 mm rainfall, with Rainfall as low as 270 mm (Fazilka – Punjab)**

# Benefits of savings of fertilizer and subsidy

<b>Input Category (kg/ha)</b>	<b>Cereal (Rice/Wheat)</b>	<b>Pulse (Chickpea/Moong/ Pp)</b>	<b>Net Savings (%)</b>
Nitrogen (N)	120-150	20	<b>83-86</b>
Phosphorus (P)	60	40	<b>33</b>
Potash (K)	40	20	<b>50</b>
Total NPK load	220-250	80	<b>67</b>

Source: ICAR-IIPR

# Holistic approach and regionally targeted diversification strategy

- Prioritize districts giving very low economic returns from rice
- Location-specific diversification incentives
- Besides income support per ha for diversification, clusters of district- assured procurement and price assurance for pulse/oilseed/millet in low yield zones
- Rewards to ecosystem services under intensive systems
- PDS reforms- nudging consumption behavior change- creating more demand for millets and pulses, initially in high mal-nutrition districts
- In the districts (2-4 t/ha): integrated approach for improving productivity, encouraging investment in improved technologies
- Other crops: maize, cotton, horticulture, etc

**Low yield/  
income rice area:  
5.86 million ha**

**Rabi rice area:  
3.5 to 4 million ha**

**Highly water  
stressed area of  
rice: >2 million ha**

**Total area to be  
prioritized:  
>11 million ha**

Thank YOU





# Evidenced Food Systems Transformation Policies in the Context of Viksit Bharat

7 April 2026

Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



# Rice Production: Ensuring Environmental Sustainability & Nutrition

Author/Presenter: Dr Swati Nayak, India Country Manager ad Interim and Scientist & South Asia Lead-Seed Systems  
Organization: International Rice Research Institute



Evidence-based Food Systems Transformation Policies in the Context of Viksit Bharat

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# Rice & It's Significance

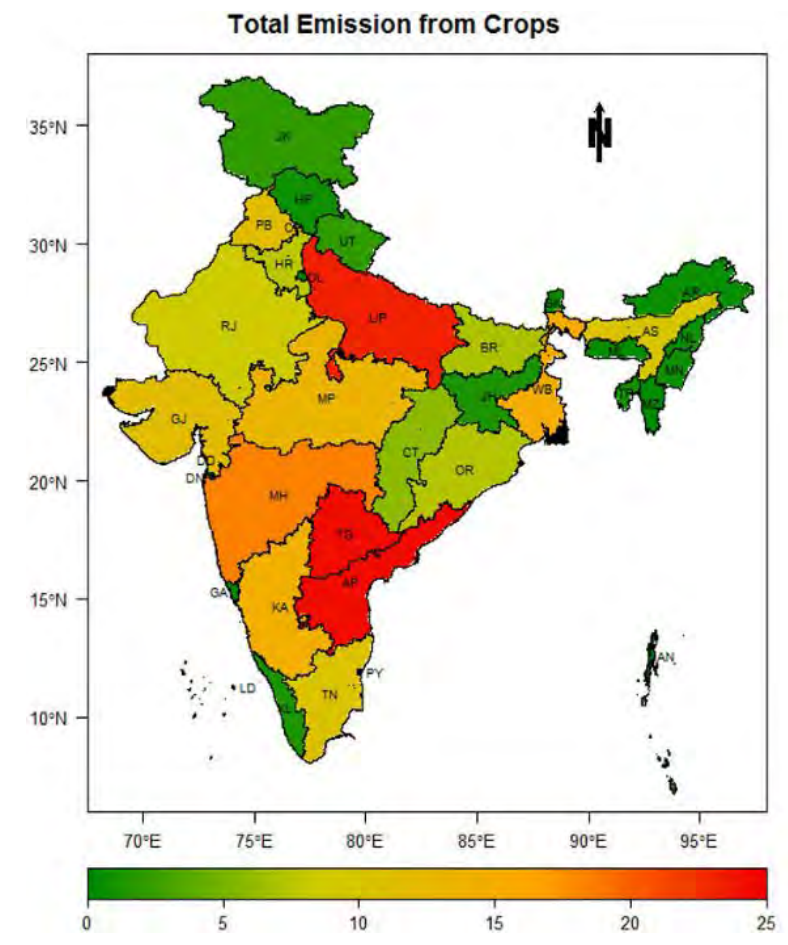


## India

- Largest producer (150 MT) & exporter (~20 MT) of rice (2024-25)
- Contributes over 30% of global rice export (> 70 % Non-Basmati & >25% Basmati)
- Major export to Africa, Middle East, USA, South & Southeast Asia

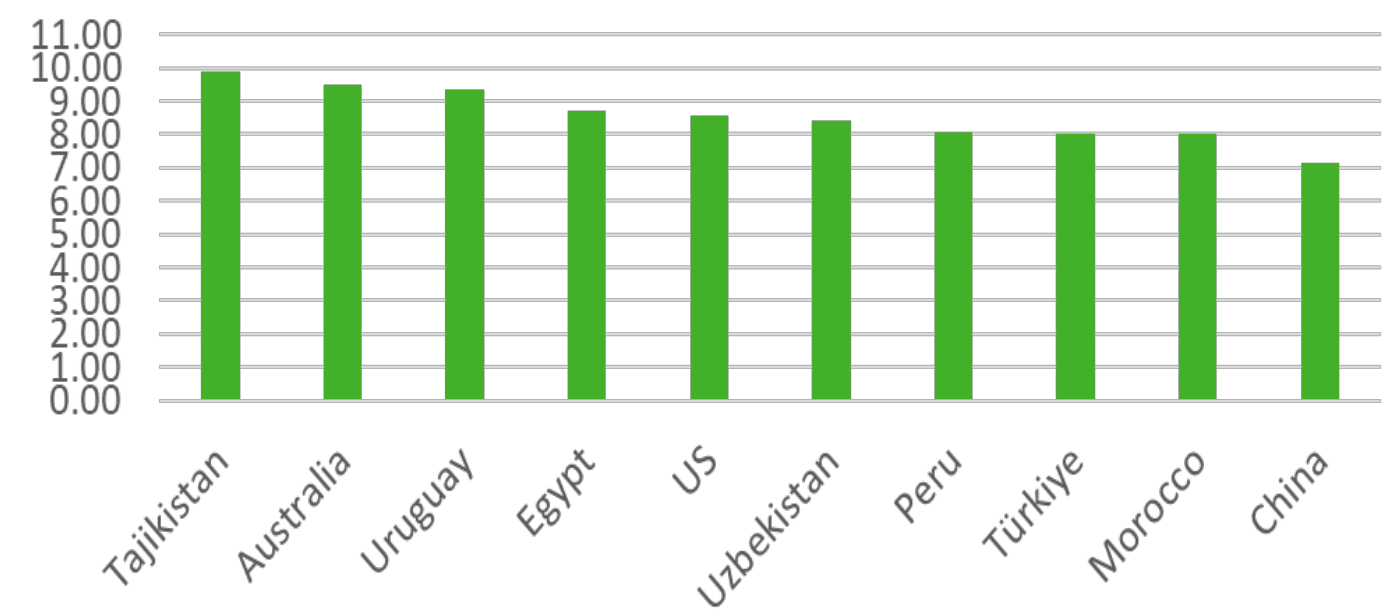
# Why rice systems must transform now and what are our policy priorities ?

- Victim of climate change in vulnerable geographies (drought/ flooding/ salinity pockets)
- High water print (3000-5000 l/kg)
- High carbon footprint & methane emission (~10% GHG emission in India)
- Residue burning, air pollution, by-product opportunity
- Less input use efficiency (Eg. Nitrogen) (**Fertilizer Burden**)
- Yield Plateauing
- Labor scarcity & increased costs, Poverty & gender issues
- Triple burden of malnutrition (1 in 9 hungry globally; >2b hidden hunger & 1 in 3 adult obese , India –a diabetes capital)
- Rice Premiumization an increasing need

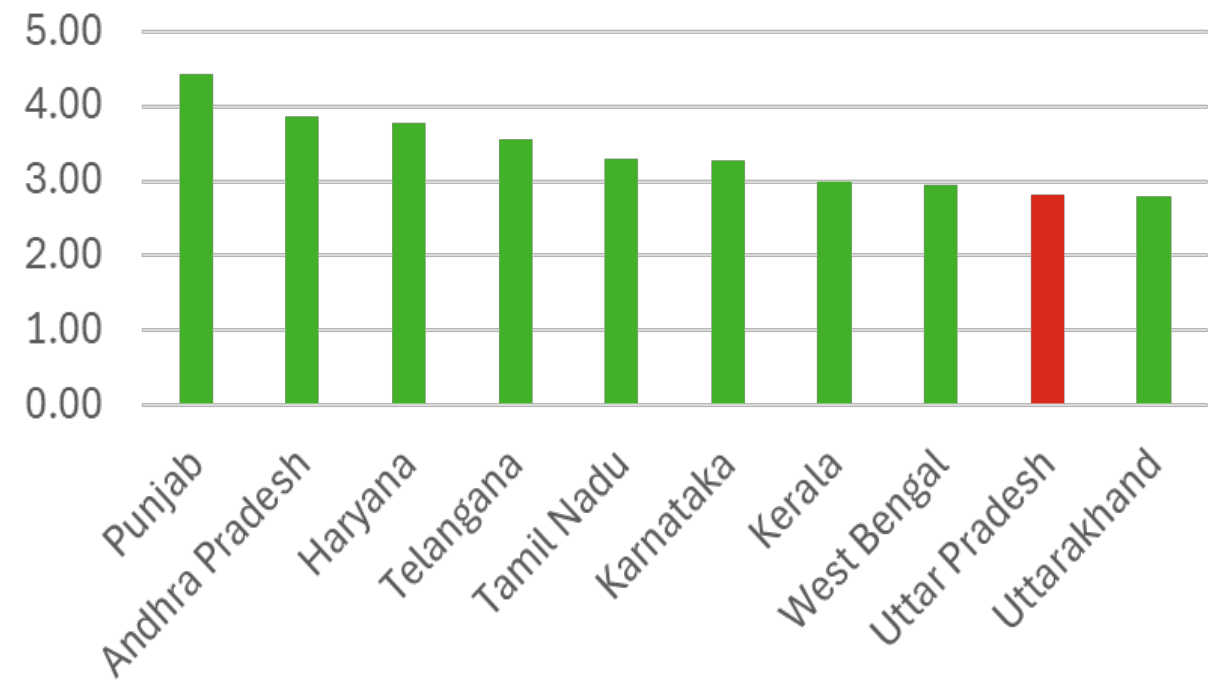


State-wise distribution of total GHG emissions from crops (Mt CO<sub>2</sub>eq)

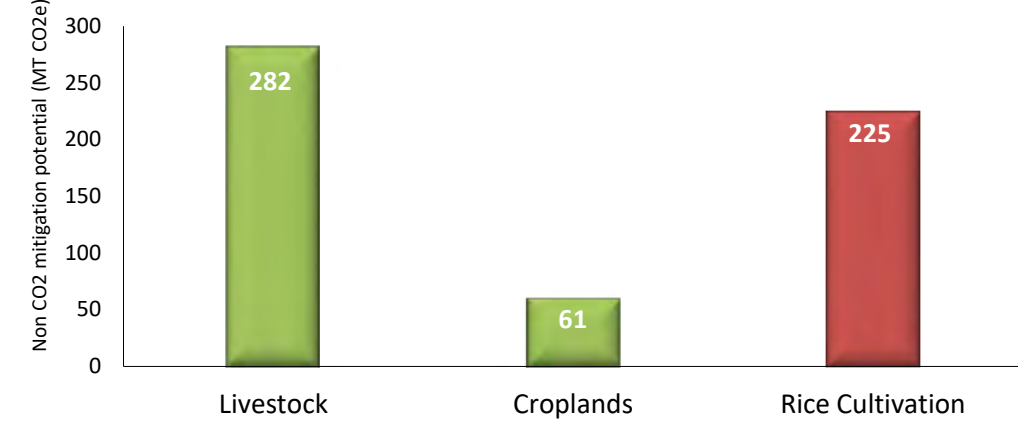
**Top Ten Countries in terms of Rice Productivity (t/ha), 2023**



**State-wise Rice Productivity (t/ha), 2024-25**



**Mitigation potential from the agriculture sector**



**India has the highest mitigation potential (35%) in South Asia**

# Breeding Innovations through National One Rice Breeding Network

## SpeedBreeding



Hon. PM Narendra Modi inaugurating SpeedBreed Facility (Dec 2021)

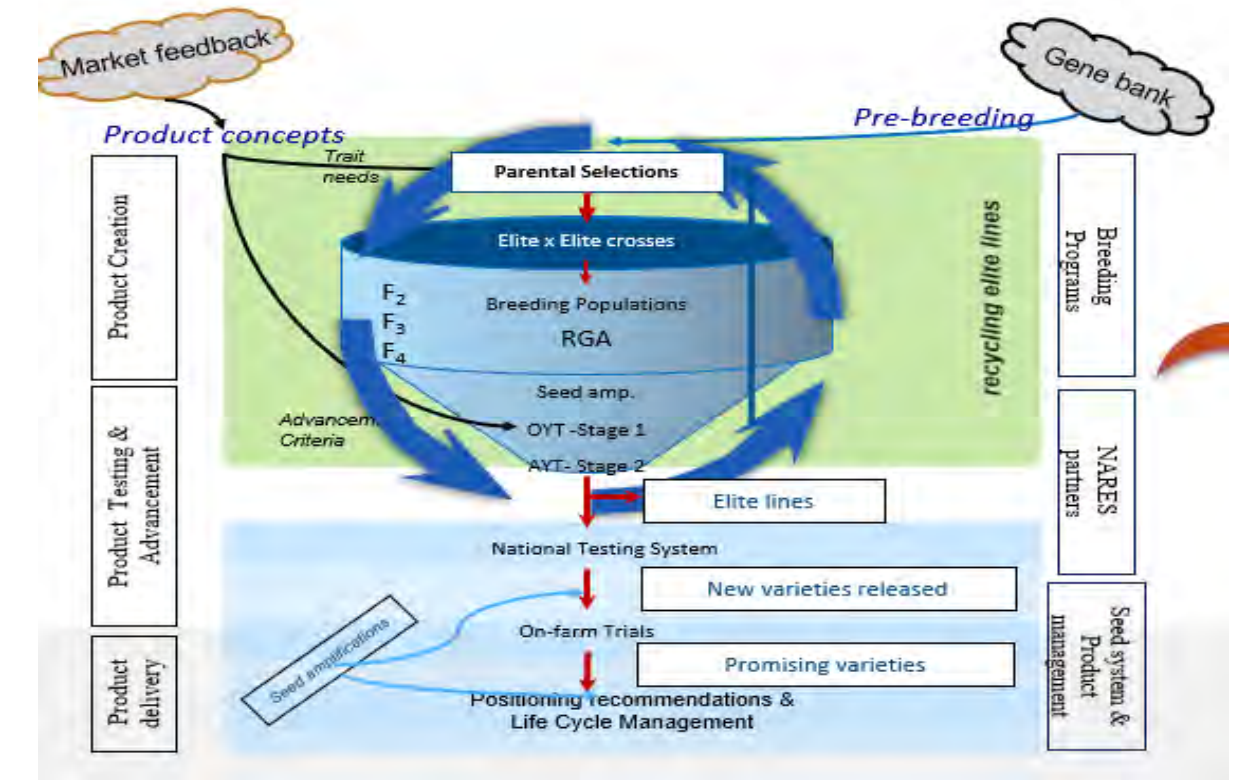
- Can grow **4-5 generations** of rice/year
- Reduce varietal development **time ~40%**
- Supported - **10+ facilities** across Asia
- **3 climate resilient** lines nominated to AICRIP

## Artificial intelligence in breeding



- AI enables rapid analysis of complex genomic and phenotypic data to identify key genes and QTLs.
- AI models enhance trait prediction accuracy and speed up genomic selection.

## Genomic selection-based breeding



- Utilizes genome-wide markers to predict genetic potential, enabling faster and more accurate selection with minimal phenotyping.
- Developing breeding lines suited for dry DSR, tolerant to drought, submergence, and salinity, while enriched with higher grain zinc.

# Evidence Driven Policy Implications ( Rice Breeding)

S.No.	Transformative Innovations	Policy level support for mainstreaming transformational change
1	Speed Breeding facility & protocol development- first of it's kind in Rice	ICAR led national level scaling by establishing Speed Breeding facilities ~10 plus locations with a SOP in place
2	DSR Breeding-global flagship –IRRI-ICAR One Rice Breeding Network	ICAR-IIRR as AICRP Rice nodal agency introduced the direct seeded rice new segments under irrigated ( early, medium & Late maturities ) and Rainfed ( Medium & Late maturities) ecologies for testing the newly developed DSR breeding lines / products from 2024 onwards
3	Market Oriented Breeding efforts through market intelligence , product concepts & product profiling	ICAR institutes initiated the market-oriented surveys to develop the product concepts and product profiles for the Indian breeding programmes through various work shops and learnings from CGIAR-IRRI efforts
4	Joint Crossing Blocks (JCB) with the NARES-CGIAR-IRRI efforts	Indian NARES institutions has come forward to initiate the joint crossing blocks at their locations with the support of IRRI
5	Joint Salinity Network proposals with AICRIP-ICAR-IIRR	ICAR-IIRR is coordinating the Salinity Network jointly with IRRI at 12 locations for testing IRRI breeding lines under salinity stress ecology

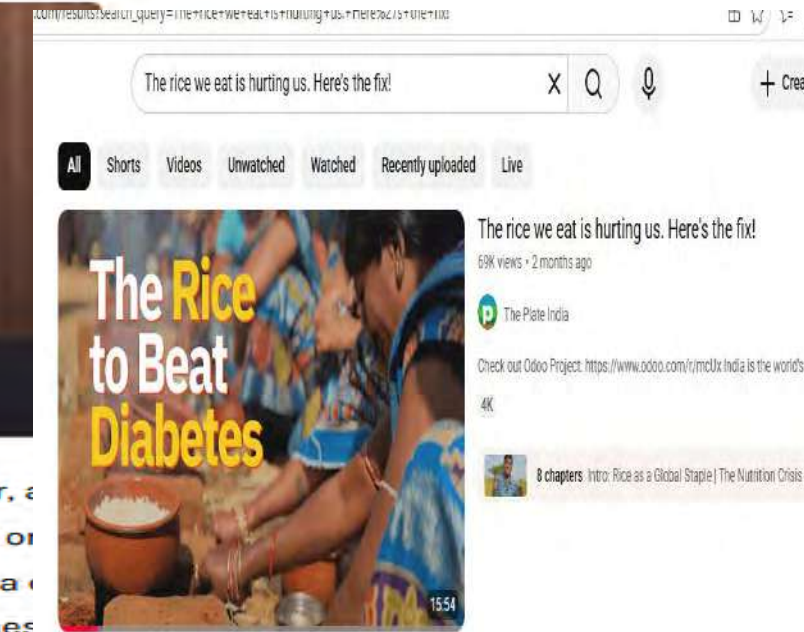
# Scaling through Committed State Investment & Science Driven Evidence Network

- Market Demand driven Field Validation, Evidence generation, Data Driven EGS linkages through Seed System Interventions
- Odisha State Commitment in Deployment and Mainstreaming of Climate Resilient and Healthier Specialty Rice Varieties – DAFE- OSSC- IRRI- ICAR - OUAT (IIRR , CRRI +)
- Assam Government – World Bank – IRRI- AAU Partnership Pushed VRR and SRR to a promising range
- DAFE, with inputs from IRRI, has included biofortified and low GI varieties in its promotional schemes ( District level demonstration plans , Ahaar centre , Seed Indenting)
- OSSC has prioritised mainstreamed and scaled several STRVs and Healthier Rice

Government partners emphasized linking rice production with improved nutrition. Specialty rice requires robust certification and policy frameworks to complement, not compete with, conventional rice.



"With women farmers and consumers at the center, a farmer-producer organization-led clusters focused on specialty rice and its targeted seed systems, Odisha build nutrition, create export value, and position these varieties as a priority," said Shubhranshu Mishra, Additional Secretary, Department of Agriculture.



## WAVA (Yrs) trend in high and low investment states (2020-24)

A business case analysis in change in Rice VRR across States

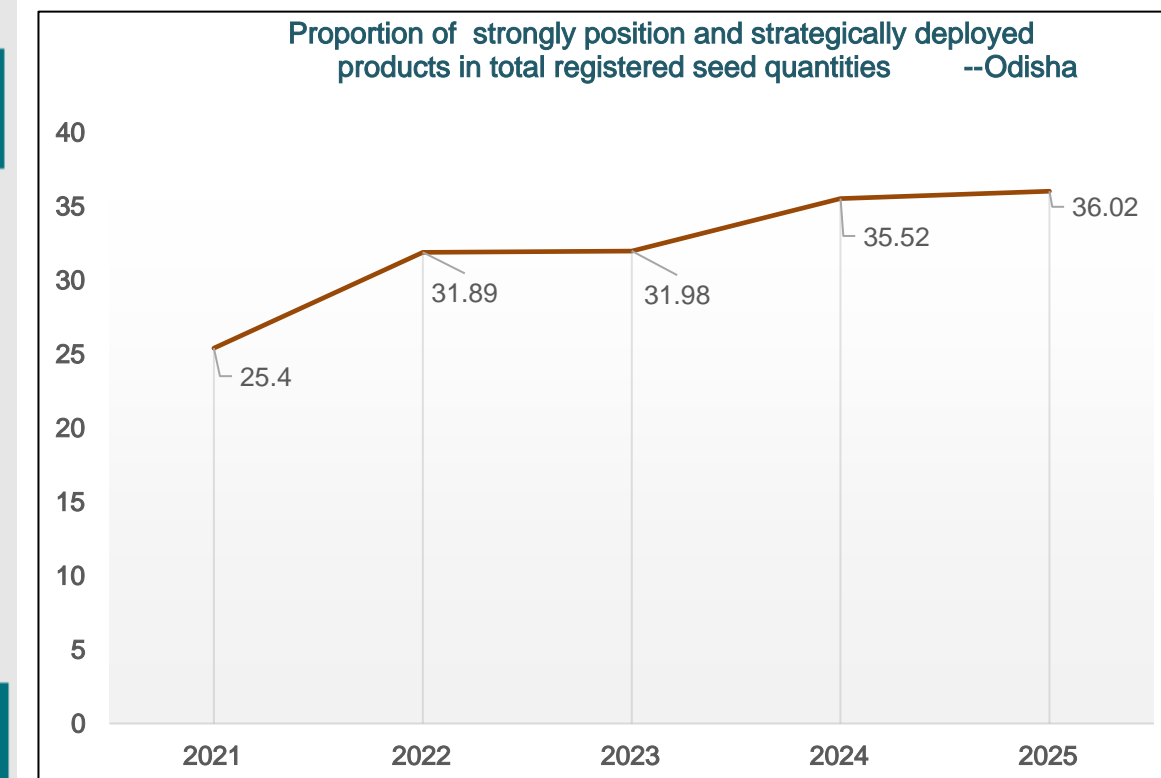


**2023**

- > 0.5 million ha under STRVs, 0.4 million farmers
- > STRV adoption: 59%
- > 103 Million USD economic benefit (87M\$ in grains, 16M\$ in seed) to the State (2018-23)

**2018**

- > Only 0.05 million ha under STRVs by ~0.03 million farmers
- > Negligible seed production through private companies/seed corporation



# Redefining landraces & low, ultra low GI rice for health and prosperity

## Nutrition-related issues:

Carbohydrate Rich | Hidden Hunger | High glycaemic impact | Low dietary diversity | Processing losses

## Novel gluten-free products development

- Landraces, Low/ultra low GI and Millet based innovative, high-value, nutritious, and nutraceutical market-ready food products
- Product offerings consist of RTC & RTE gluten-free bakery products, breakfast cereal, and convenience items.
  - ✓ Nutritious wholegrain cookies: Landraces (*Kalanamak, Chakhao*), low GI rice & *Finger Millet*
  - ✓ Ready to eat breakfast for diabetic consumers: Rice flakes, muesli, brown rice, coarse semolina, instant poha & upma using landraces

## Policy Imperative and Work in Progress:

- Support rice value addition efforts through entrepreneurship and commercialisation through startups, FPOs, and private sector engagement
- Scaling and Mainstream nutrient-rich/PQR in PDS, ICDS, and school meals
- Promoting diversified diets by integrating pulses and millets alongside rice
- Incentivize nutritious rice varieties through procurement and subsidy reforms
- Strengthen awareness & value chains for healthier rice consumption



Cookies from landrace rice



Low GI rice flakes



Low GI rice semolina



Low GI poha mix



Instant rice upma mix



Entrepreneurship development and commercialisation

# Low-emission technology bundles for environmental sustainability

Collectively, emissions can be reduced by as much as 65% - mostly methane



## 1 Improve water management:

- AWD/ Mid-season drainage/Laser land leveling

## 2 Residue management:

- **In-situ:** incorporation, decomposer
- **Off-field:** bailer, alternate use (feed, composting, biochar, mushroom production, other products)

## 3 Nutrient management:

- SSNM/PNM
- Sulphur containing fertilizers
- Slow-release fertilizers

## 4 Variety:

- Shorter duration inbreds and hybrids

## 5 Uniform sowing:

- Mechanized and precise direct-seeded rice

# Farm mechanization and residue management in a green circular economy



Nursery raising machine for mechanical transplanting



Precision hill seeder



Baler



Compost turner

# Direct Seeded Rice - Evident Entry Point for advancing sustainable rice systems

## Puddled Transplanted Rice (PTR)



### Drivers of Shift

Labour, Water, Economics, GHG

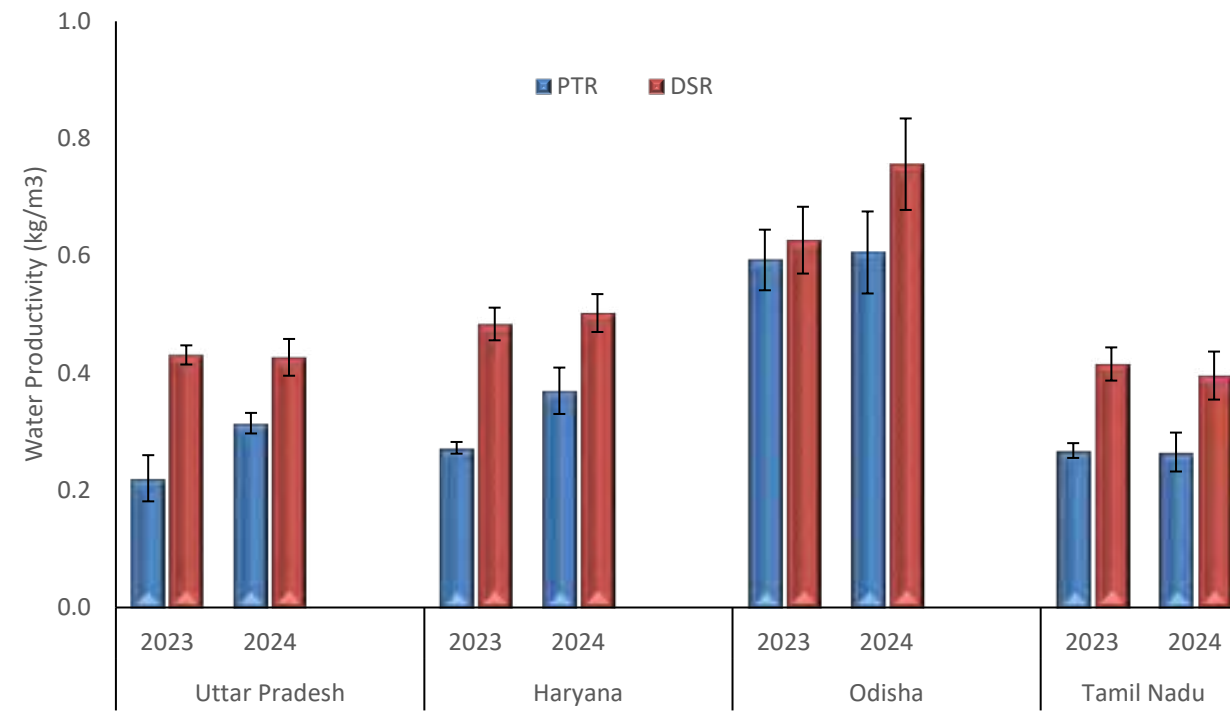


## Direct Seeded Rice (DSR)

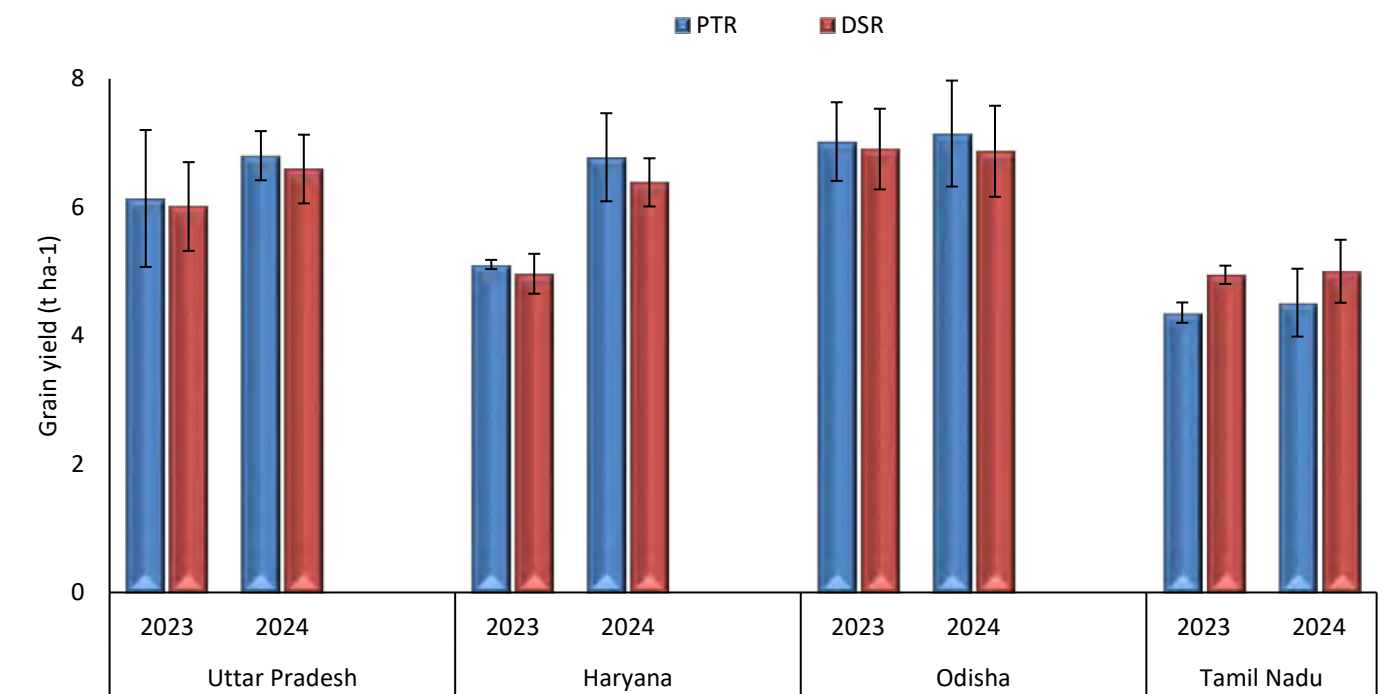


- 40% labour saving
- 25-40% water saving
- up to \$150 profit/ha
- 30-40% lower emissions
- Increased yield gain when combined with BMPs
- Early sowing of succeeding crop

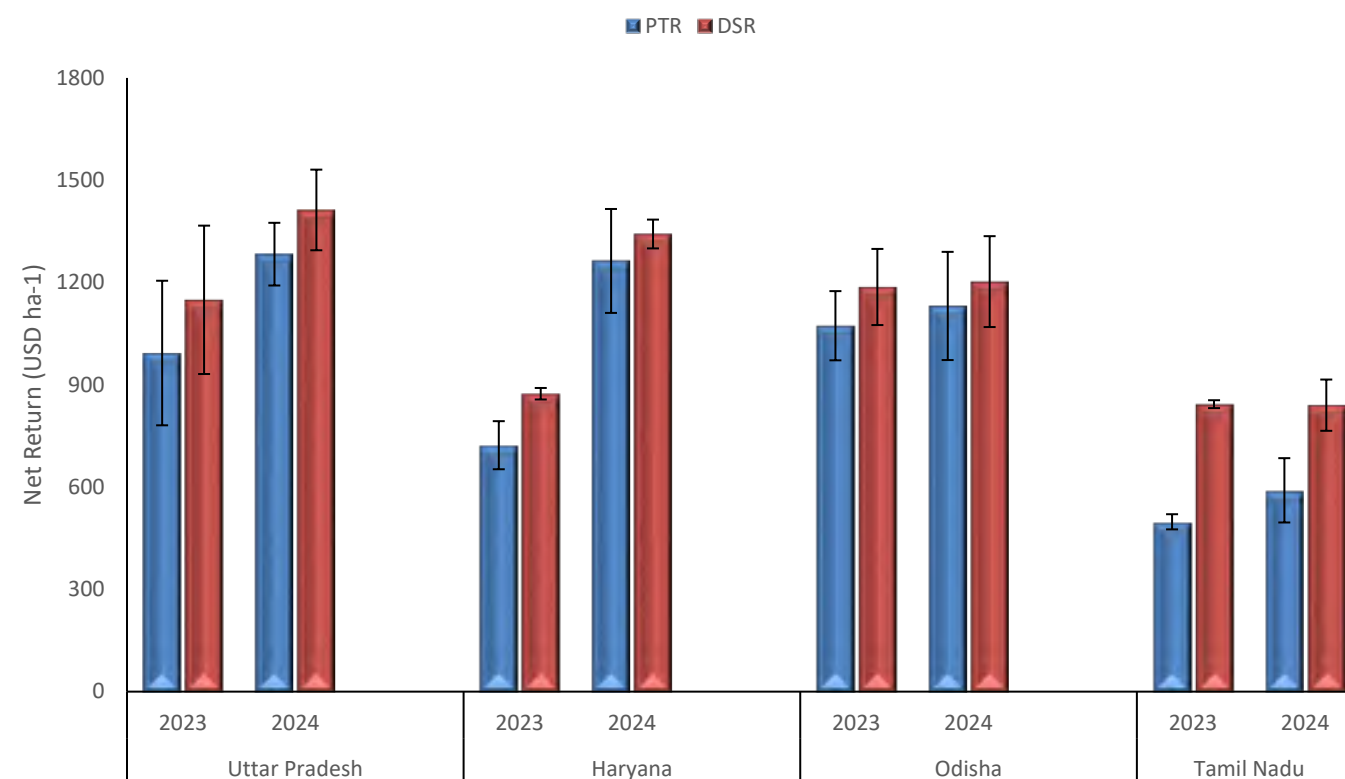
### Water Productivity in DSR Vs PTR



### Grain Yield in DSR Vs PTR



### Net Return in DSR Vs PTR



### Key findings

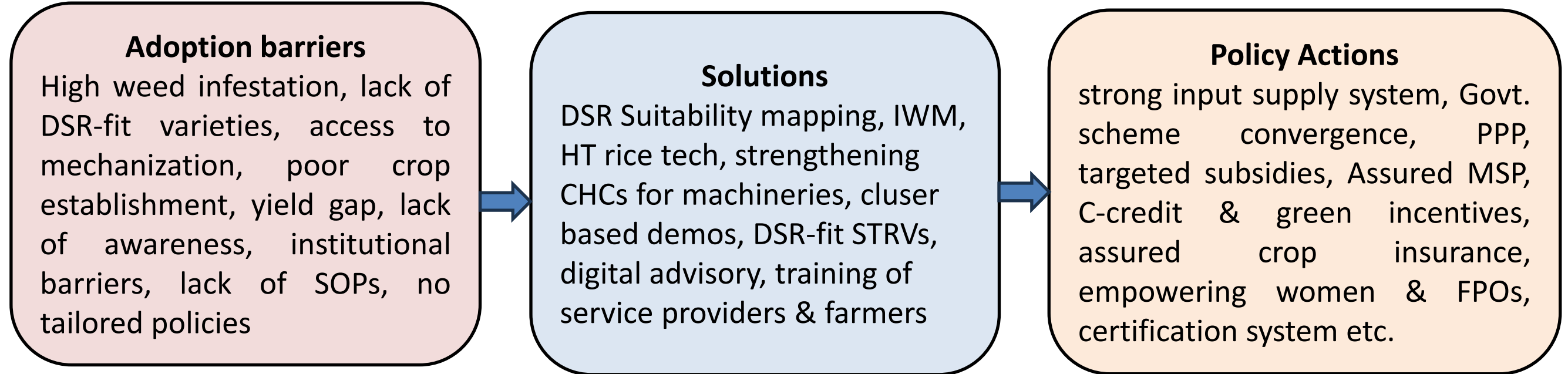
- High Water productivity in all states (7-95%) compared to PTR
- Yield were similar in DSR & PTR in all states except Tamil Nadu where yield gain 0.6 t/ha in DSR over PTR.
- Net returns were higher in DSR in all states in 2023. DSR had 80 to 350 USD/ha higher than PTR.

# Efforts in mainstreaming DSR in National and Global Policy Landscape

- DSR Consortia (**DSRC**) -to develop risk reducing agronomy practices (e.g. *Vattar* DSR)
- Identified core DSR traits; **tested 31 DSR-fit** varieties (10 already in national seed chain)
- Developing **DSR suitability mapping**; strategies for digital weed mapping and **drone-based herbicide application**
- Stewardship **guidelines for HT rice** with ICAR & Patented two machines (**e-seeder & precision hill seeder**)
- **Demonstration Clusters** (20,000 ha) and training of >1200 service providers
- **Samridh Dhan Network** & Strategic collaboration among state governments, IRRI & WRG
- Global **DSR Conclave** (Oct 2025) & **Rice policy dialogue** (Mar 2026)



- **Key outcomes of the convenings**
- Region-wise **‘White Paper’** by identifying region-specific constraints, solutions & Scaling roadmap for DSR in suitable areas



**Adoption barriers**  
 High weed infestation, lack of DSR-fit varieties, access to mechanization, poor crop establishment, yield gap, lack of awareness, institutional barriers, lack of SOPs, no tailored policies

**Solutions**  
 DSR Suitability mapping, IWM, HT rice tech, strengthening CHCs for machineries, cluster based demos, DSR-fit STRVs, digital advisory, training of service providers & farmers

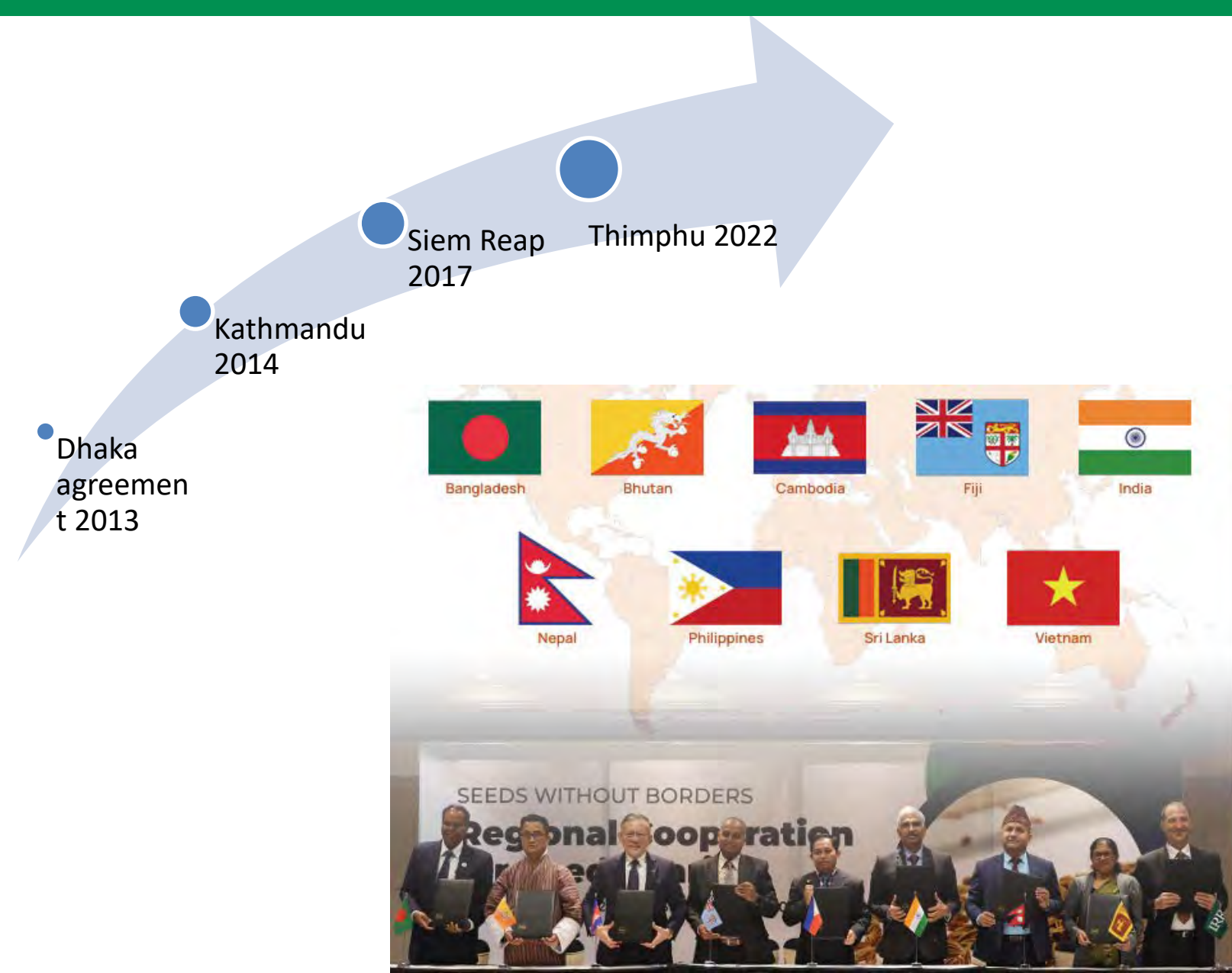
**Policy Actions**  
 strong input supply system, Govt. scheme convergence, PPP, targeted subsidies, Assured MSP, C-credit & green incentives, assured crop insurance, empowering women & FPOs, certification system etc.



Patented two farm implements (Hill Seeder & E-Seeder) with JNKVV, Jabalpur

# Fostering and Strengthening Regional Cooperation- Seeds Without Borders

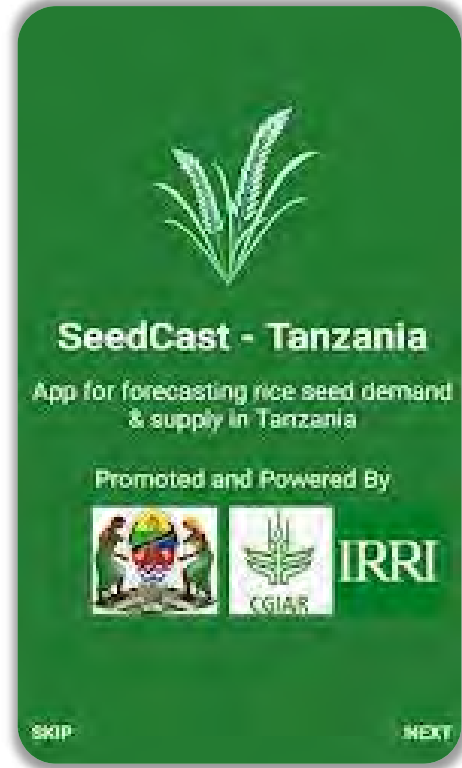
Innovation	Mainstreaming / Scaled Impact
Cross border sharing of registered products & mutual recognition of varietal testing and release systems and data , evidence	Started between India and Bangladesh , now has total 9 member countries and CGIAR IRRI as moderator
Rice as a Pilot Crop	As membership expanded, approved crops expanded to Cereals, pulses, Oilseeds, non-hybrid vegetables, sugarcane, fibre crops, roots , tubers, fruits
Dialogues, Regional Policy Forums	Observers- Indonesia, Lao PDR & 8 African countries (Burundi, Ethiopia, Kenya, Madagascar, Mozambique, Tanzania, Uganda & Zambia)  BRICS Seed and Input Framework (draft in progress ) drawn inspiration



Variety Released so far	Crop	No of varieties(17)
Bangladesh to India	Rice	10
India to Nepal	Rice	3
Nepal to India	Rice	2
Bhutan to India	Potato	1
Philippines to India	Rice	1

Seed inventory management, demand collation , and supply information tool, originally co-developed and **piloted in India (IRRI -OSSC)** in small scale, now being **adopted in Bangladesh by BADC;** being **piloted in Tanzania by TOSCI.**

This tool's introduction is helping the Seed system digitization policy of Bangladesh



## Supporting MoAFW (DAFW & ICAR ) and other National Stakeholders on

- BRICS Framework on seeds and inputs
- Bilateral Cooperation and Seed Sector Opportunity
- Co-convening National Seed Congress
- India Africa Seed Summit



## Four stakeholder consultations, one mission



# The Cascaded Impact- Reinforcing Global and State Investments

Uttar Pradesh Agriculture Growth and Rural Enterprise Ecosystem Strengthening Initiative (UPAGREES)



## Productivity Enhancement

- Resource-use efficiency for productivity enhancement
- Mechanisms for improved seed system
- Strengthening extension services for tailored climate-smart agronomy practices
- Leveraging carbon markets

## Commodity Clusters

- Crop clusters
- Fisheries
- Integrated agriculture export hubs

## Digital & Financial Ecosystem

- Digital architecture & technology services
- Agri finance ecosystem

**WORLD BANK CHIEF AJAY BANGA HAILS UTTAR PRADESH'S RESILIENT FARMING MODEL AS A GLOBAL TEMPLATE FOR SMALL FARMERS**

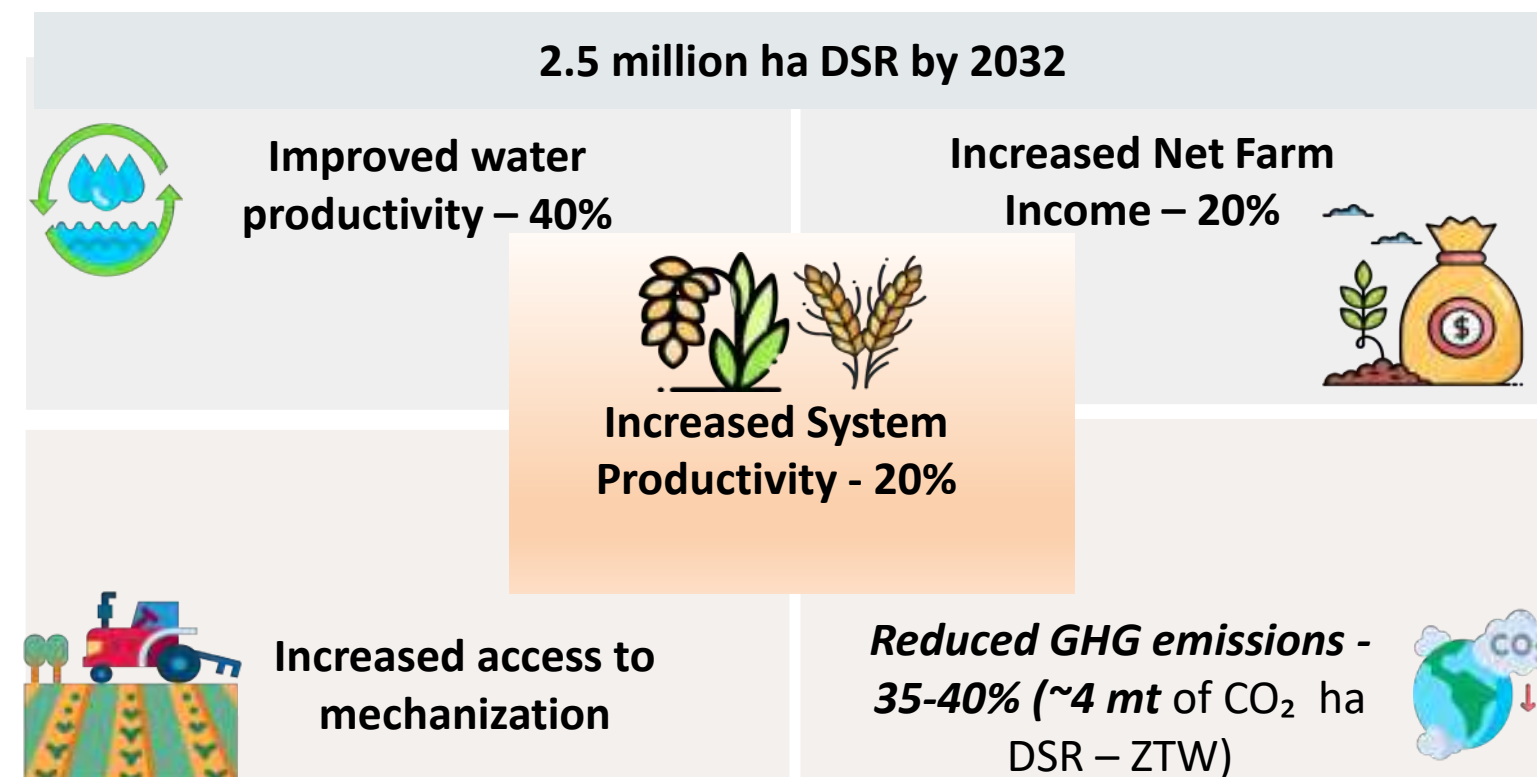
Banga highlighted that UP has shown how resilience, cooperative systems, and digital tools can come together to create a dynamic and scalable agricultural ecosystem. "This model works – it's a proof of concept."



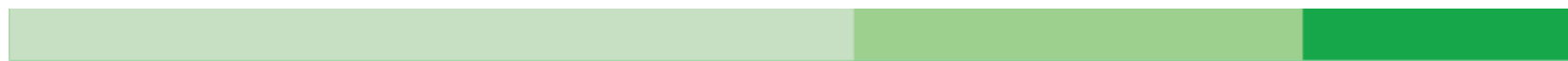
## Priority Areas for Rice based Systems

- R-W systems optimization (DSR)
- Climate smart varieties + BMPs
- Traditional rice & value-chain
- Capacity Development

## Expected impact



**THANK YOU**





# Evidence-Led Food Systems Transformation Policies in the Context of Viksit Bharat

7 April 2026

Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



# Commodity focus and evidence-based policy contributions to Viksit Bharat

## Maize and Wheat: Balancing Food Security, Sustainability and Bioenergy

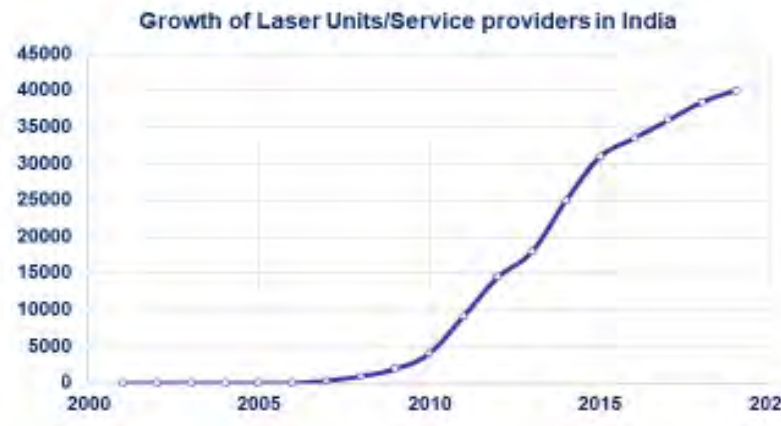
Mahesh K Gathala ([m.gathala@cgiar.org](mailto:m.gathala@cgiar.org))  
Country Representative for CIMMYT India/Lead Systems Agronomist- Asia

Evidence-Led Food Systems Transformation Policies in the Context of Viksit Bharat

7 April 2026 | Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi

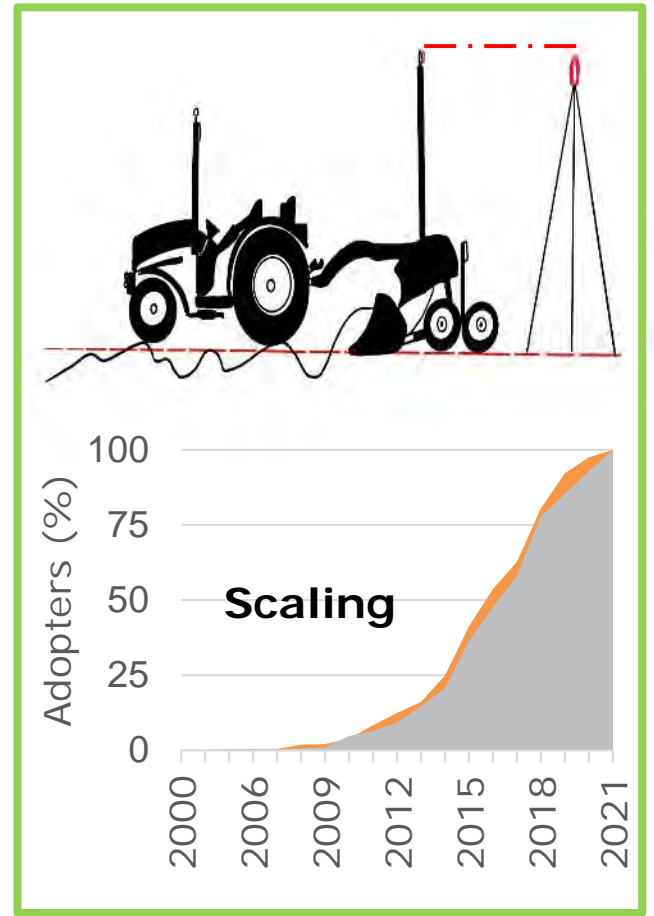


# Laser Assisted Precision Land Leveling: A Silent Water Revolution With Impact at Scale Through Science and Participatory Innovations Approaches



- Introduced through partnerships between CGIAR and NARS through eco-regional program, The Rice-Wheat Consortium (RWC) led by CIMMYT
- Best example of impact at scale in NRM with large private investments (~US\$ 1 billion) with public and private benefits

Combination of Bottom-Up to Top-Down



<p>Introduced in India during 2000-01 (RWC/CIMMYT-IRRI, ICAR/NARS)</p>	<p>Adoption: ~20 million ha in India</p>	<p>Direct employment generation: 350 person days/unit/yr</p>
<p>At current level (40000 units) employment generation: 14 million person days/yr</p>	<p>Indirect employment: manufacturing, transport, services</p>	<p>Yield gains in RW system (5 mha, 0.5 t ha<sup>-1</sup> yr<sup>-1</sup>)- &gt;2 mt yr<sup>-1</sup>;</p>
<p>Electricity saving for irrigation</p>	<p>Water saving in RW system (5 mha, 18 ha-cm ha<sup>-1</sup> yr<sup>-1</sup>) = 10 km<sup>3</sup> yr<sup>-1</sup></p>	<p>Other benefits- GHG mitigation, savings in subsidy bill etc</p>

- More than 100 manufacturers are running business beyond India

Source: Jat and Gathala et al, 2006; 2009a,b; 2011; 2015; Aryal et al, 2015, 2018; Vijesh et al., 2021



# Climate Resilient Research Innovations Platforms



Seven long-term basic and strategic research trials on Conservation Agriculture based Sustainable Intensification (CA) continued to generate scientific evidence on key performance indicators to address specific NRM issues (soil health, water, environment, energy, and GHG) with improve income and nutrition.

Sr. No.	Long-term Research Platform	Site	Establishment Year
1	Long-term strategic research on Conservation Agriculture based sustainable intensification in wheat and maize based systems-Karnal	ICAR-CSSRI Karnal, Haryana	2009
2	LTE addresses challenges in eastern India where the need for sustainable and low-risk agronomic innovation is acute for millions of vulnerable smallholder farmers	ICAR-RCER, Patna, Bihar	2010
3	Long-term trial on precision water and nutrient management in Conservation Agriculture-based maize-wheat system in western IGP-Ludhiana	BISA- Ludhiana, Punjab	2014
4	Long-term trial on precision water and nutrient management in Conservation Agriculture-based rice-wheat system in western IGP-Ludhiana	BISA- Ludhiana, Punjab	2014
5	Long term research on conservation agriculture (CA) in rice-wheat system	RPCA-U-Pusa Bihar	2006
6	Long-term research on conservation agriculture in rice-maize systems in eastern IGP	RPCA-U-Pusa Bihar	2007
7	System diversification in western IGP for sustaining the natural resources and improving the resilience in maize systems	ICAR-IIMR, Ludhiana, Punjab	2023



# INSIGHTS

## POLICY FORUM

### AGRICULTURE AND ENVIRONMENT

## Fields on fire: Alternatives to crop residue burning in India

Farmer profit can be increased and air quality improved

By R. Shyamprasad<sup>1</sup>, N. P. Springer<sup>2</sup>, H. Tallur<sup>3</sup>, S. Polashy<sup>4\*</sup>, M. L. Jat<sup>5</sup>, H. S. Sidhu<sup>6</sup>, P. D. Kishoripriya<sup>7</sup>, N. Shikha<sup>8</sup>, W. Girma<sup>9</sup>, V. Gupta<sup>10</sup>, J. Cunniff<sup>11</sup>, J. Datta<sup>12</sup>, H. H. Dholakia<sup>13</sup>, J. Dixon<sup>14</sup>, R. Gerard<sup>15</sup>, R. Gupta<sup>16</sup>, J. Halim<sup>17</sup>, A. Jadhav<sup>18</sup>, H. S. Jat<sup>19\*</sup>, A. Kishor<sup>20</sup>, J. K. Ladha<sup>21</sup>, S. Lopez-Ridaura<sup>22</sup>, S. P. Nambiar<sup>23</sup>, S. Paul<sup>24</sup>, A. Rötter<sup>25</sup>, P. C. Sharma<sup>26</sup>, R. Singh<sup>27</sup>, D. Singh<sup>28</sup>, R. Somanathan<sup>29</sup>

Although intentional use of fire to transform land has decreased globally (1), particularly among highly arid

burning, clarify the business case for alternative practices, identify remaining uncertainties, and discuss approaches to increase

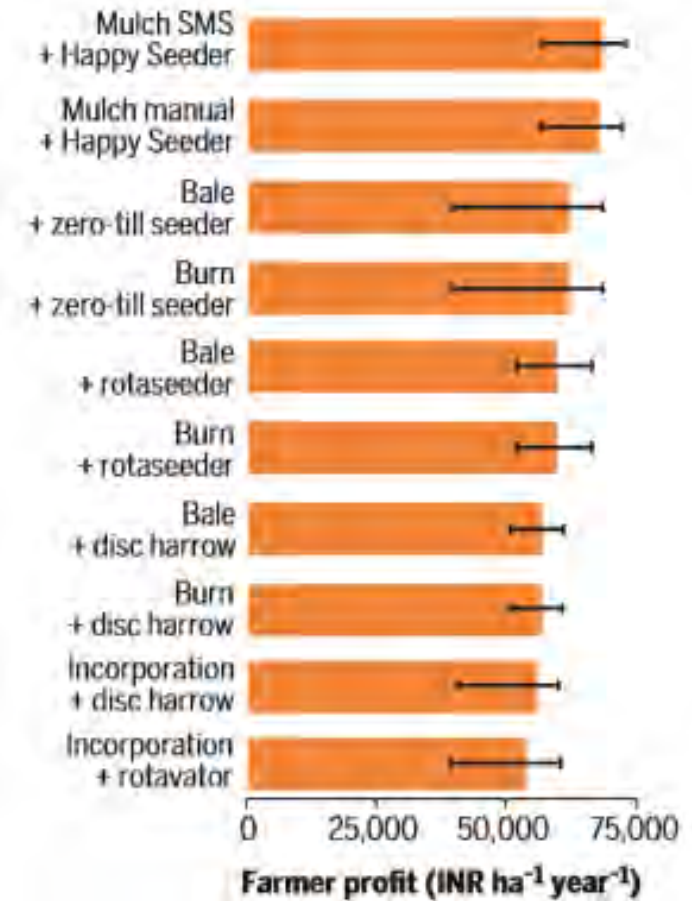
a rice-wheat cropping system (~4.1 million ha). Concerns over groundwater withdrawal have led to a planting cycle that allows the rice crop to benefit from monsoon rains. This cycle creates a short period (~10 to 20 days) to harvest rice, manage the crop residue, and plant wheat. Many of the 2.5 million farmers in northwestern India prepare for wheat planting by burning an estimated 23 million metric tons of rice residue in their fields (2).

India's national government recognizes both the air pollution risks and the crucial role of crop residue burning. Despite federal and state regulations since 2014 and related advisories and bans, directives against burning have been only partially enforced. The reluctance to enforce existing policies arises, in part, from the belief that profitable alternatives to burning crop residue do not ex-

ist from <https://doi.org/10.1093/aes/afz009> on August 8, 2019

# Technologies, Execution and Policy Impacts

Science, 9 AUGUST 2019, VOL 365 ISSUE 6453



## Times of India:

- Haryana slashes stubble burning by 90% since 2016: CM Saini
- 'Need of hour is to cultivate less water-intensive crops' = 2.2 lakh ha (200000 INR ha<sup>-1</sup>)
- 95% dip in stubble fires, farmers not to blame for Delhi pollution : ICAR Chief



# ICAR-CIMMYT Joint Participatory Innovation Platforms for Potential Yield Realization in Maize Systems in NW India (ICAR-IIMR and State Departments)

Crop	Crop duration (days)	Grain yield (Mg ha <sup>-1</sup> )	Total cost of cultivation (INR ha <sup>-1</sup> )	Irrigation water use (m <sup>3</sup> ha <sup>-1</sup> )	Irrigation water productivity (Kg grain m <sup>-3</sup> )	Net Return (INR ha <sup>-1</sup> )	Total GWP (kgCO <sub>2e</sub> ha <sup>-1</sup> )
Maize	95	6.01a	41759b	2106b	3.07a	77476a	1869b
Rice	128	6.22a	52380a	16966a	0.38b	71622b	4943a
<b>Benefits</b>	<b>-33 days</b>	<b>-0.21</b>	<b>-10621</b>	<b>-14860</b>	<b>8-fold</b>	<b>5854</b>	<b>-3074</b>



Window available between two main crops

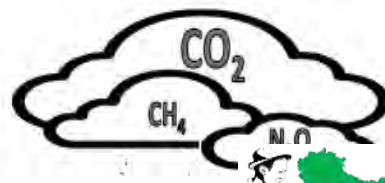
Comparable and similar yields to rice



Eight times (88%) less irrigation is required with 8-fold higher water productivity



Low production cost and higher profit margins

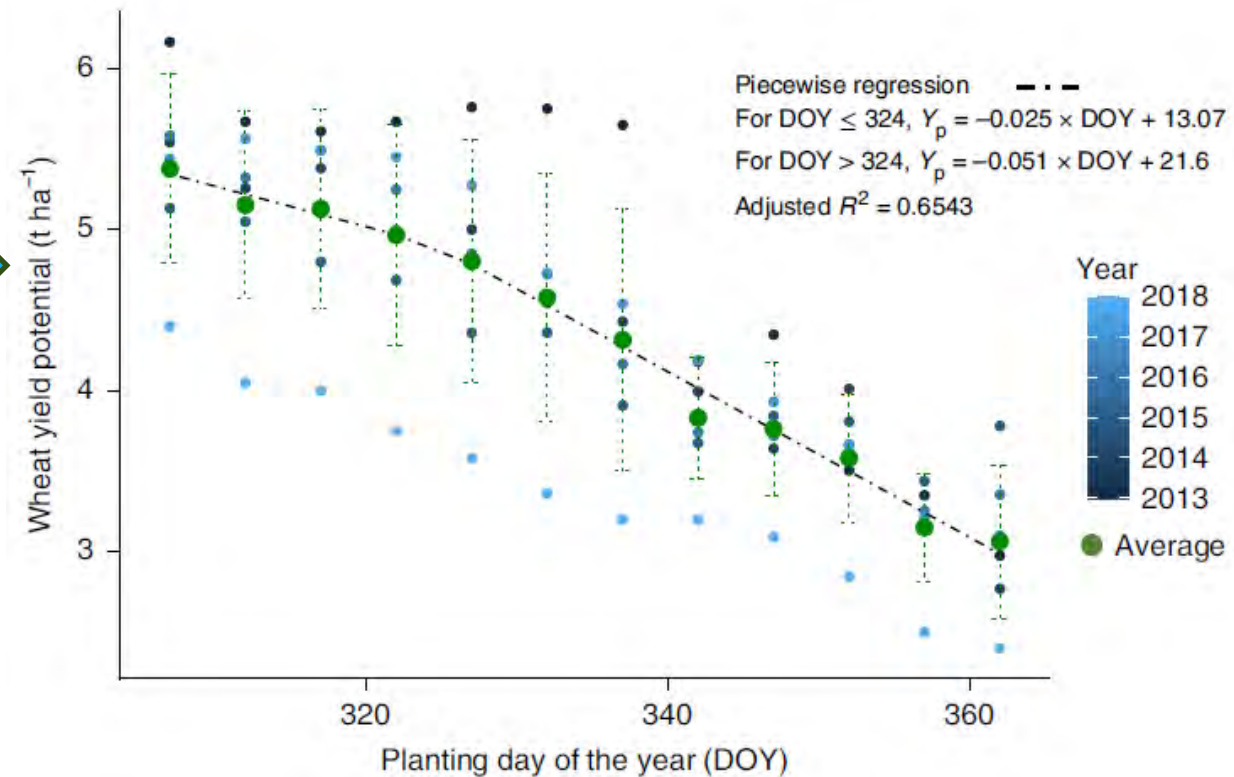
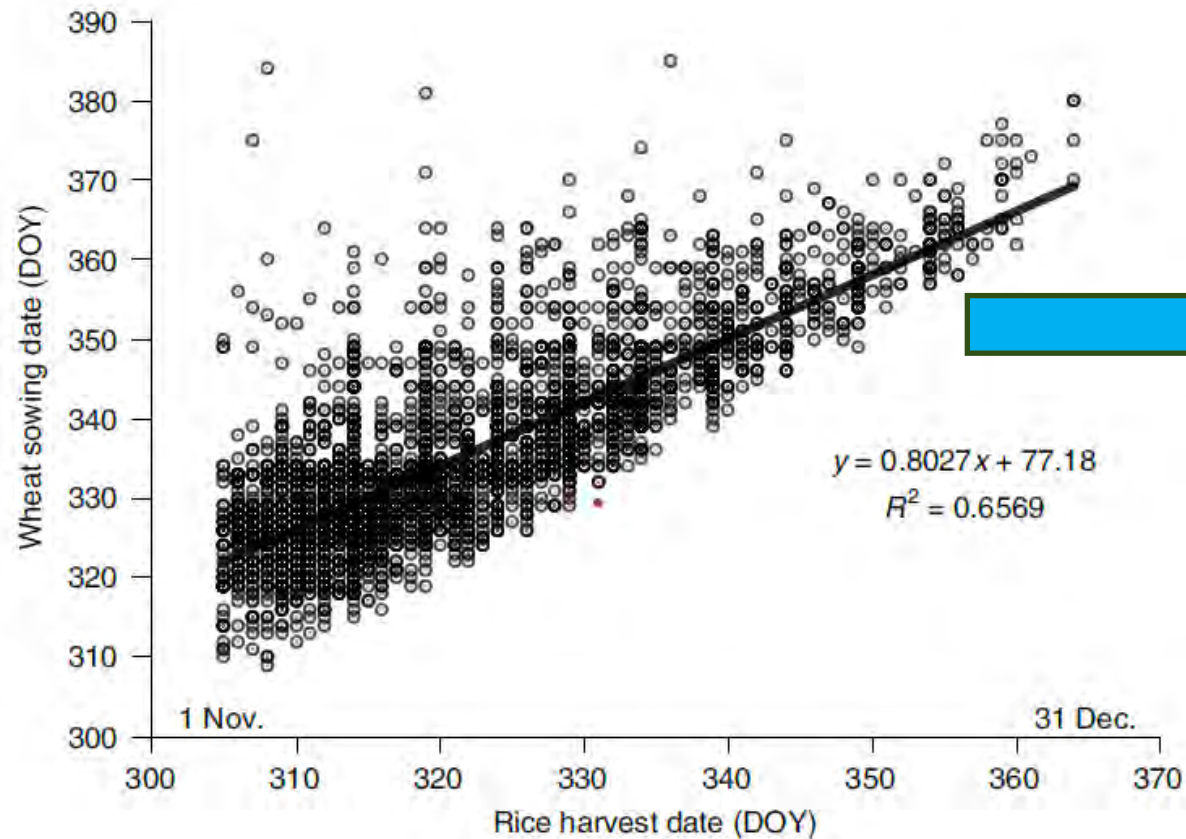


GWP reduced by 62%



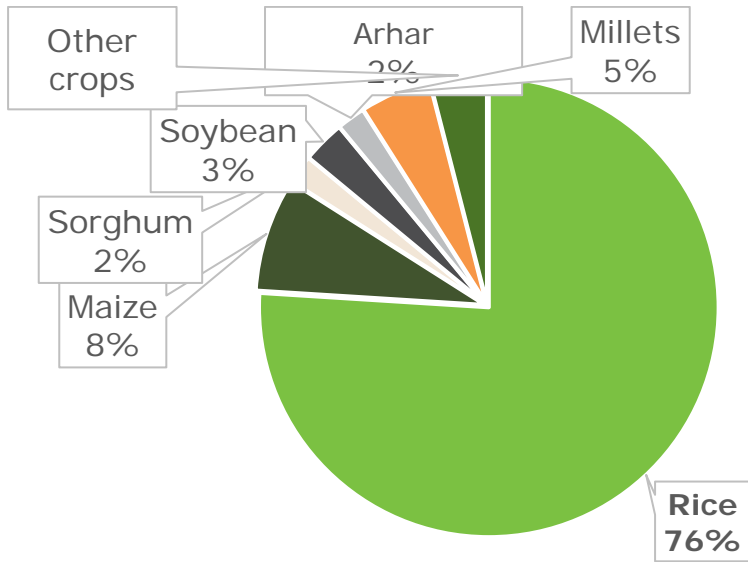
Source: Shankar et al., 2026; Jat et al., 2025; Gathala et al., 2020, 2021

# Time management governs climate resilience (Science based recommendation for Wheat planting in Eastern) India



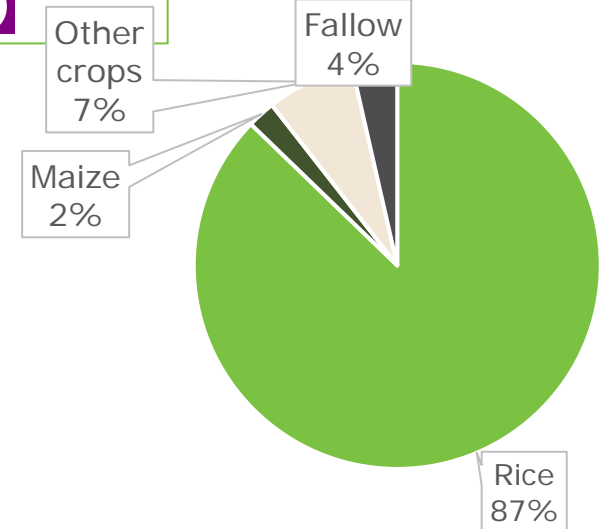
McDonald et al., 2022 (<https://doi.org/10.1038/s43016-022-00549-0>)

# Impact of timely sowing of Rice on Crop diversification



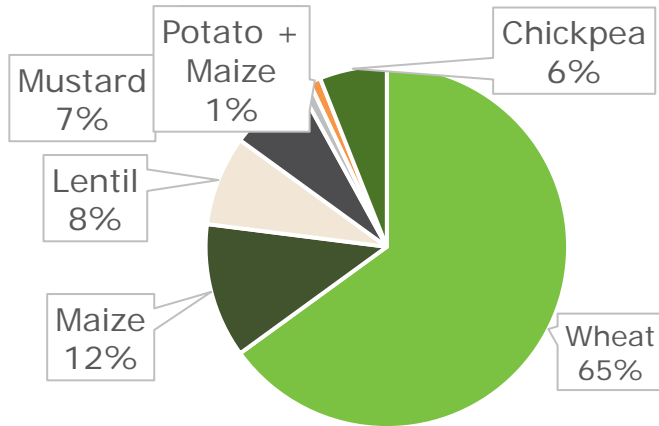
**CRA: 24% area diversified.**

## Crop Diversification (Kharif)

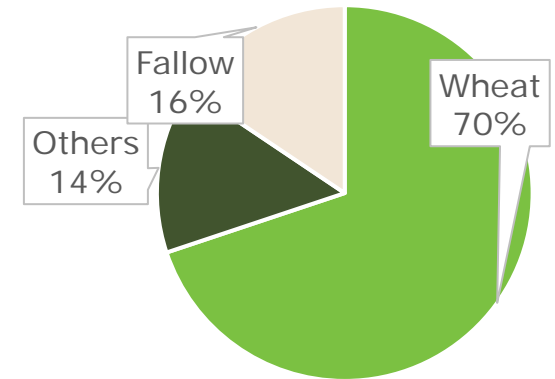


**Non-CRA: 9% area diversified.**

## Crop Diversification (Rabi)



**CRA: 36% area diversified.**



**Non-CRA: 14% area diversified.**

Jat et al., 2026

# Crop productivity, energy use for irrigation, pumping cost and global warming potential with alternative systems in Punjab

Scenarios	Productivity (t ha <sup>-1</sup> ) Rice eq. yield	Energy use for ground water pumping (kWh)	Pumping Cost (Rs ha <sup>-1</sup> )	% saving (Rs/ha) as compared to RWCT-FP	GWP (kg CO <sub>2</sub> eq. ha <sup>-1</sup> )
CT Rice-wheat-Flood Irrigation	11.79c	3995	22252	-	3971
CA Rice-Wheat-Flood Irrigation	11.72c	3702	20620	7.3	3680
<b>CA Rice-wheat- Drip + Solar</b>	<b>12.06bc</b>	<b>3723</b>	-	<b>100</b>	<b>0</b>
CT Maize-wheat-Flood Irrigation	11.87c	1444	8043	63.9	1435
CA Maize-wheat irrigation	12.43b	1181	6578	70.4	1174
<b>CA Maize-wheat-Drip + Solar</b>	<b>12.93a</b>	<b>1189</b>	-	<b>100</b>	<b>0</b>



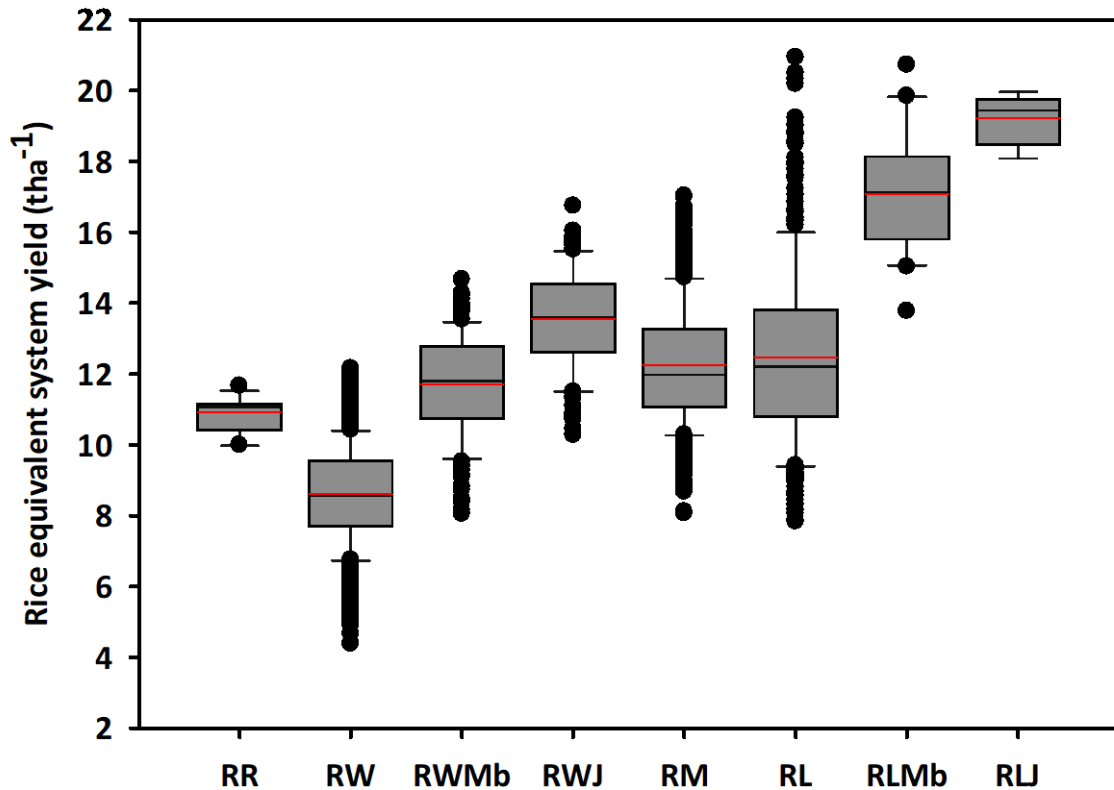
- Conservation Agriculture
- Diversification
- Drip Irrigation
- Solar



- 10% Increased system yield
- 70% energy reduced for pumping
- More than 90% of irrigation water saved
- No GWP for water pumping

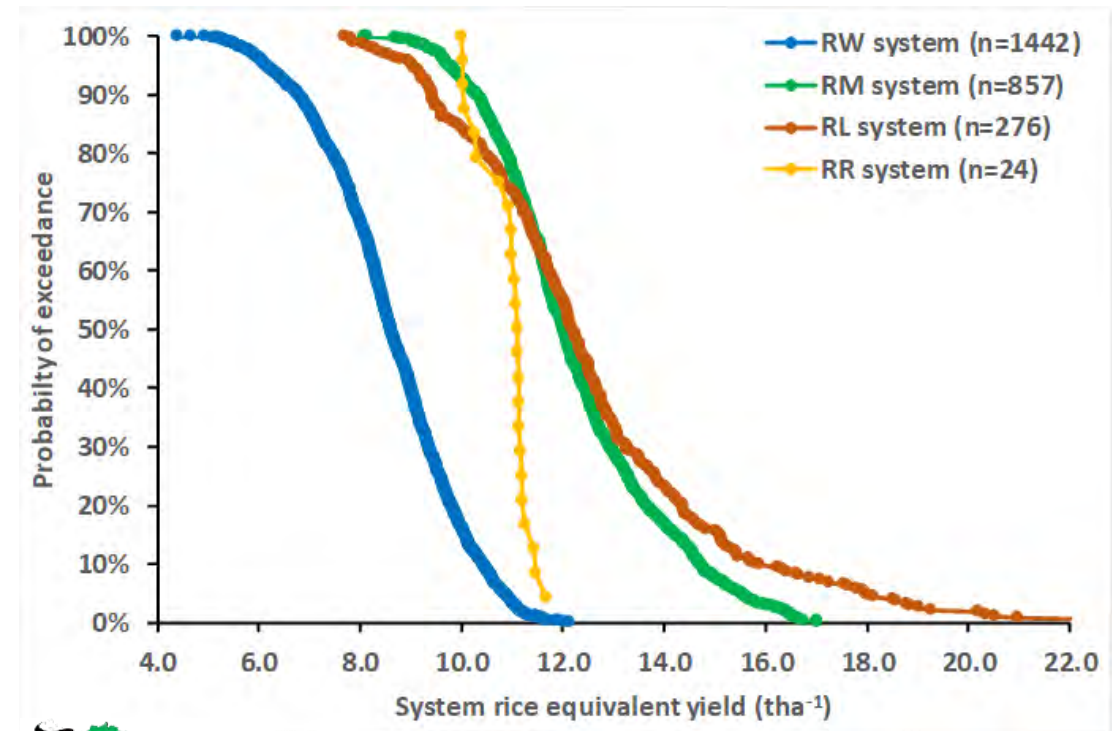
Source: Rolaniya, Jat, Sidhu, Saini (2020)-ICAR-PAU-CIMMYT-BISA

# Systems productivity scenario (over 400 farm trails) across eight districts of the EGP, South Asia



	RR	RW	RWMb	RWJ	RM	RL	RLMb	RLJ
n =	24	1442	168	103	857	276	20	6
SE =	0.11	0.04	0.11	0.14	0.06	0.16	0.39	0.29
CV =	4.75	15.96	12.22	10.25	13.82	21.73	10.19	3.71

- RW and RR cropping systems are not competitive
- Diversifying with RM or RL gives higher systems yields led to **Maize based diversification**
- Rice-Mustard-Boro rice also very productive and profitable led to **rice-based intensification**
- **Rice-potato-maize systems**



Source: Islam, Gathala et al., 2019; 2020; 2021; Peter et al., 2023

# Business models for scale-out the CASI: Science Informed Policy

## STAKEHOLDERS ENGAGED AND COORDINATED BY FARMER SUPPORT GROUPS

Research project: acts as a catalyst through farmer support groups to test and apply CASI in the EGP

Research and Extension Departments

- Build capacity
- Provide technical backstopping

Private sector

- Machinery manufacture
- Supply agrochemical inputs & seed

Finance sector

- Credit options
- Microfinance opportunities
- NABARD

Government sector

- Subsidise new machinery
- Support at different levels of governance

2013-14 started with Only three Farmers clubs

**Farmer support groups:**

- Facilitate engagement between stakeholders
- Coordinate support for farmers from external agencies
- Provide benefits to local communities

2020-21 working with >100 Farmers club  
76 women groups for mechanized rice nursery

Provide services to:

- Local communities
- Community beyond the farmer support group

Converge government schemes:

- Facilitate and organise to benefit farmers

Participatory research

- Catalyse research projects
- Link farmers and researchers

Employment opportunities

- Youth employment
- Seed multiplication
- Machinery operation

Small business opportunities

- Small scale product processing
- Small scale factories

## BENEFITS PROVIDED BY FARMER SUPPORT GROUPS TO LOCAL COMMUNITIES

### Policy intervention

- Included in compulsory CA machine (CHC)
- CA machinery included in subsidy schemes
- Replicate business model in Southern WB
- Encourage maize production to replace boro (winter) rice
- Mandatory convergence with govt. programs and schemes

Gathala et al., 2020, 2021;  
Peter et al., 2023

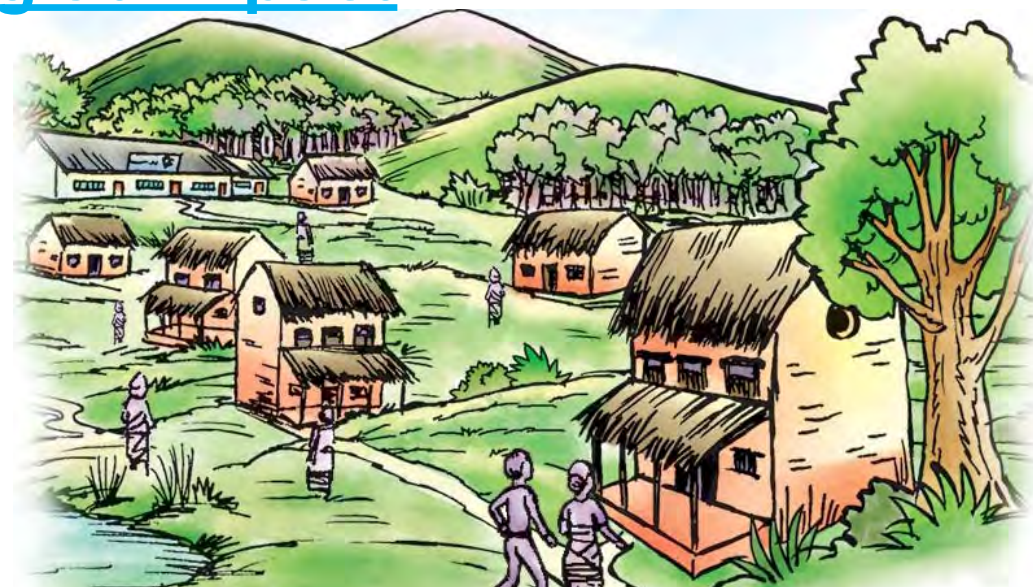


# Building resilience through Climate-Smart Villages (CSVs)

## Private sector led scaling at impact

1. Mechanisms to create evidence base for Climate-Smart Agriculture (CSA), and facilitate co-development of scaling mechanisms
  - Scaled CSA to tribal farmers of Maharashtra (1000 CSVs)
  - Climate Resilient Agriculture (CRA) program in Bihar reaching to all 38 districts and 9 districts in Madhya Pradesh
2. Scaling CSVs through the Corporate sector
  - ITC Limited adopted CSV approach. Currently working on more than 7000 villages across 12 states covering more than 21.80 acres ([ITC Annual Report 2025](#))
  - ITC Limited plans to scale CSVs to 15 states in India reaching 3 Million acres by 2030

**Partners** : ICAR institutes, SAUs, State/Provincial Governments, Industry and Civil society.



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Synthesis

### The climate-smart village approach: framework of an integrative strategy for scaling up adaptation options in agriculture

Pramod K. Aggarwal<sup>1,2</sup>, Andy Jarvis<sup>1,3</sup>, Bruce M. Campbell<sup>1,4</sup>, Robert B. Zougmore<sup>1,5</sup>, Arun Khatri-Chhetri<sup>1,2</sup>, Sonja J. Vermeulen<sup>1,6</sup>, Ana Maria Loboguerrero<sup>1,3</sup>, Leocadio S. Sebastian<sup>1,7</sup>, James Kinyangi<sup>1,8</sup>, Osamu Bonilla-Findji<sup>1,3</sup>, Maren Radeny<sup>1,8</sup>, Jaim Recha<sup>1,8</sup>, Deissy Martinez-Baron<sup>1,2</sup>, Julian Ramirez-Villegas<sup>3</sup>, Sophia Huyer<sup>1,9</sup>, Philip Thornton<sup>1,8</sup>, Eva Wollenberg<sup>1,10</sup>, James Hansen<sup>1,11</sup>, Patricia Alvarez-Toro<sup>3</sup>, Andrés Aguilar-Ariza<sup>7</sup>, David Arango-Londoño<sup>3,12</sup>, Victor Patiño-Bravo<sup>3</sup>, Ovidio Rivera<sup>3</sup>, Mathieu Ouedraogo<sup>1,5</sup> and Bui Tan Yen<sup>1,7</sup>

**ABSTRACT.** Increasing weather risks threaten agricultural production systems and food security across the world. Maintaining agricultural growth while minimizing climate shocks is crucial to building a resilient food production system and meeting developmental goals in vulnerable countries. Experts have proposed several technological, institutional, and policy interventions to help farmers adapt to current and future weather variability and to mitigate greenhouse gas (GHG) emissions. This paper presents the climate-smart village (CSV) approach as a means of performing agricultural research for development that robustly tests technological and institutional options for dealing with climatic variability and climate change in agriculture using participatory methods. It aims to scale up and scale out the appropriate options and draw out lessons for policy makers from local to global levels. The approach incorporates evaluation of climate-smart technologies, practices, services, and processes relevant to local climatic risk management and identifies opportunities for maximizing adaptation gains from synergies across different interventions and recognizing potential maladaptation and trade-offs. It ensures that these are aligned with local knowledge and link into development plans. This paper describes early results in Asia, Africa, and Latin America to illustrate different examples of the CSV approach in diverse agroecological settings. Results from initial studies indicate that the CSV approach has a high potential for scaling out promising climate-smart agricultural technologies, practices, and services. Climate analog studies indicate that the lessons learned at the CSV sites would be relevant to adaptation planning in a large part of global agricultural land even under scenarios of climate change. Key barriers and opportunities for further work are also discussed.

# Developing smart crop Insurance Solutions

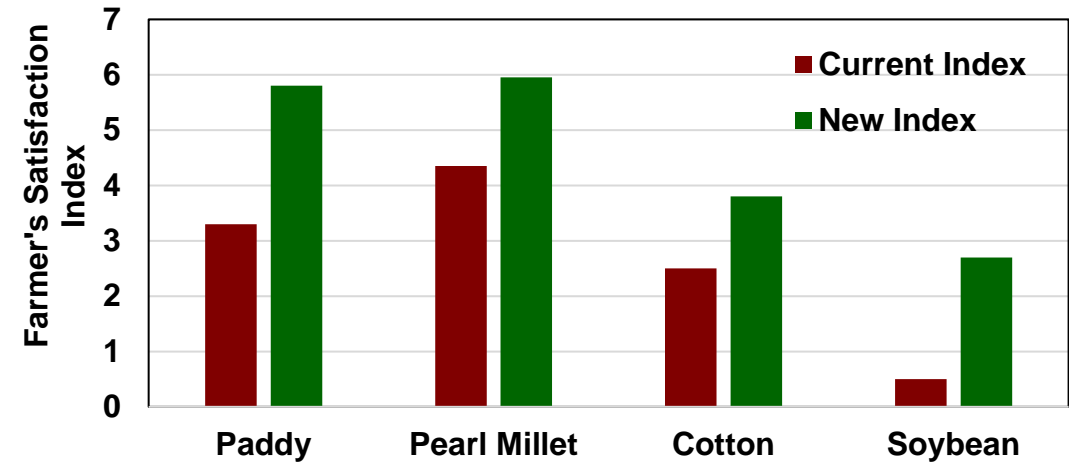
## 1. Reducing basis risk in weather index insurance by designing Improved triggers resulting in win-win products for farmers, industry and government

- Yield modelling for WBCIS trigger design resulting in **improved insurance products by reducing basis risk** in, which was used by more than **1 Million farmers** in Maharashtra.
- Farmer's satisfaction index-payment when due and in right amount, industry: 70-80 % claim ratio and Government premium subsidy not to increase

## 2. Contribution to PMFBY

- BISA-CIMMYT lead and contributed to development of a technology use for crop insurance under PMFBY
- BISA-CIMMYT contributed to the development of YES-TECH Manual 2023 for the implementation of the Yield Estimation System based on Technology (YES-TECH) under PMFBY

**Partners** : AIC, MNCFC, ICAR, Government of Maharashtra and reinsurance industry.



### Designing weather index insurance of crops for the increased satisfaction of farmers, industry and the government

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Basis risk  
Farmer satisfaction index  
Weather triggers

#### ABSTRACT

Weather-based crop insurance is a powerful tool for stabilizing farmers' income by providing timely payouts directly linked with weather parameters. However, its performance can be marred by faulty design, leading to high basis risk and insufficient payouts. This paper presents a new methodology for contract design for weather-based insurance, first tested in India. By combining agro-meteorological statistical analysis, crop growth modelling and optimization techniques, a heuristic model is developed which generates superior contract design which yields better and frequent payouts at no extra cost of subsidies (in terms of premium rates). The study also presents 'Farmer Satisfaction Index' as a powerful evaluation tool in determining the effectiveness of insurance products through measurement of basis risk. The method is backed by results from implementing the proposed model in many districts of Maharashtra, India. The proposed contract performed better than the existing insurance contract with 56 and 72 percent increase in Farmers Satisfaction Index for Soybean and Pearl Millet, while increasing correlation of payouts with yield losses and reducing the overall loss-cost ratio. Selected triggers effectively captured climatic risks in important crop growth phases. These results were consistent for 30-years evaluated for long-term time series of 100 years of synthetic climate data. Findings indicate the use of recommended approach can lead to increased satisfaction of farmers, insurers and policymakers alike.



# ATLAS OF CLIMATE ADAPTATION IN SOUTH ASIAN AGRICULTURE (ACASA)

*Interconnections between climate risks, practices, technologies, and policies*

# Atlas of Climate Adaptation in South Asian Agriculture

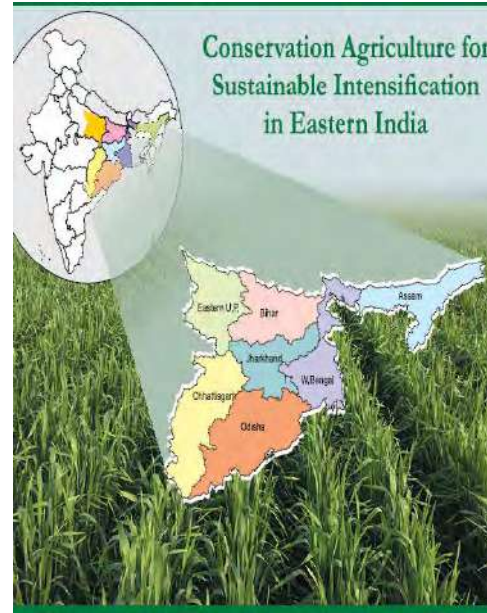
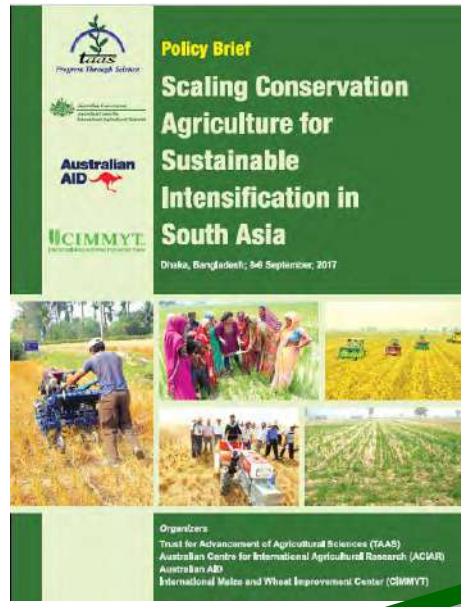
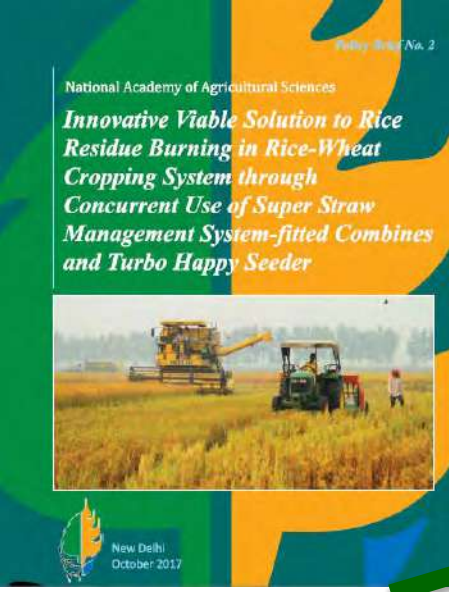
## What's new in the ACASA

1. Granular risk assessments for fifteen crops and six livestock species
2. High-resolution risk profiles at approx. 25sq. km (~group of 4-5 villages)
3. Location and context-specific, expert validated adaptation options
4. Gender and economic suitability of interventions
5. Open access with downloadable data, codes, and scripts
6. Use-case guidance for government, agri-food, insurance, banking, civil society, and donors

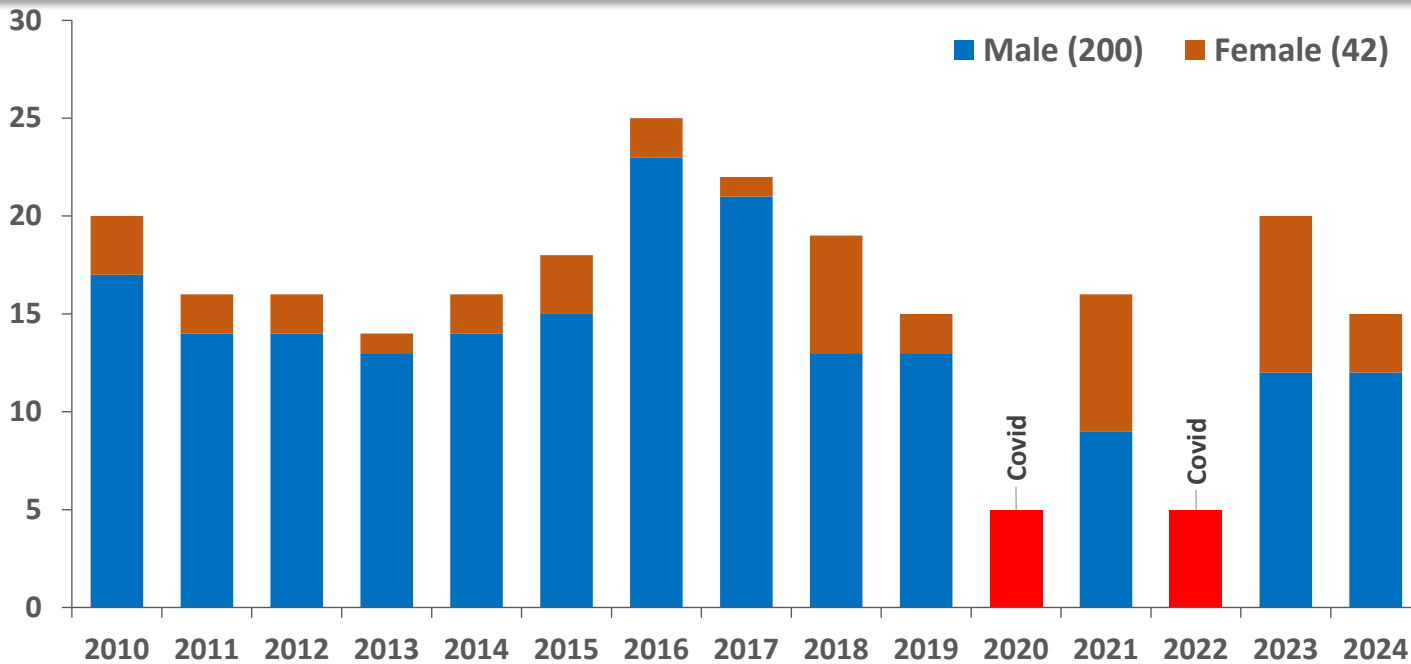


<https://acasa-bisa.org/>

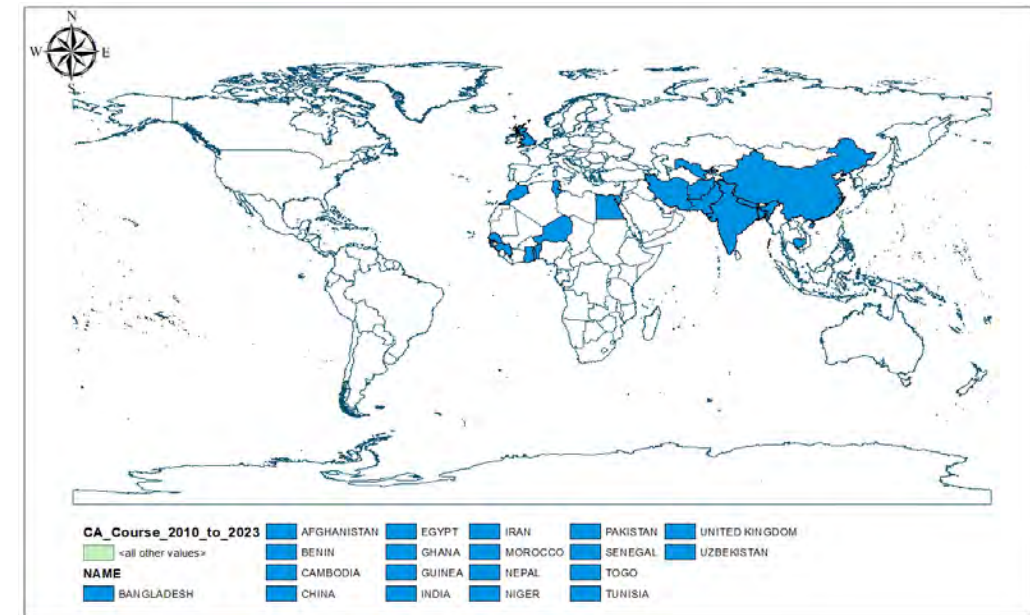
**Research Evidence are Filling in to Policy for Scaling**



# Developing a New Cadre of Researchers on Regenerative Agriculture/Conservation Agriculture: Global CA Advance Course Asia and North Africa



## Geographies of the beneficiaries- Global



- Number of courses = 13 since 2010
- Beneficiary countries = 20
- Total beneficiaries = 242
- Overall, women's participation = 21%

Young men and women from NARS, CGIAR, ARI's, NGOs, Governments, Private Sector



# Providing Robust, Science-Based Evidence to Policymakers



CIMMYT-NARES  
science outcomes  
led to CRA  
investment in Bihar  
and MP

## Supporting NARES through:

- Long-term trials
- Capacity development
- Student training
- Knowledge transfer
- Farmer engagement:

*“seeing is believing”*





# Science Informed Policy Publications

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# Evidence-Led Food Systems Transformation Policies in the Context of *Viksit Bharat*

7 April 2026

Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



# Key Takeaways

**Dr. Mamata Pradhan**

Senior Research Coordinator

IFPRI

**Evidence-Led Food Systems Transformation Policies in the Context of Viksit Bharat**

7 April 2026 | Parijat Lecture Hall, Ground Floor, NASC Complex, New Delhi



# 1. Why Food Systems Transformation Matters

- India's agri-food system is at a critical juncture, facing climate variability, natural resource degradation, and changing dietary patterns
- Policy focus is gradually shifting from ensuring food security to achieving nutrition security and sustainable farmer incomes
- Challenges are interconnected across production systems, markets, trade dynamics, and consumption behavior
- A fragmented approach is no longer sufficient - there is a need for a holistic, systems-based policy framework
- Food systems transformation is central to achieving Viksit Bharat goals of growth, inclusion, and sustainability

## 2. Evidence-Based Policymaking – Ideal vs Practice

- Evidence-based policymaking is essential for effective transformation, but difficult to operationalize in practice
- Policymaking happens within a complex political economy context, where evidence competes with political and fiscal considerations
- There is a visible shift from evidence-driven to politically-driven and now populist policy decisions
- Significant gaps remain between research generation, policy translation, and on-ground implementation
- New tools (AI, data platforms, rapid analytics) can help bridge the gap by making evidence more timely and accessible

## 3. Inclusion and Inequality – A Structural Challenge

- Technological advancements have improved productivity, but gains are not equitably distributed across farmers
- Structural constraints such as land ownership inequality and tenancy systems limit access to benefits
- A large share of cultivators are tenant farmers, often excluded from institutional support and policy schemes
- Micro-level evidence highlights that income and productivity gains do not automatically reduce inequality
- Inclusive transformation requires deliberate policy targeting, institutional reforms, and better data on vulnerable groups

## 4. Structural Distortions in Current Policy Framework

- Existing price policies are heavily skewed toward rice and wheat, despite changing consumption patterns
- Input subsidies (fertilizer, electricity) have created inefficient and environmentally unsustainable production incentives
- These policies contribute to soil degradation, groundwater depletion, and higher greenhouse gas emissions
- Public procurement systems lead to excess stocks and rising fiscal costs without proportional nutritional gains
- Trade patterns reflect these distortions, including the export of water-intensive crops – Rice, Sugar, etc.

## 5. Rethinking Commodity Strategies

- No “one-size-fits-all” policy-need for regionally differentiated strategies
- Large variation in productivity: many districts face low yields and even negative returns
- Significant potential for diversification in low-productivity regions
- Millets, pulses, and maize offer better economic and environmental outcomes in many contexts
- Policy must shift from uniform support → targeted, district-level interventions

## 6. Beyond Rice – Managing the Transition

- Rice remains central, but is resource-intensive (water, emissions, labour)
- Challenges: yield stagnation, climate stress, labour shortages, nutrition gaps
- Transition is complex - rice cannot be replaced overnight
- Need to reimagine rice systems: improved varieties, water-saving technologies like DSR
- Diversification requires aligned incentives, farmer confidence, and market assurance

## 7. From Innovation to Adoption – The Missing Middle

- Strong scientific solutions exist, but adoption remains limited
- Key gap: lack of a full “enabling ecosystem” (markets, infrastructure, institutions)
- Technology alone is insufficient - needs policy support and economic incentives
- Importance of demonstration-led adoption (“seeing is believing”) Scaling requires coordination across research, government, and private sector

## 8. From Evidence to Policy – Panel Insights

- Major gap is not evidence, but translation of evidence into scalable policy action
- Policy implementation constrained by institutional fragmentation and weak coordination
- Critical role of seed systems, R&D, and varietal innovation in productivity gains
- Scaling requires integration into existing systems, not parallel structures
- Success depends on policy coherence, incentives, and sustained engagement with stakeholders

## 9. Emerging Policy Directions & Reform Priorities

- Shift toward region-specific, data-driven policy design (move beyond one-size-fits-all)
- Transition from price support to income support (DBT) to reduce distortions
- Promote diversification toward millets, pulses, and high-value agriculture
- Reorient subsidies toward R&D, innovation, and sustainable resource use
- Build enabling ecosystems: markets, value chains, and infrastructure for adoption
- Strengthen science-policy linkages to translate evidence into action
- Ensure policy coherence and coordination across sectors and institutions

**THANK YOU!**

