# SYSTEMS ANALYSIS FOR AGRI-PRODUCTION ESTIMATES

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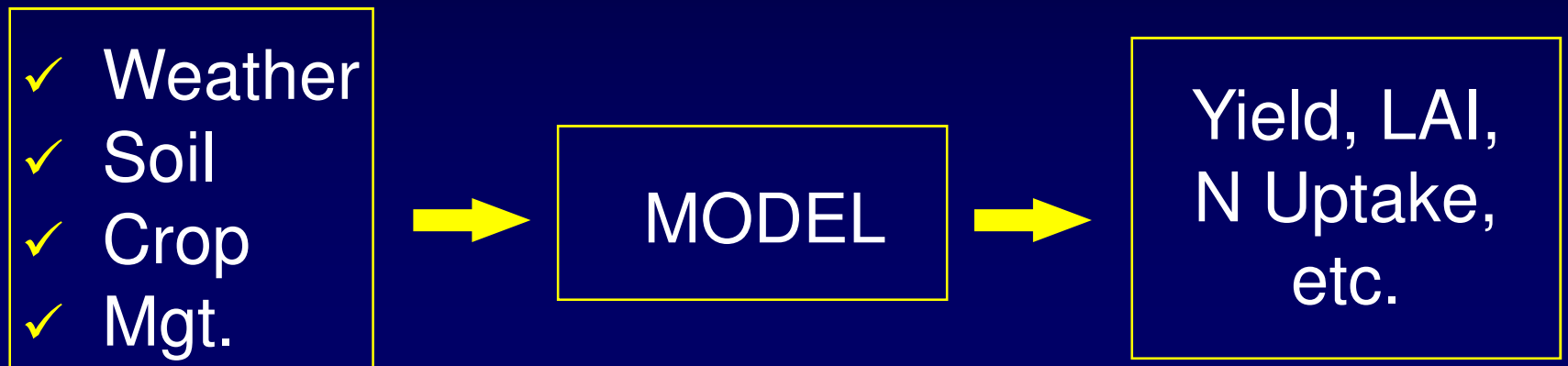
# Integrate Factors



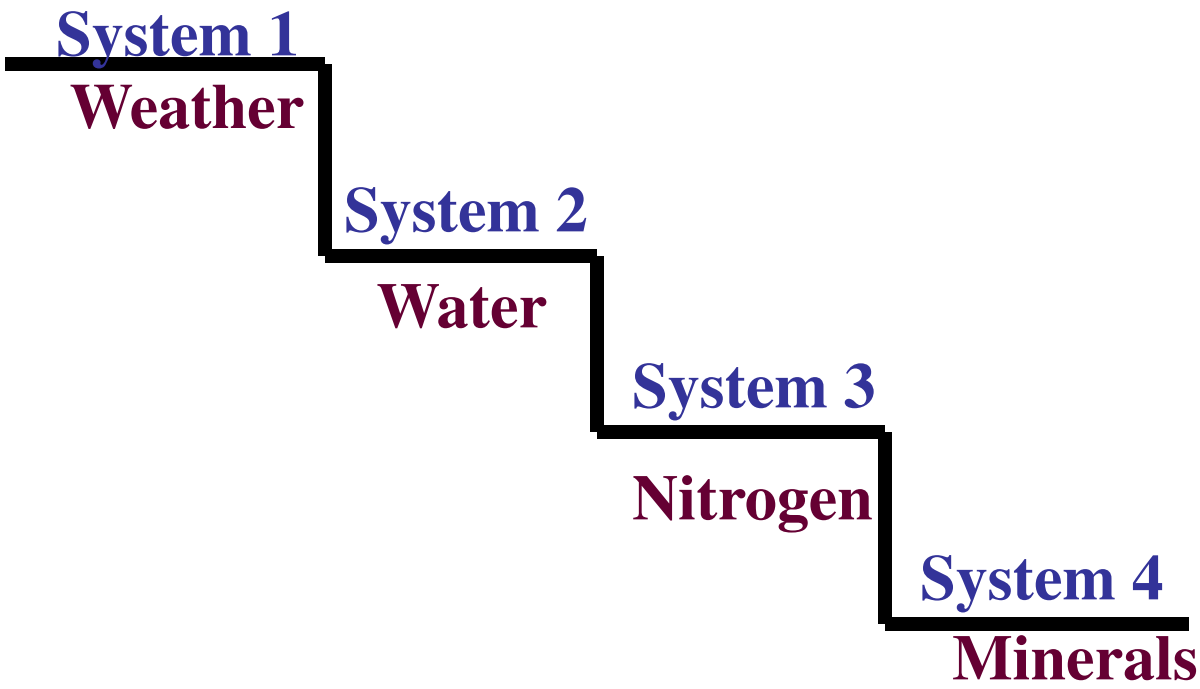

INPUT

MATHEMATICAL EQUATIONS

OUTPUT

# PLANT PRODUCTION SYSTEMS

(Systems characterized by the dominant environmental factor)



# Simulation models used extensively

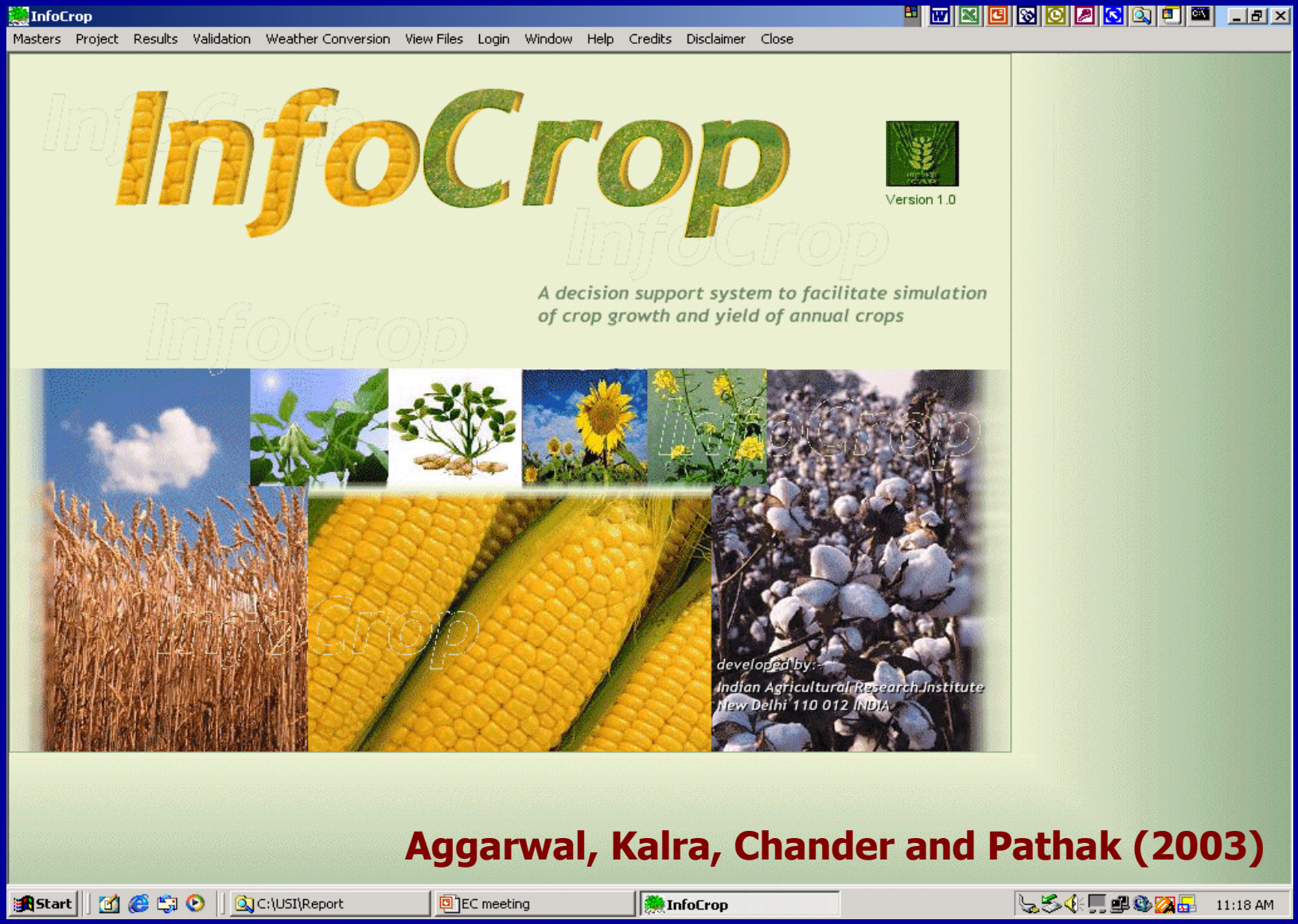
## Developed by the center

1. WTGROWS
2. ORYZA1N
3. InfoCrop
4. InfoSoil

## Acquired

1. DSSAT
2. ORYZA1, ORYZAW, ORYZA 2000
3. WOFOST
4. DNDC

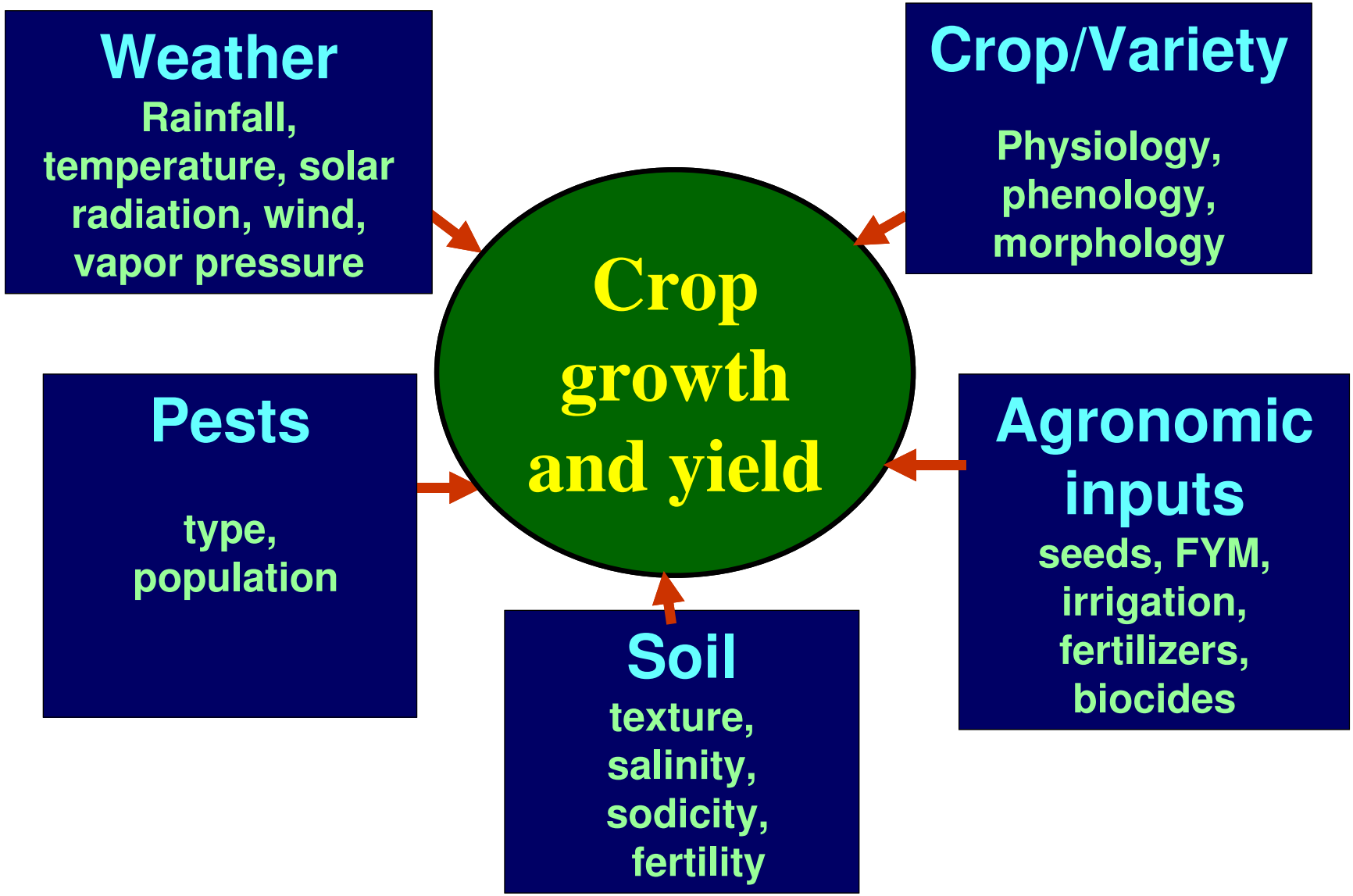
# Simulation of soil-crop-atmosphere processes



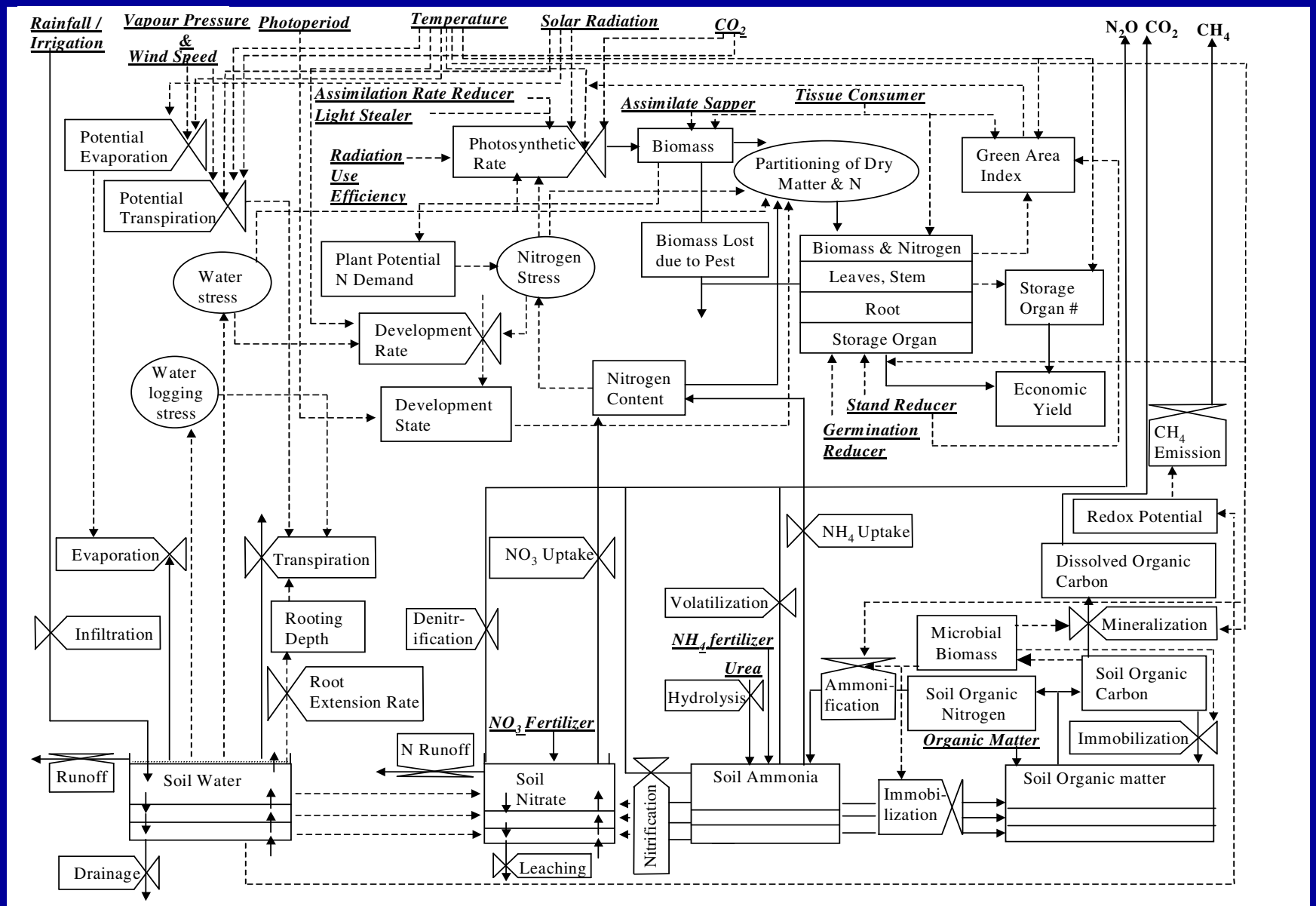

**Aggarwal, Kalra, Chander and Pathak (2003)**

Unit of simulation and Informatics, IARI

# INFOCROP: Key Components

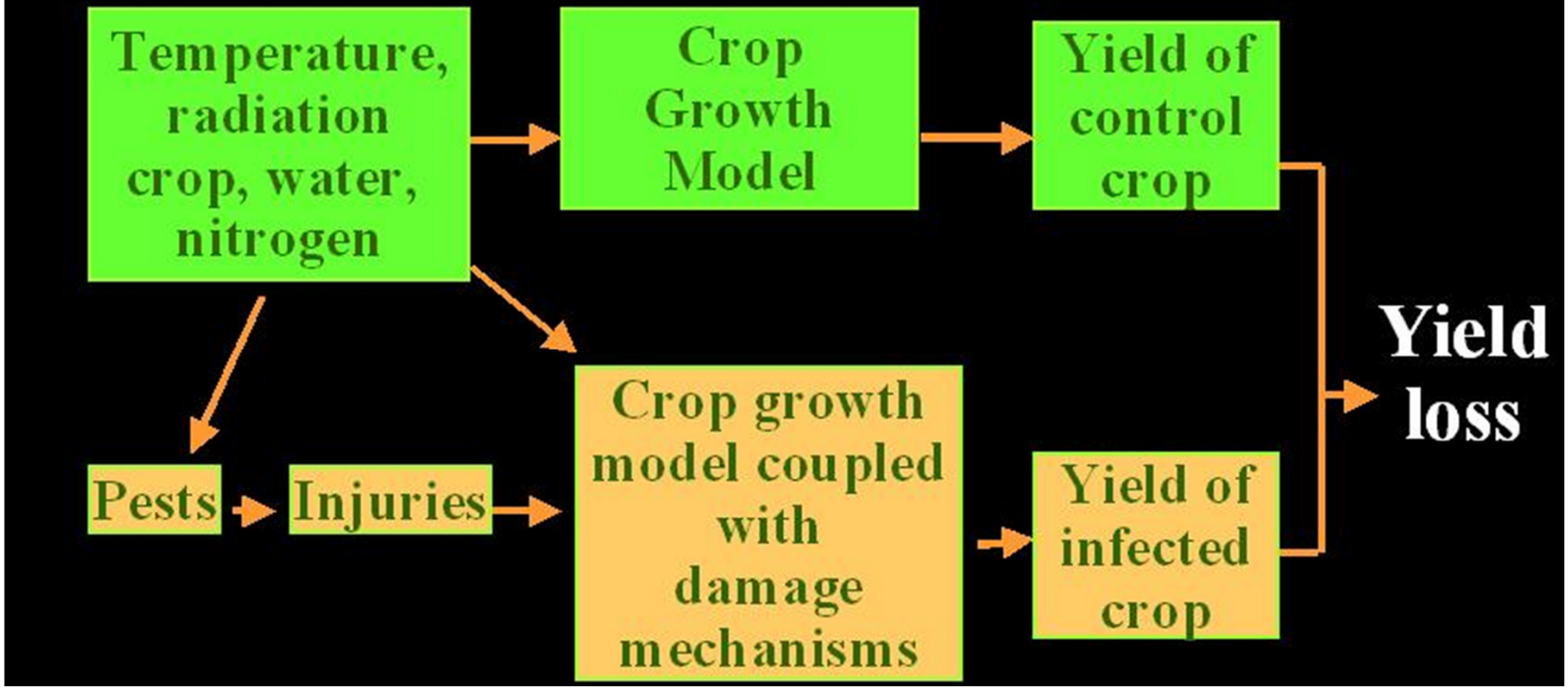


Unit of simulation and Informatics, IARI

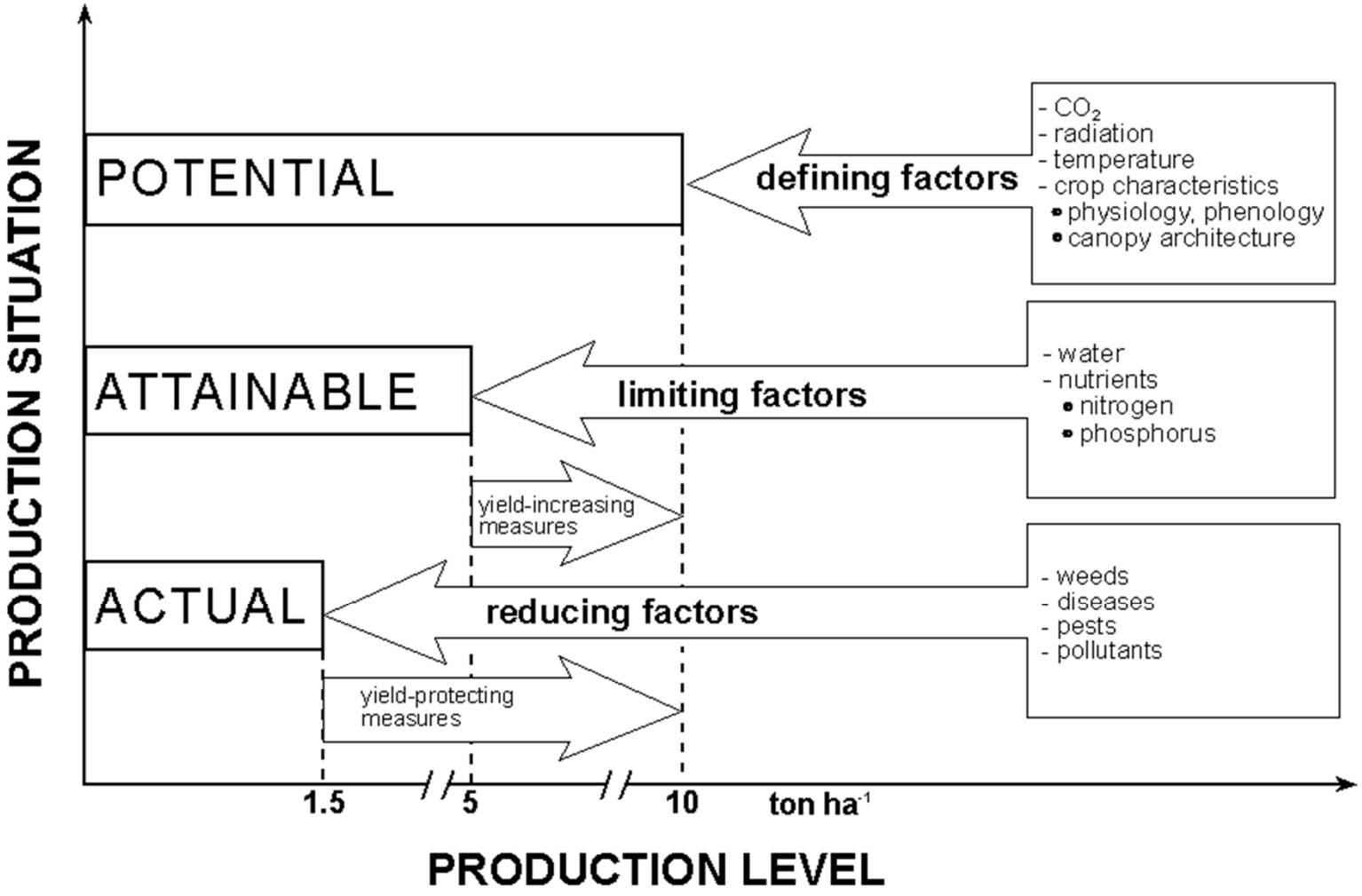



# Relational diagram of InfoCrop

# Simulation of Yield Losses due to Multiple Pests (INFOCROP)



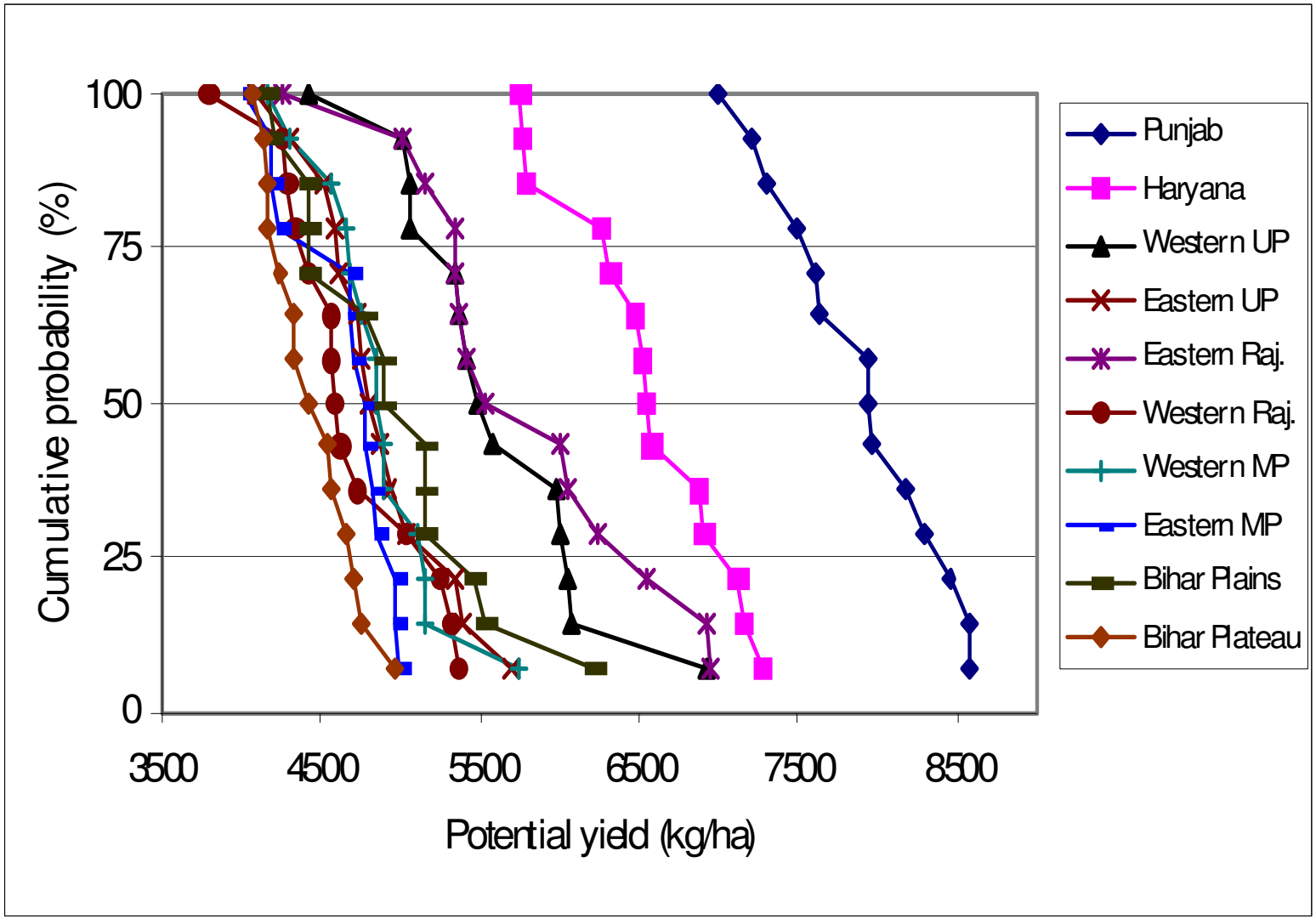
# Relationship among Potential, Attainable and Actual yields

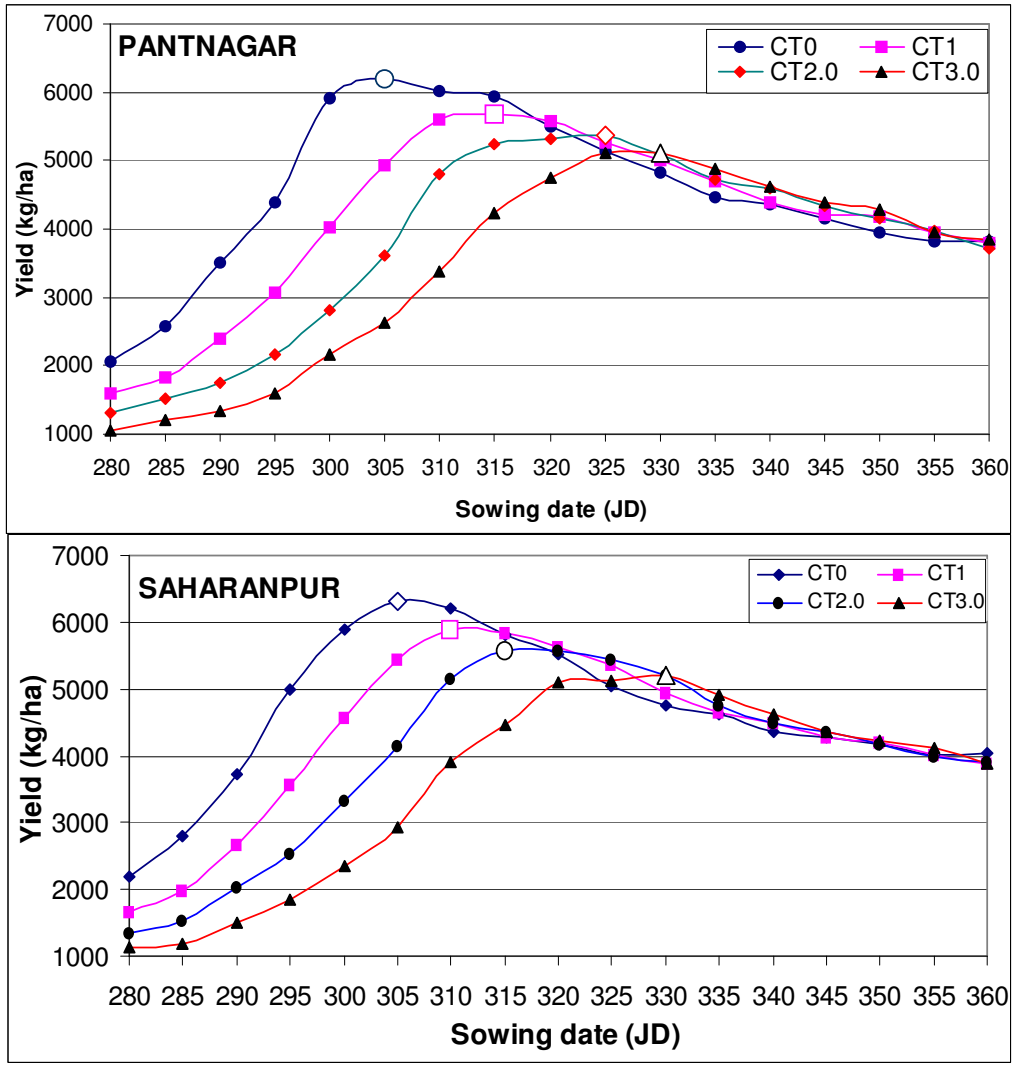


# Applications of Systems Simulation in Agriculture

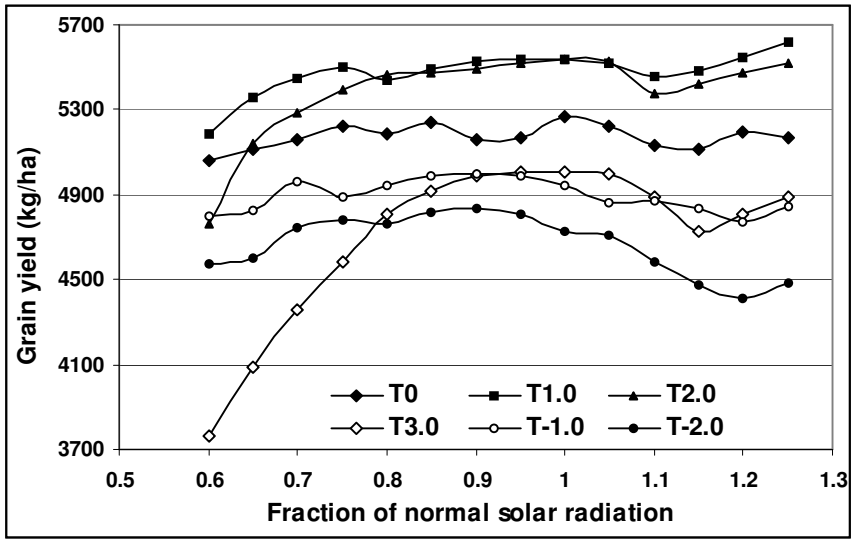
- **Estimating potential yield and yield gap**
- **Optimizing fertilizer management**
- **Yield forecasting**
- **Impact assessment of climatic change**
- **Assessing environmental impact**
- **Plant type design and evaluation**
- **Genotype by environment interactions**
- **Weather based agro-advisory services**

# CLIMATIC POTENTIAL YIELD OF WHEAT IN INDIA






**Effect of sowing dates and temperature rise on attainable yield of wheat in different agro-environments.**



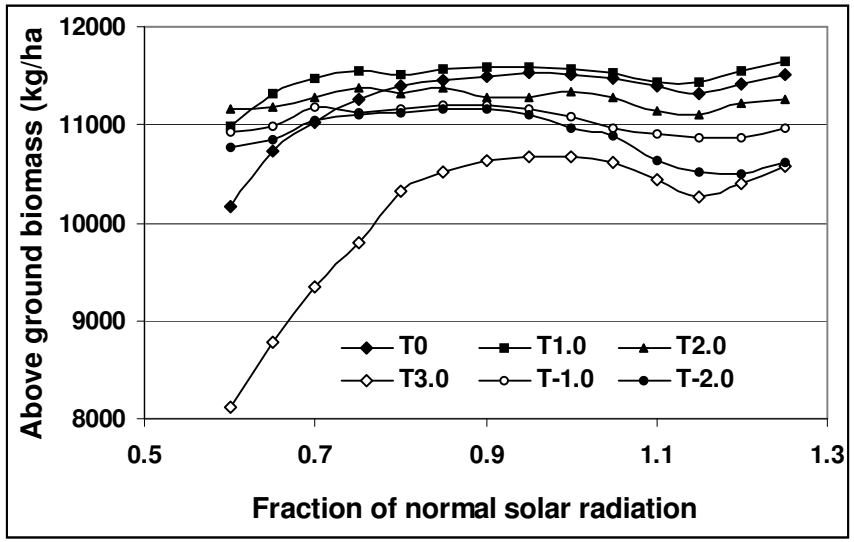
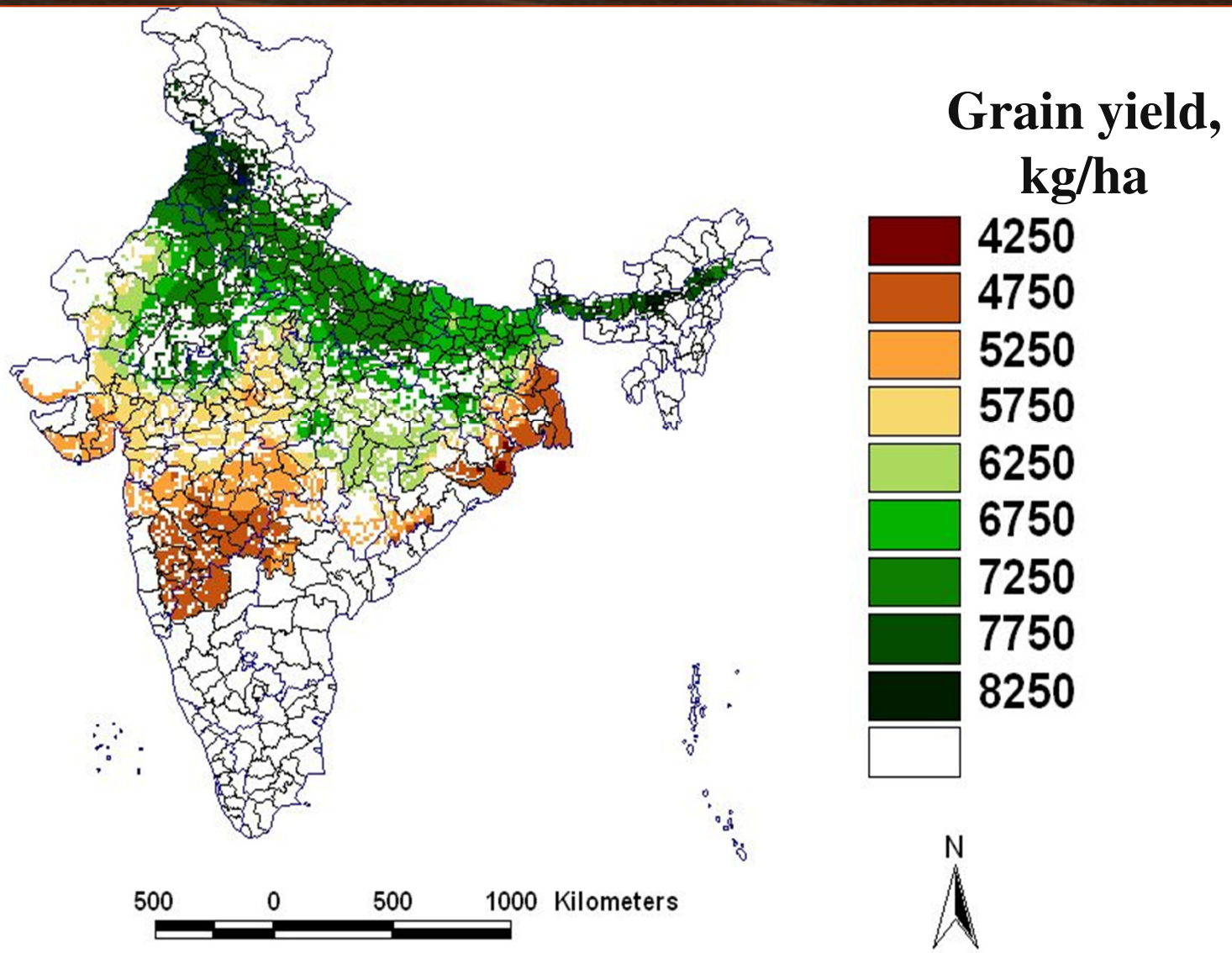
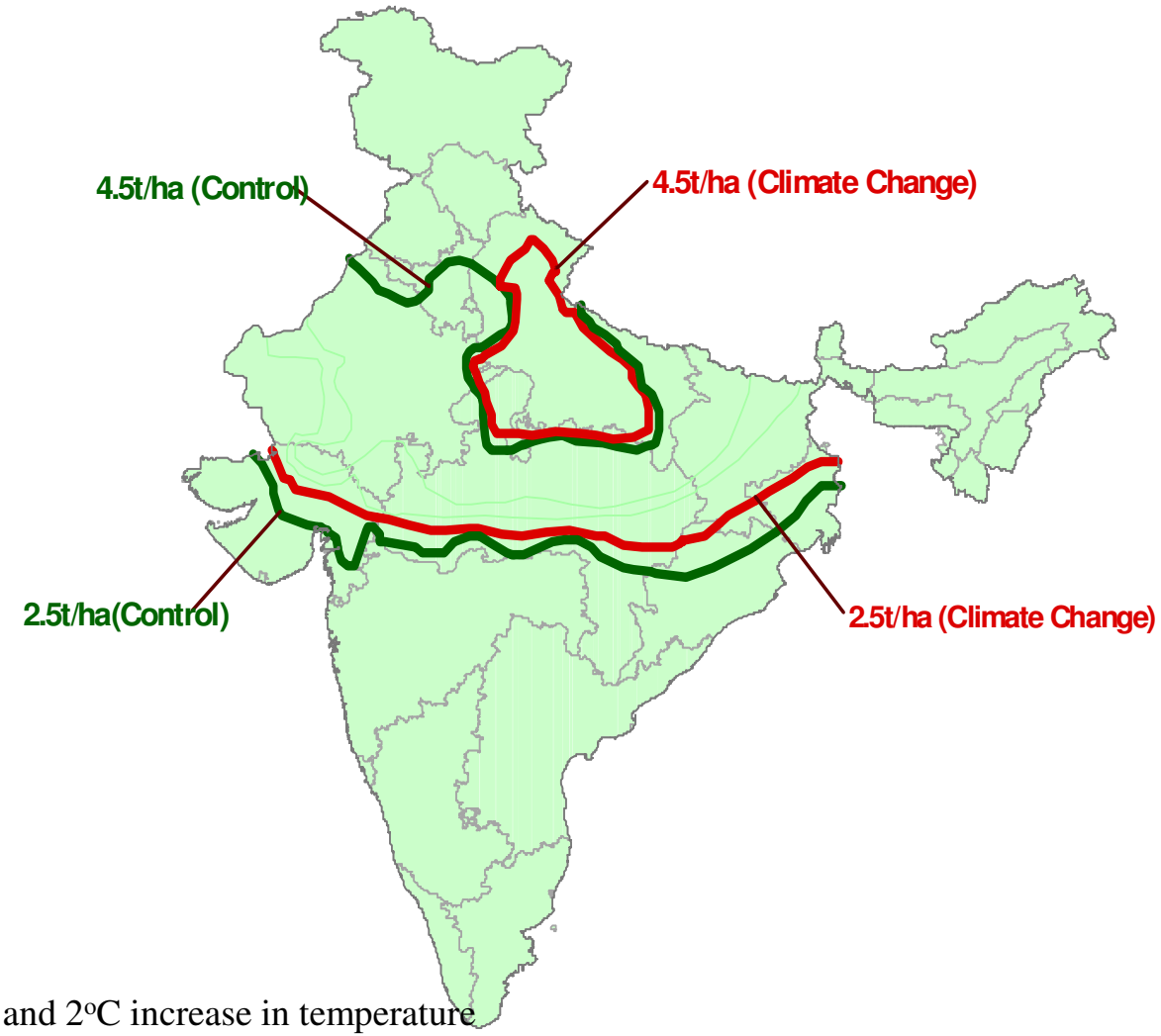




**Figure : Radiation and temperature change interaction on growth and yield of wheat at New Delhi environment**

# Potential Yields of Wheat

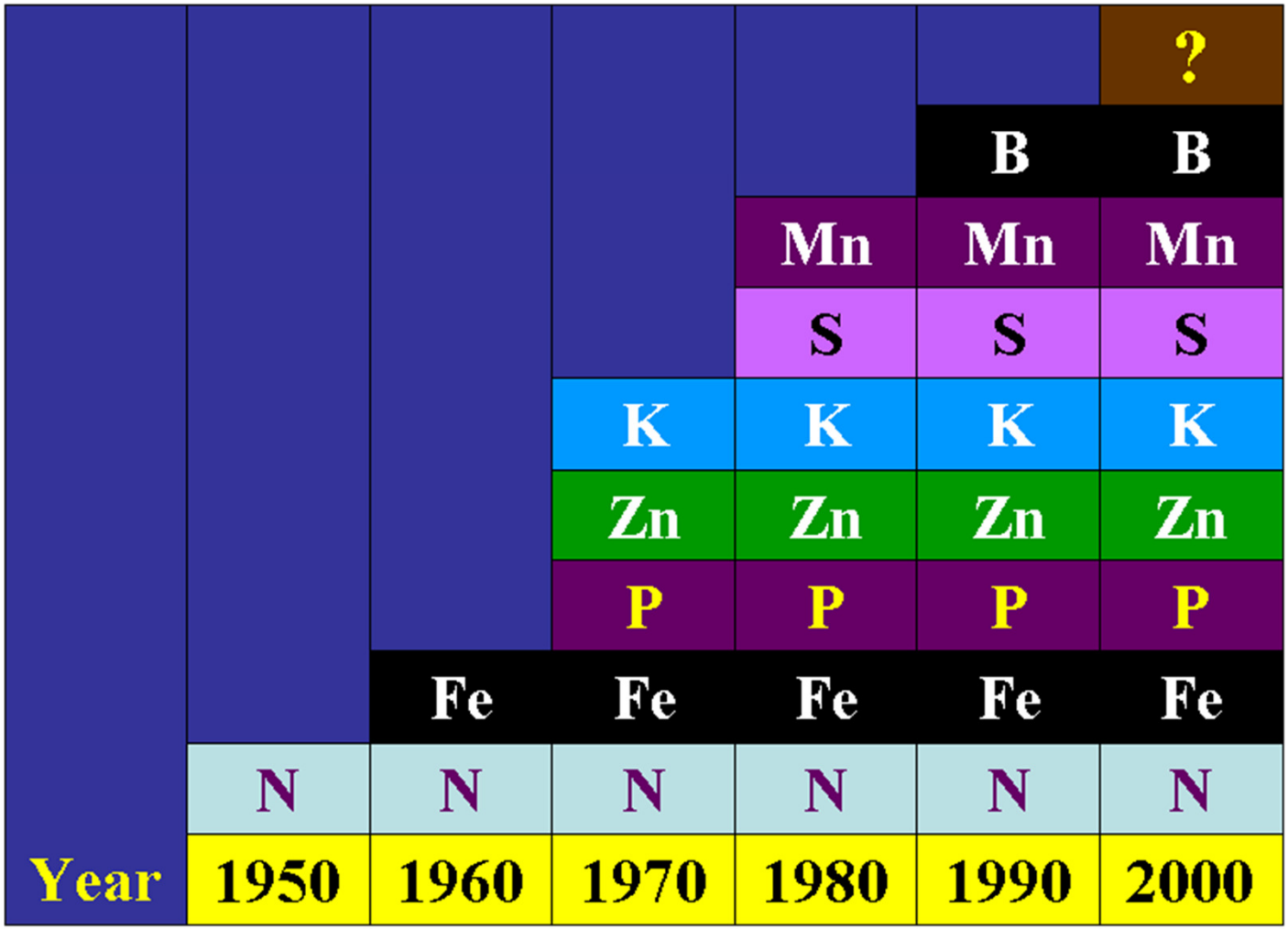


# Impact of Climate Change* on Productivity of Irrigated Wheat




*425 ppm $CO_2$ and 2$^{o}$C increase in temperature

# Emerging Multi-Nutrient Deficiencies in Soils



# Customized Fertiliser- CF Basal

- **Tata Chemicals Ltd. is the first corporate to develop CF**
- **Crop and area specific, containing all crucial nutrients in right proportion and amount**
- **Inherent nutrient supplying capacity of soil and nutrient demand for achievable yield target for developing CF formulation**
- **Tailor-made ready-to-use product: improves yield and increases farm income**
- **Farmers get all crucial nutrients in one, All in One**
- **Reduces soil nutrient mining, improves soil chemical health**
- **Increase agronomic use efficiency & reduce losses of nutrients**
- **Role of Government in Policy Advocacy**
- **Fortification of Complex fertilisers ???**

# Customized Fertiliser- Concept

Know nutrient requirement

Contribution from soil

Contribution from crop residue

Calculate nutrient gap

Determine fertiliser use efficiency

Define yield target

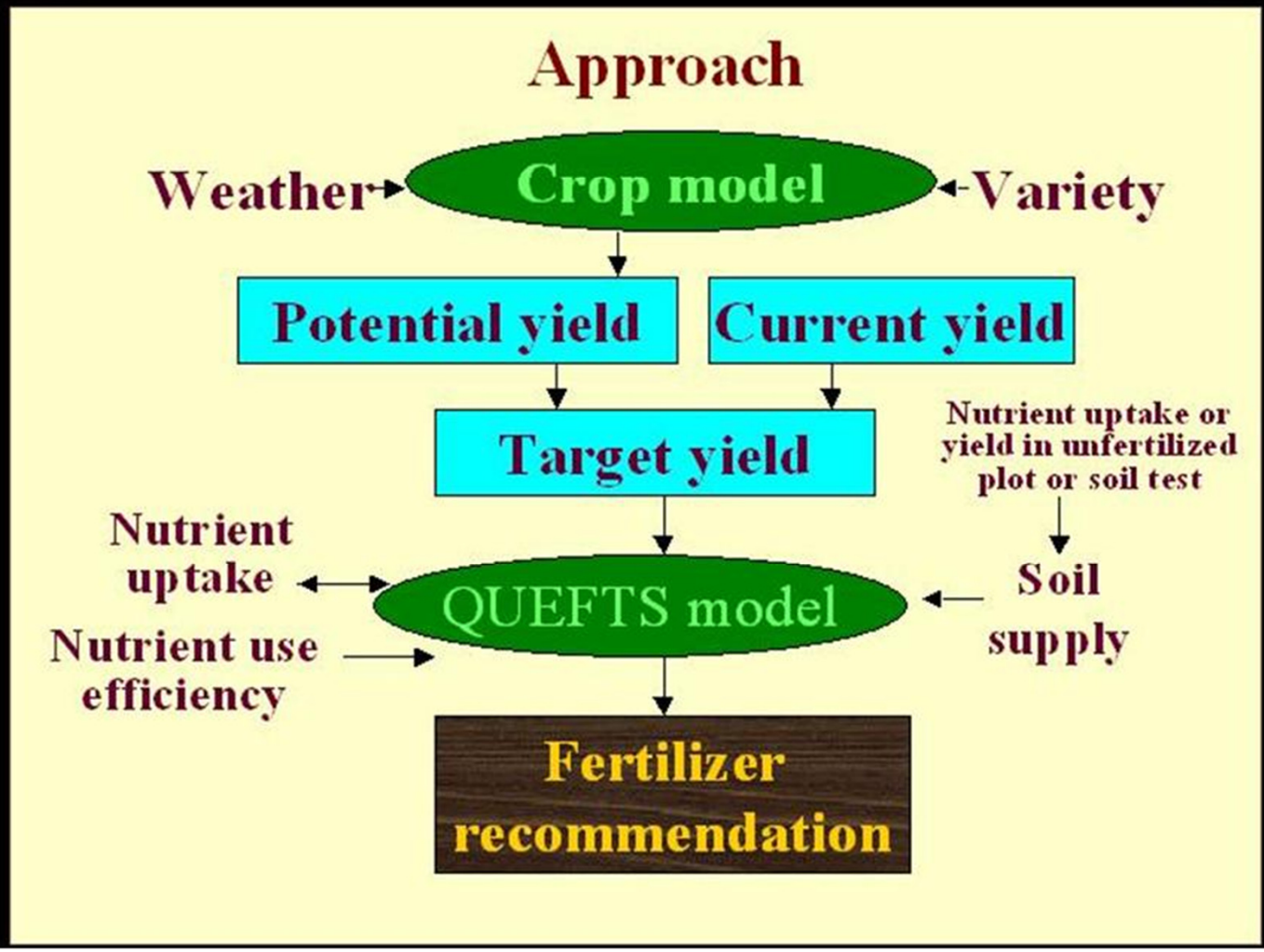

Grades of CF

QUEFTS

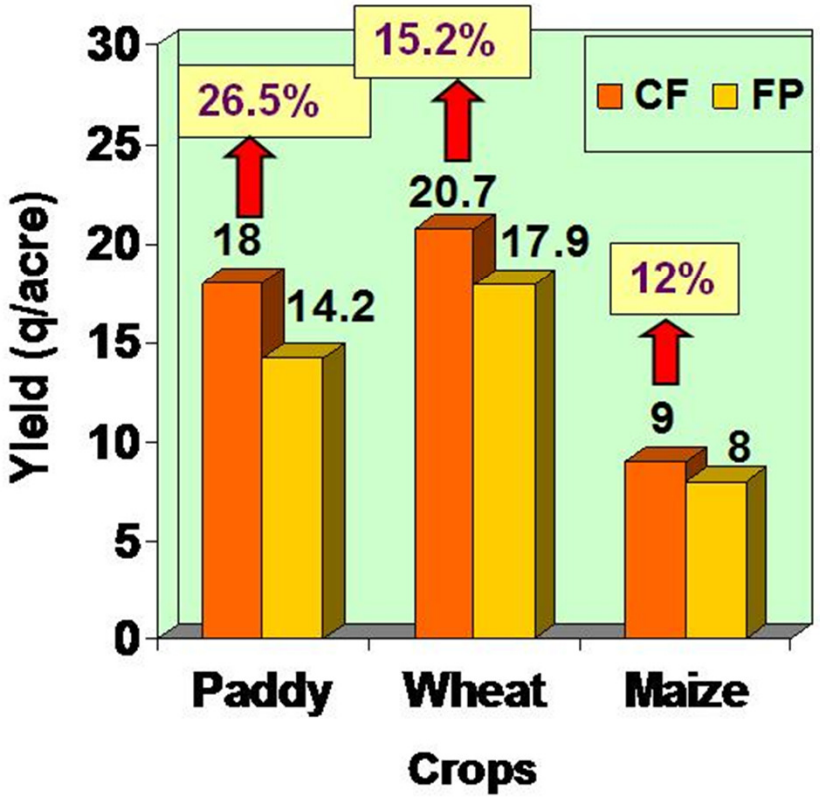
STCR

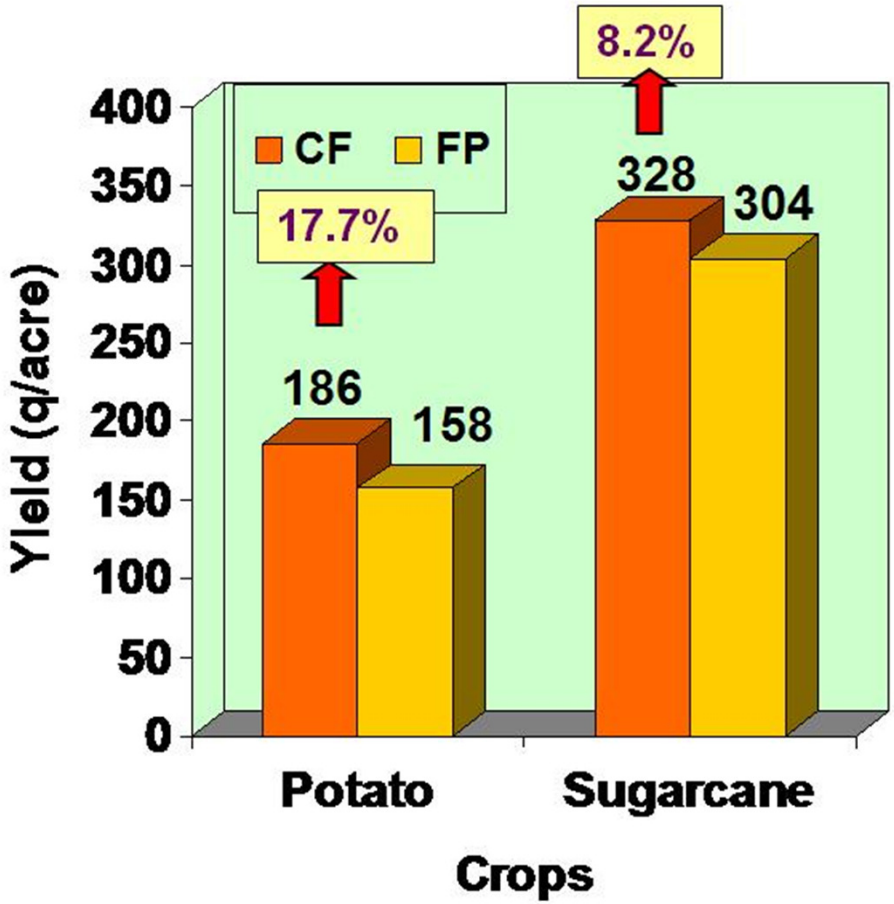
Scientific wisdom

# Optimizing Fertilizer Use



# Increase in Crop Yield by CF: Summary



# Soil Health Service
# (Possible Application Window)

- **Nutrient Management (on the basis of availability of nutrients in soil, pH, EC, crop type, soil texture, bulk density, soil mechanical impedance for root growth, adopted tillage & residue management, prevailing weather)**
- **Water Management (on the basis of soil texture, bulk density, soil mechanical impedance, soil available water, crop type, nutrients' input, prevailing weather)**
- **Tillage needs (on the basis of crop type, surface roughness and moisture conditions, bulk density, soil mechanical impedance, extent of reduction in delay of sowing of wheat, extent of water logging as a function of time)**
- **Insects and pests, extent & control options (on the basis of crop type, soil moisture and irrigation schedule, nutrients' input, weather condition mainly rainfall, humidity & temperature)**

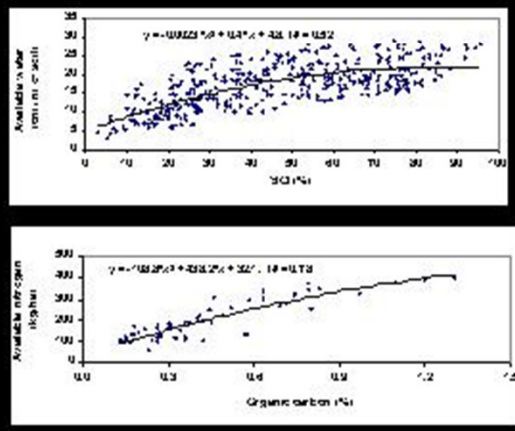
# Development of soil data-base for land use planning

**Primary soil characters**

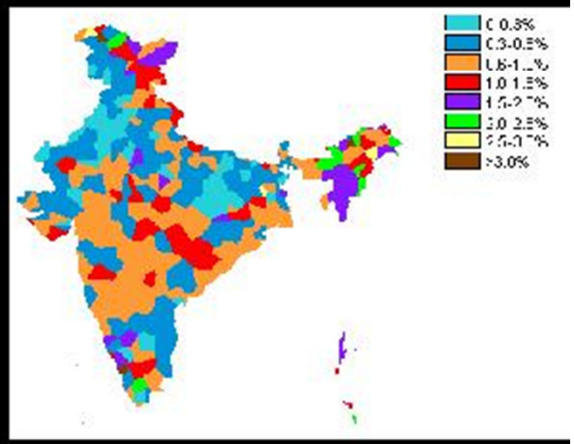
**Moisture retention, release and transmission characteristics**

**Soil fertility evaluation and trends**

**Organic carbon budget, its dynamics and sequestration potential**



Pedo transfer functions




Organic content status of Indian soils

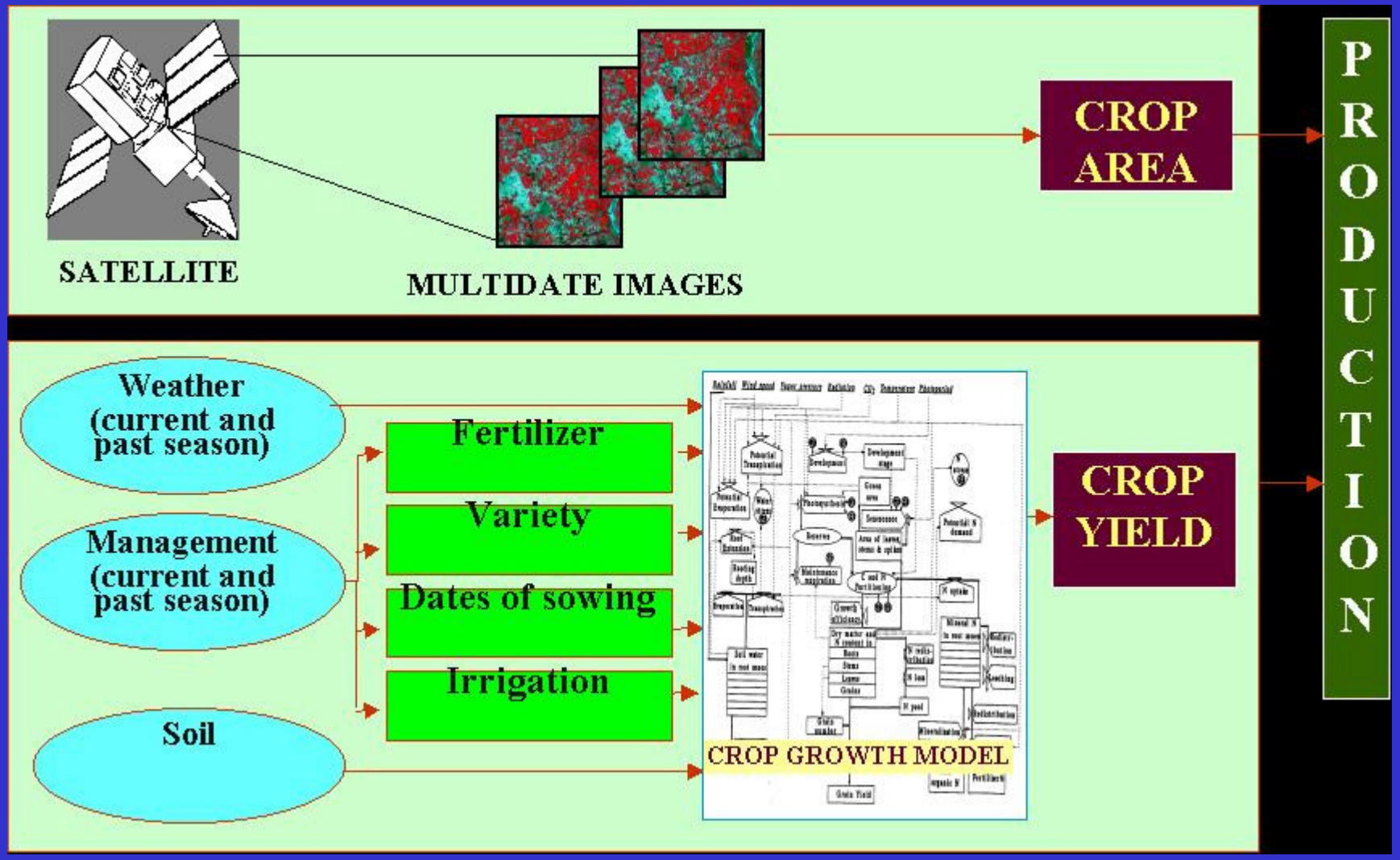
# Resource Conservation Technologies

**•To demonstrate incorporation of crop residues and use of zero/minimum tillage as a potential resource conservation technique for sustained rice-wheat productivity.**

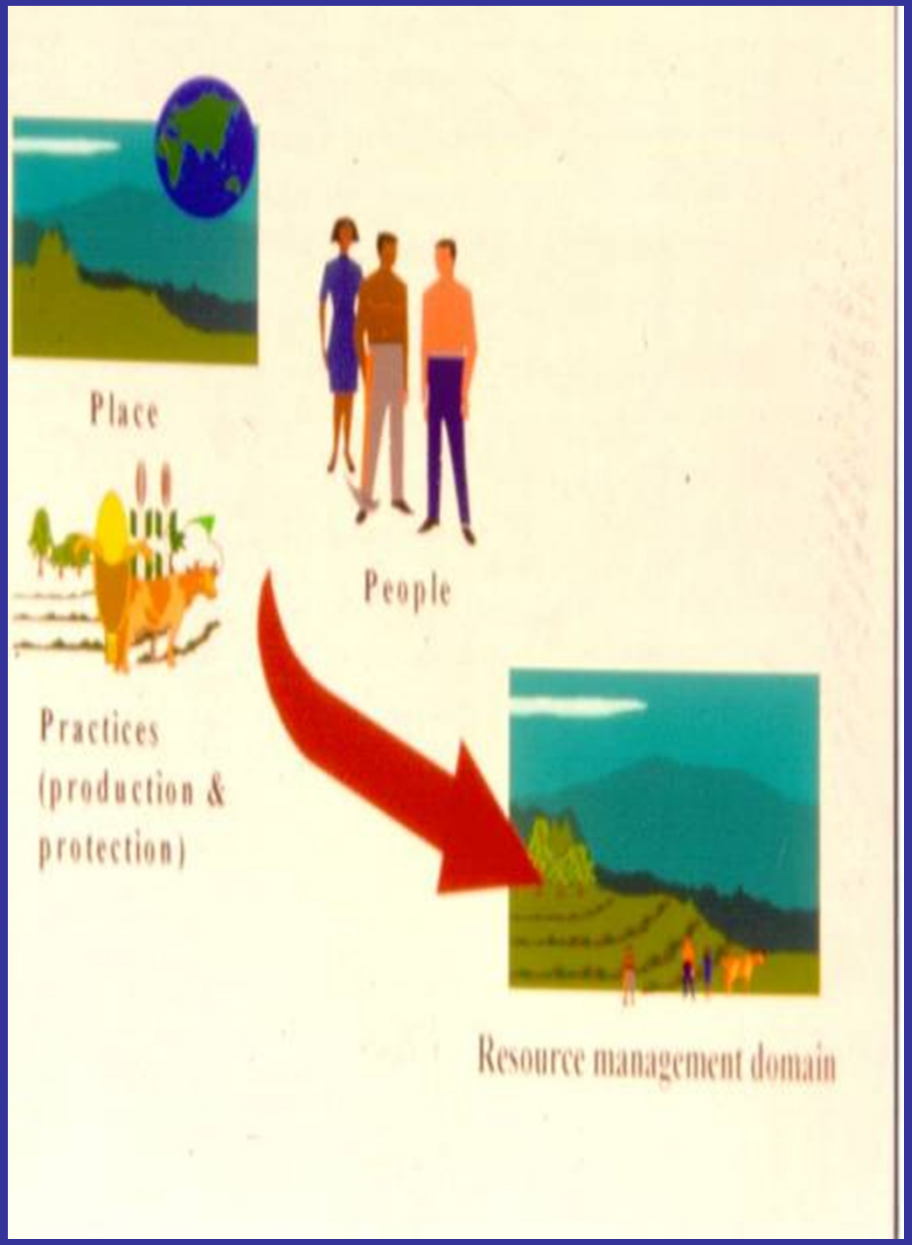
**•Assess the effect of zero/minimum tillage adoption and crop residue incorporation on turn around time for wheat, C-sequestration and gains (time course during cropping system progress), soil environment (nutrient and moisture availability, soil mechanical impedance), resource/inputs conservation, growth and yield of companion crops, environmental protection (through saving fuels, reduced emission of GHGs through enhanced nutrient use efficiency, water savings, C-sequestration) and cost-benefit analysis.**

**•Assess short- and long-term consequences of RCTs on agro-ecological health (estimate on the basis of three years trials in multi-locations as well on the basis of secondary literature search).**

# ON-LINE PRODUCTIVITY ESTIMATES IN ADVANCE

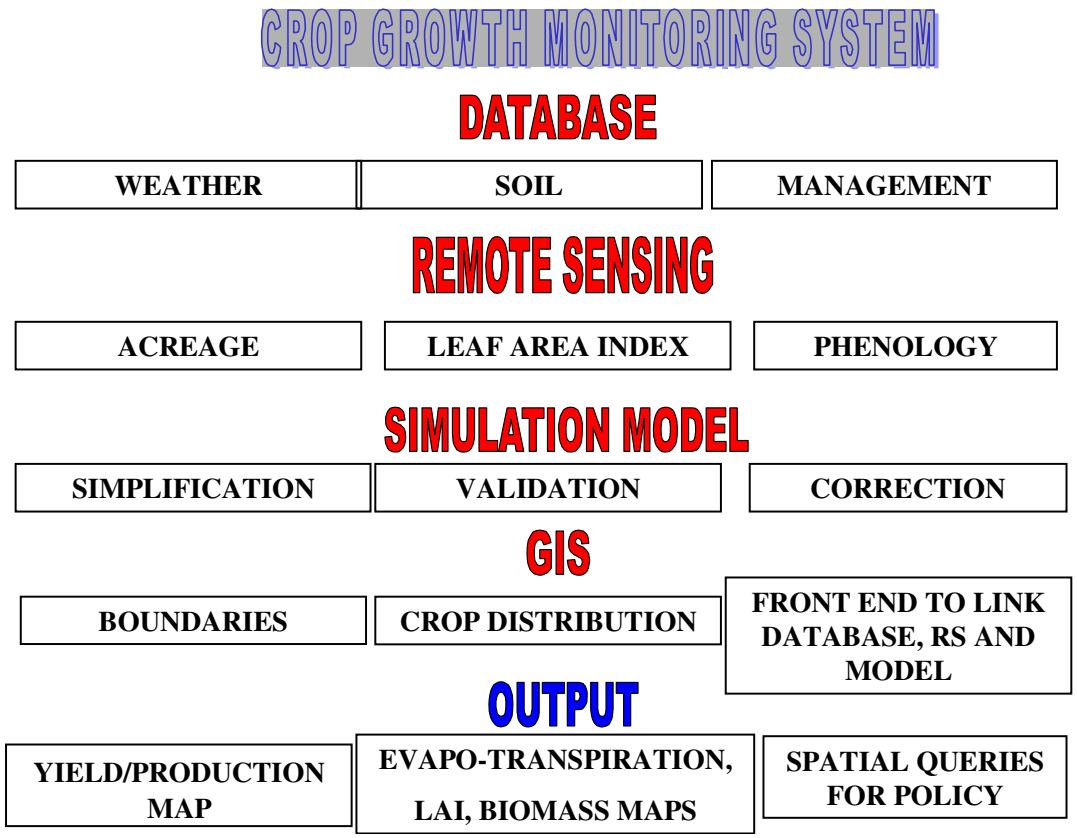


# ON-LINE AGRO-ADVISORY




-Pre-sown, operational, & post-harvest advise
-Outlining optimal production zones
-Planning crop cycles with weather and market
-Inputs' management

**STAKEHOLDERS:**
**Farmers, Agri-clinics, Researchers, NGOs, Planners, Agro-industries**




**Future of crop yield forecast with remote sensing inputs and crop model by including relational database layers**

# THANKS