



# AI for Food System Climate Resilience

Prof Soora Naresh Kumar  
Head and Principal Scientist  
Indian Agricultural Research Institute  
New Delhi-110012, India

[nareshkumar.soora@gmail.com](mailto:nareshkumar.soora@gmail.com)

[soora.nareshkumar@icar.gov.in](mailto:soora.nareshkumar@icar.gov.in)

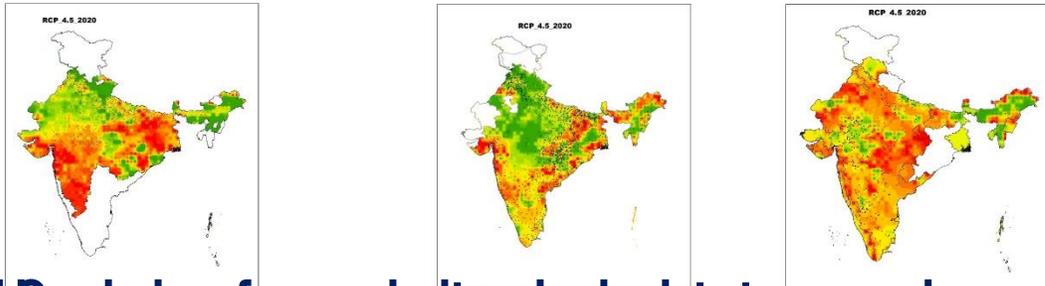
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IARI: The seat of the Green Revolution



# Climatic risks in India : An Existential Threat

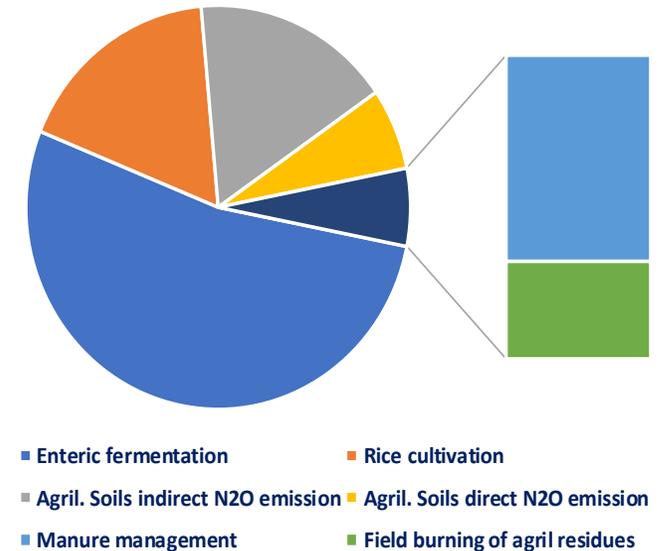
- In past 53 years (1970-2022): ~4 climate, water, seismic-related disasters each month
- During 1995-2024: >100 climatic disaster events (floods, cyclones, droughts, cold waves, heat waves & hailstorms) reported
- Labour productivity loss: >100 bn h per year due to heat exposure (Global: 220 bn h); Warming of 1 & 2°C labour productivity losses up to 156 and 230 bn h.
- Crop productivity loss projected to be 6-21% across major crops



- GHG emissions from agriculture in absolute terms are increasing (2019 emissions increased by about 13 Mt over 2016)
- Losses are multi-dimensional (infrastructure, livestock, production, quality, suitable areas)
- Adaptation costs are estimated to be about 5 trillion US\$

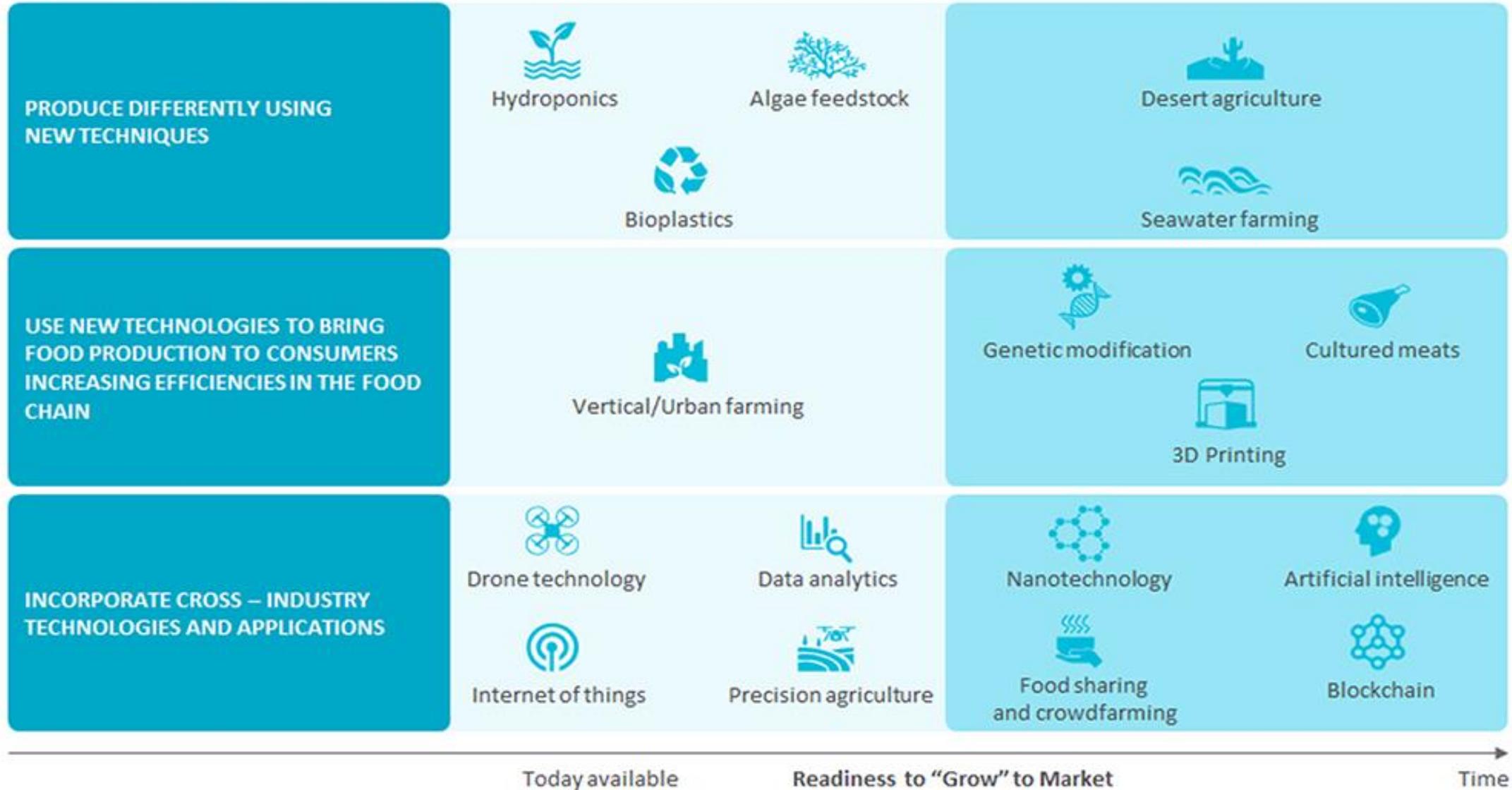
- Total GHG emissions from India: 3132 Mt
  - Removal by LULUCF 485 Mt (15.5%)
  - Total net GHG emissions from India: 2646.5 Mt
- GHG emissions from Indian Agri: 421 Mt**

GHG emission (%) from agricultural sector

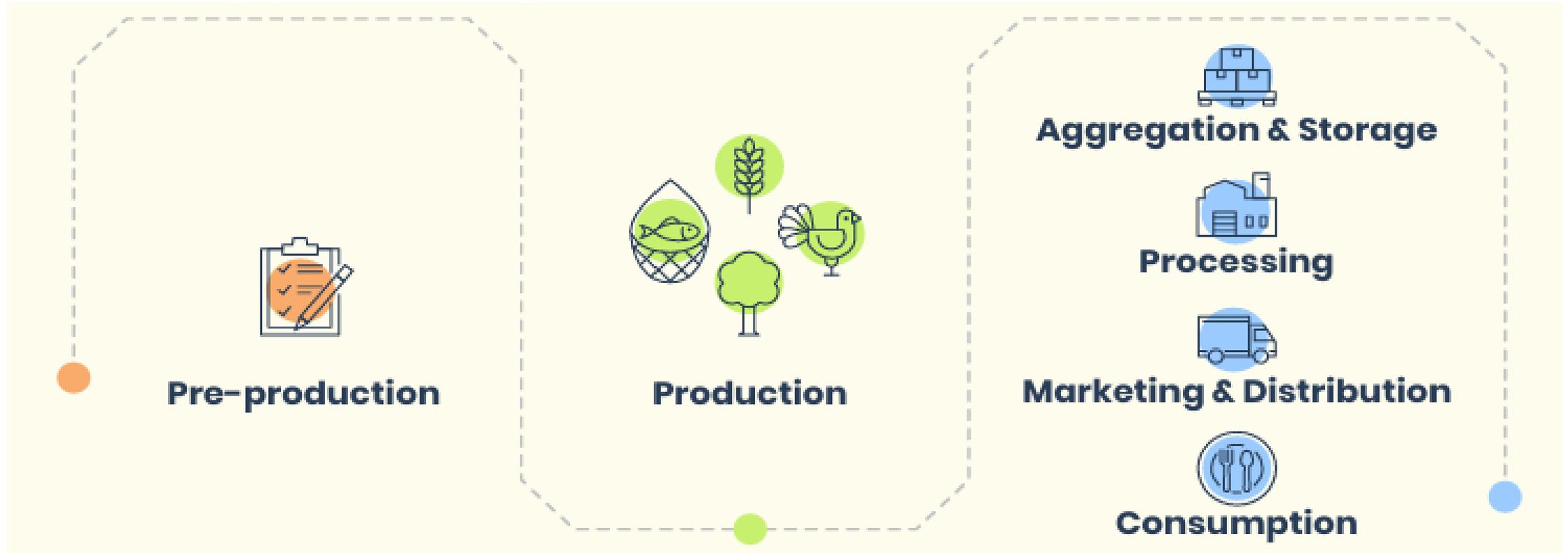


# Agriculture 4.0 and beyond

Map of technologies and maturity



# AI in typical agrifood value chain

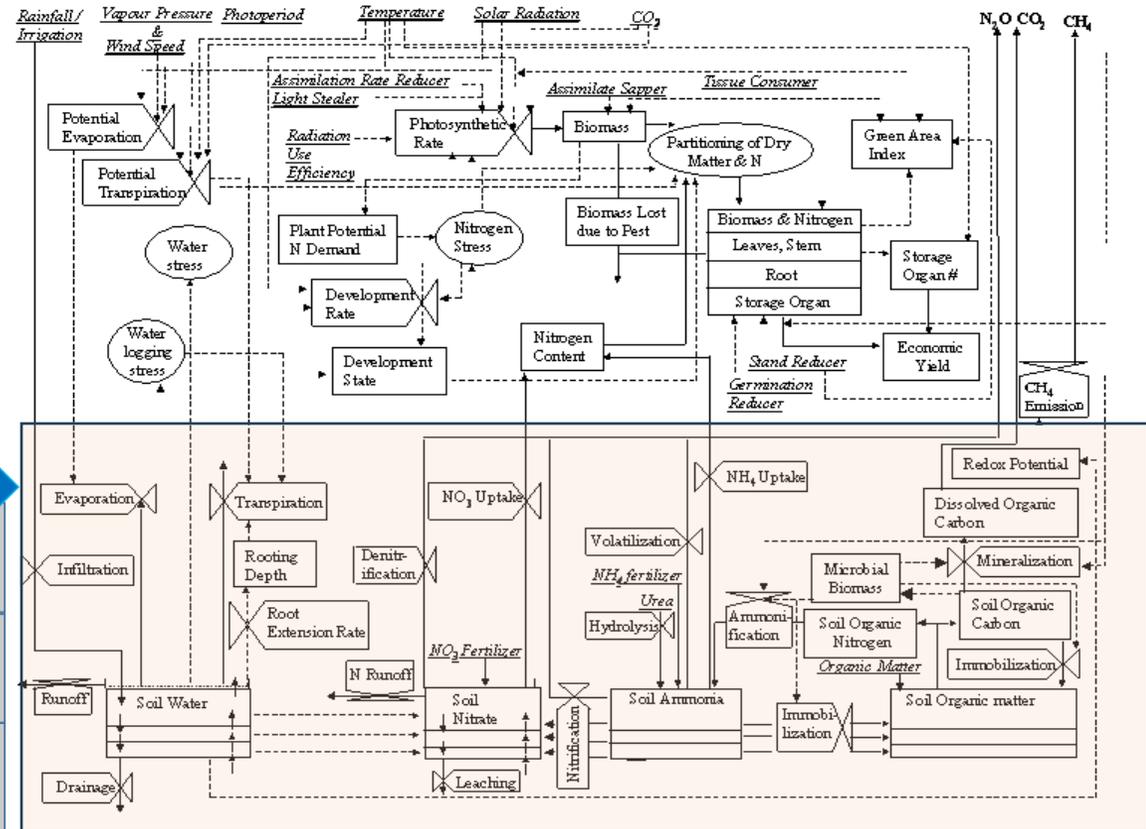
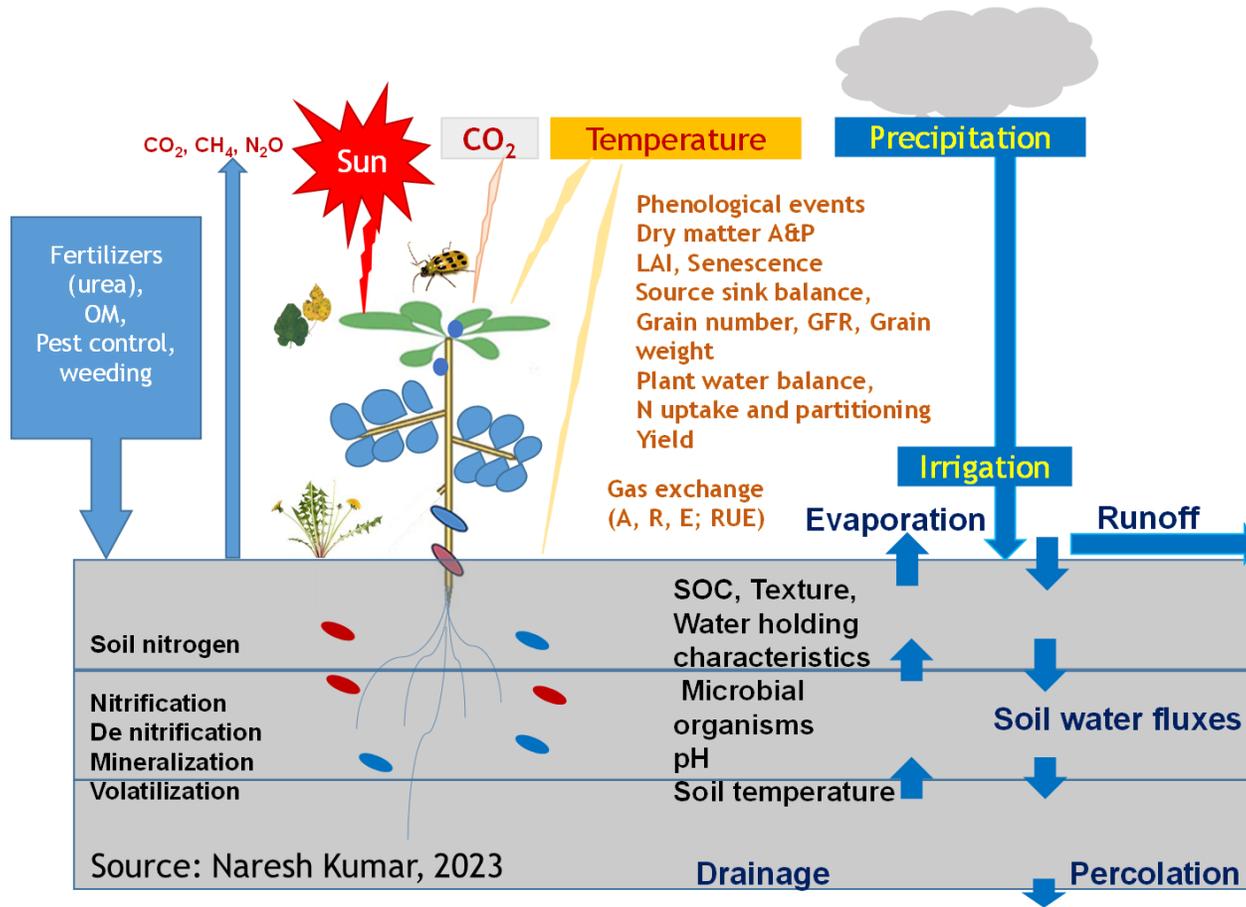


Weather forecast  
 Seasonal forecast  
 Pest and disease forecast  
 Input intelligence  
 Crop improvement  
 Market (D/S) intelligence  
 Crop Insurance  
 Yield forecast, etc

Weather-based crop management  
 -irrigation, nutrients, pests  
 (precision agriculture), IoT  
 Yield forecast  
 Targeted yield-based management  
 Market intelligence  
 Protected cultivation  
 Crop insurance, etc

Weather-based supply estimates  
 Stock and price analytics  
 Risk analysis (blockchain)  
 Market intelligence  
 Demand /surplus hotspots  
 Storage automation, IoT  
 Processing efficiency, etc

# Processes in InfoCrop simulation model



# InfoCrop v2.1



- **Daily weather**
  - Tmin, Tmax, RF, SR, W, VP, CO<sub>2</sub>
- **Varietal coefficients**
  - Time to flowering, maturity, potential grain weight, SLA, light interception, etc
- **Soil characteristics**
  - Layer-wise soil texture, structure, hydraulic characteristics, pH, Ec, SOC, BD
- **Management**
  - Sowing time, seed rate, Nitrogen, OM, Irrigation
  - Pest load, etc...

- **Daily and summary outputs**
- **Crop growth, development and yield**
  - phenology,
  - Total Dry Matter, Leaf Area Index
  - Yield,
  - Gain number, grain wt, etc)
- **N uptake by crop parts and grain**
- **Soil N balance**
- **Soil water Balance**
- **Soil carbon balance**
- **Emissions (N<sub>2</sub>O, Methane, CO<sub>2</sub>)**

Download at [https://www.iari.res.in/infoCrop\\_v2/InfoCrop-Registration.php](https://www.iari.res.in/infoCrop_v2/InfoCrop-Registration.php)

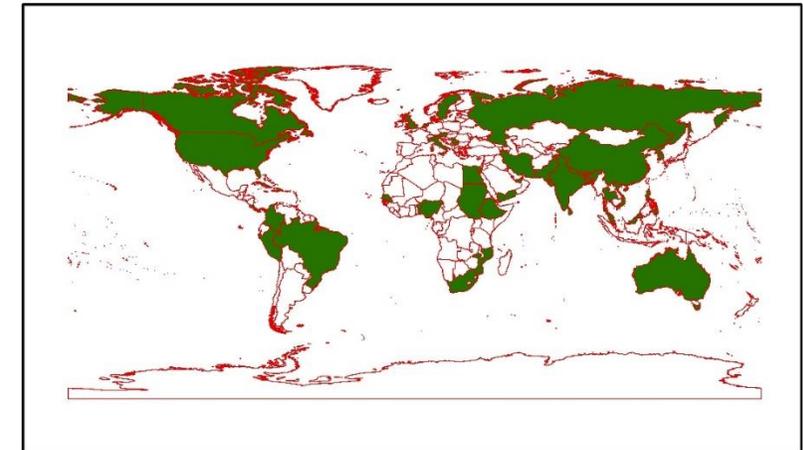
**InfoCrop v2.1,**  
about 2500 downloads and  
many users in 46 countries

## InfoCrop

- **Cereals:** Wheat, Rice, Maize, Sorghum, Millets
- **Oil seeds:** Ground nut, Mustard, Soybean
- **Pulses:** Chickpea, pigeon pea
- **Horticultural crops:** Potato
- **Cash crops:** Cotton

## CocoSim

- **Perennial plantation crop:** Coconut



- **Calibrated to the district average yield for India for major 11 crops**



# Models developed in the Environmental Modeling lab, Environmental Sciences Division, IARI

## InfoCrop Spatial model beta

Version 1.0  
Monday, 22 September 2025 16:46:53

**InfoCrop Spatial Analysis Model**

START

Dr.S.Naresh Kumar, Vikas Kumar  
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**Spatial Analysis**

Read the User Manual for detailed instructions

Upload Master Shape File (for .shp, .shx, .prj, .dbf, .pnt)

Download Master Shapefile (.shp)

File Conversion Tool

Upload File for Soil Data

Select File

Sl. No	Grid_Sl_No	Longitude	Latitude	Elevation	Country	CRCode	State	District	Tehsil	ACZ	WCode	Crop_name	W
1	019	83.7	17.1	45.7	India	IN	ANDHRA PRA	NANDYAL	CAMPBELL BAY	1	A12	Wheat	W
2	022	82.7	7.25	108	India	IN	ANDHRA PRA	NANDYAL	SARUMALA	4	A73	Wheat	W
3	071	78.2	15.1	251	India	IN	ANDHRA PRA	NANDYAL	DYVALAVADA	4	A75	Wheat	W
4	076	78.45	15.1	171.8	India	IN	ANDHRA PRA	NANDYAL	ALLAGADDA	2	A81	Wheat	W
5	081	78.7	15.1	323.7	India	IN	ANDHRA PRA	NANDYAL	DHONE	4	A166	Wheat	W
6	0166	77.7	15.35	532.1	India	IN	ANDHRA PRA	NANDYAL	DHONE	4	A171	Wheat	W
7	0171	77.95	15.35	485.7	India	IN	ANDHRA PRA	NANDYAL	DHONE	4	A171	Wheat	W

Execute

Simulation Result

Location: Total Rows / Matched Rows: 4646

Plot View

Select Crop: Sorghum

Select Parameter: YIELD

Select Year: 2001 - 2006

Select Color: RedYellowGreen

MapView: Sorghum

YIELD | Years: 2001 - 2006

Download statistics for the selected crop and chosen time period, including Mean and CV:

Start Year: 2001

End Year: 2006

Select Parameter:

Select Color:

Save as Image:

ICAR

## InfoCrop V1 & V2.1

**INFOCROP** Version Beta

A decision support system for tropical agriculture

**InfoCrop v2.1**

A decision support system for tropical agriculture

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## Cropping system model

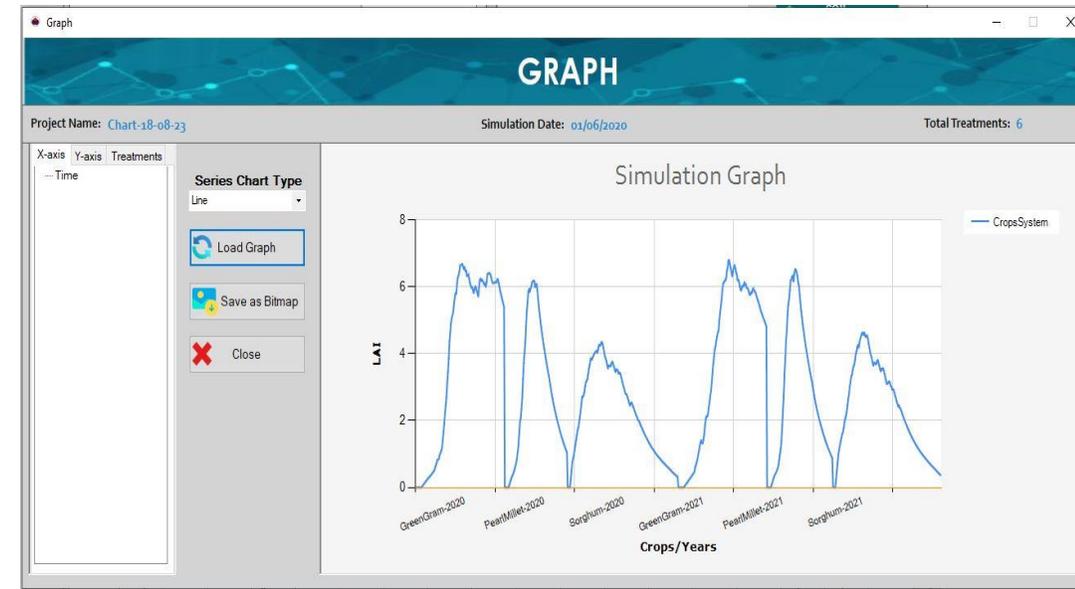
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Wednesday, 08 May 2024 11:58:49

**InfoCrop Cropping System Model**

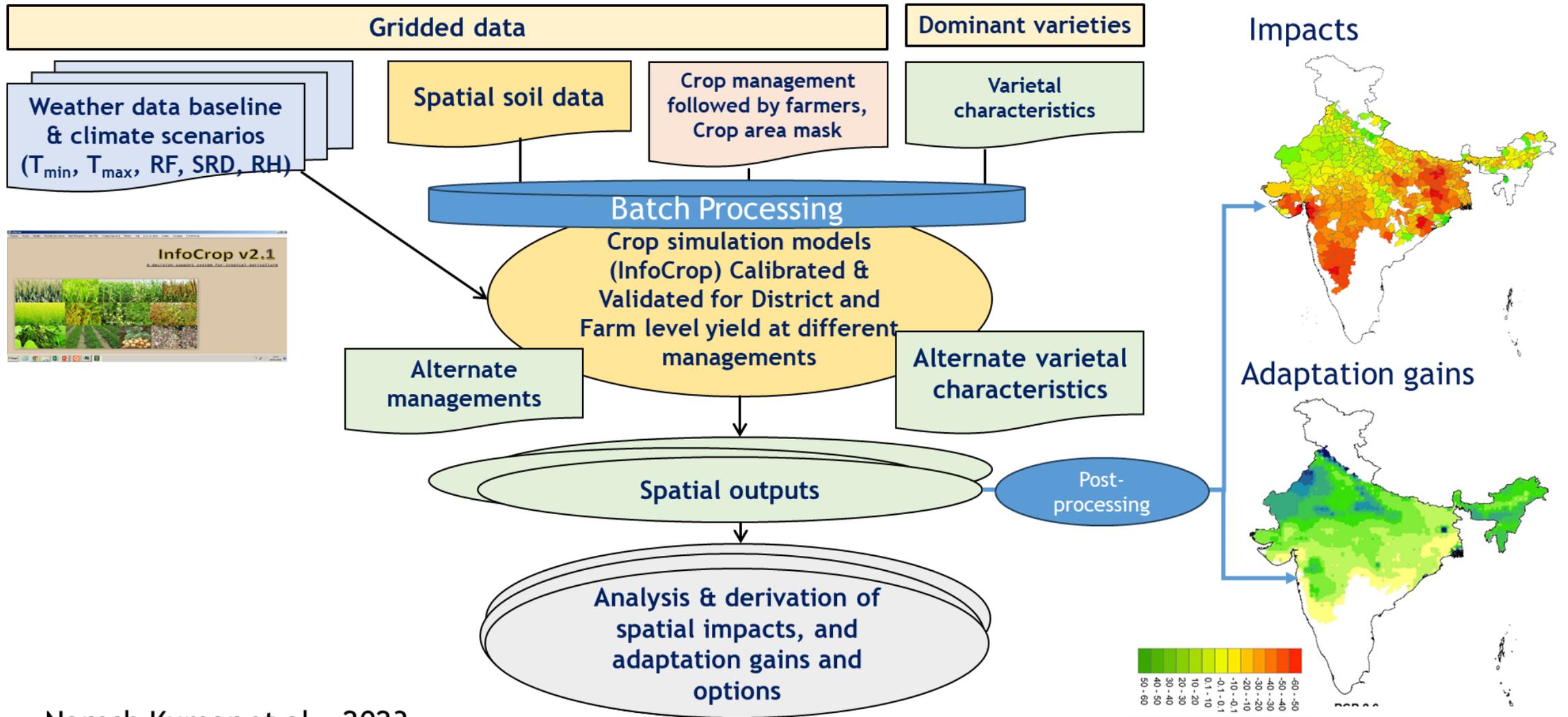
Start

About

Exit



# Gridded simulation framework followed

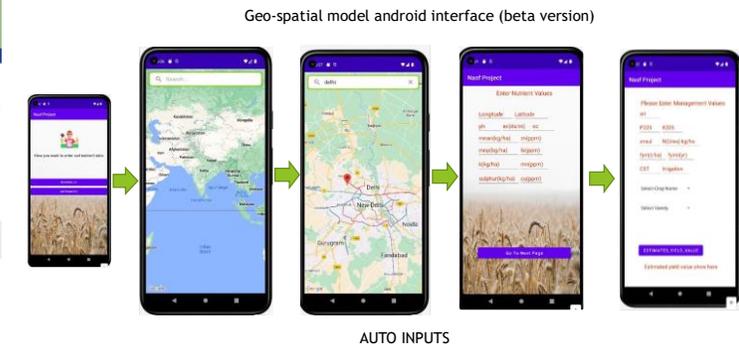
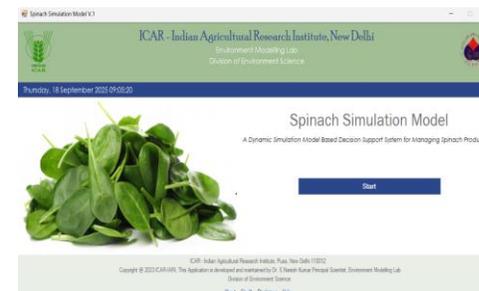
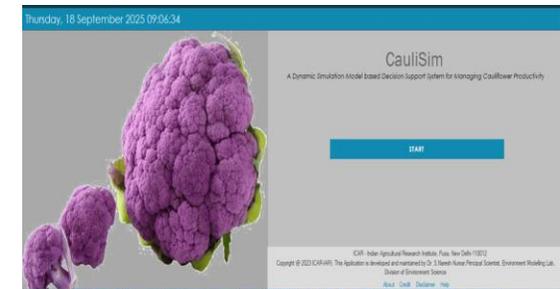


Naresh Kumar et al., 2023



# Simulation models for horticultural crops developed at the Environmental Modelling Lab, Div Envi Sci, IARI

- **Potato (InfoCrop-POTATO)**
- **Coconut (InfoCrop-COCONUT, CocoSim)**
- **Onion (InfoCrop-ONION in progress)**
- **Tomato (InfoCrop-TOMATO in progress)**
- **Spinach (IvSim)**
- **Grapes (VitisMod)-phenology**
- **Cole crops (cauliflower, cabbage and broccoli)**
- **Root vegetables (carrot, beetroot, radish, etc)**
- **Capsicum,**
- **French bean**





InfoCrop v2.1

A decision support system for tropical agriculture



*Thank U.....*

Climate change research facilities at IARI  
nareshkumar.soora@gmail.com  
9968768178



[Download InfoCropv2.1 at : InfoCrop V2.1 Download Registration Form \(iari.res.in\)](http://InfoCrop V2.1 Download Registration Form (iari.res.in))