Research Efforts to Address Climate Change

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Global Mean Temperatures are Rising Faster with Time

Data: 1880-2015

Global Temperature (meteorological stations)

Temperature Anomaly (°C)

Annual Mean
5-year Running Mean

http://data.giss.nasa.gov/gistemp/graphs_v3/Fig.A.gif
Atmospheric Temperature Concerns & Future Predictions

@15°C Earth’s average surface temperature today

@ 0.8°C Higher than what it was a century ago

@ 2°C rise is the globally agreed threshold beyond which the earth will experience conditions difficult for survival

@ If emissions cut immediately and drastically, the rise can be stopped at 1°C

@ If emissions keep rising unchecked, temperature could rise an extra 4°C or more
Climate Change and Indian Agriculture

- Large country with diverse climate
- Two thirds area rain dependent
- High monsoon dependency
- Increase in frequency of extreme weather events
- Diverse seasons, crops and farming systems
- Close link - climate and water resources
- Small holdings, poor coping mechanisms and low penetration of risk management products
### Droughts and Extreme Climatic Events in India

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall Departure (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>-8</td>
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<tr>
<td>2001</td>
<td>-15</td>
</tr>
<tr>
<td>2002</td>
<td>-19</td>
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<tr>
<td>2003</td>
<td>+2</td>
</tr>
<tr>
<td>2004</td>
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<tr>
<td>2005</td>
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<td>2011</td>
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</tr>
<tr>
<td>2012</td>
<td>-8</td>
</tr>
<tr>
<td>2014</td>
<td>-12</td>
</tr>
<tr>
<td>2015</td>
<td>-14</td>
</tr>
</tbody>
</table>

*2015 Drought:*

- Scanty (-60 to -99)
- Deficient (-20 to -59)
- Normal (+18 to -19)
- Excess (+20 or more)

*Based on the data given by IMD*
Cyclones and Unseasonal Rains

- Flood tolerant cultivars
- Plant nutrition
- Wind breaks

- Earthling in light soils
- Adjusting sowing dates

Impact of Hudhud cyclone on Andhra Pradesh
ICAR Team Report

CRIDA

CENTRAL RESEARCH INSTITUTE FOR DRYLAND AGRICULTURE
Santoshnagar, Hyderabad 500059
Weather Aberrations and Affected Sectors of Agriculture
India Food Security

1.3 Billion + Indians

Marginal Lands
Declining Per Capita Land Availability
Socio-economic structure
Markets & Price

Climate Variability

Productivity vs Food Security

Climate Change

* 270 million tons + * Imports of food legumes and edible oils

Hunger Malnutrition

Droughts
Cyclones/Floods
Heat wave
Hail storms
Frost
Background

- **Increasing impact** of climate variability on agriculture
- Need for **coping** with current climate variability, preparing for future climate change
- **Crop losses** due to extreme events, responsibility of NARS for solutions
- Need for continuous **data generation** for identifying trends and building scenarios
- To support in **International Forums** with respect to Adaptation of CC and National Commitments
- **Standing Parliamentary Committee** recommended steps for food security under climate change impact scenarios
Objectives of NICRA Project

- To enhance the resilience of Indian agriculture including allied sectors to climatic variability and climate change through development and application of improved production and risk management technologies.

- To demonstrate site specific technology packages on farmers’ fields for adapting to current climate risks.

- To enhance the capacity building of scientists and stakeholders
Components of NICRA

- **Strategic Research** (40 ICAR institutes) including Sponsored & Competitive grants
- **Technology Demonstration** (8 ATARIls + 121 KVKs) (23 AICRPDA + 25 AICRPAM) (TOT of 8 Core Institutions)
- **Capacity building** (Research/Extension personnel, farmers and stakeholders)
- **Knowledge Management portal** (Repository of huge data and information processing on climate change)
SOIL
WATER
CROPS
HORTICULTURE
AGRO-FORESTRY
LIVESTOCK
FISHERIES
POULTRY
FARM
MACHINERY
SECTORS

40 ICAR Institutes
8 ZPDs, 121 KVKs
AICRP Centers 50
Competitive & Sponsored Projects

ADAPTATION
MITIGATION

Agriculture
- Tolerant Varieties
- CA
- IFS
- Soil Health
- Paddy Systems
- Horticulture
- Water Management

Livestock & Poultry
- Breed
- Feed
- Shelter

Fisheries
- Spawning
- Environment

Poultry

NICRA .......

CRIDA
## Partner Institutions of NICRA

<table>
<thead>
<tr>
<th>Core Institutes</th>
<th>Programme Area</th>
</tr>
</thead>
</table>
| CRIDA          | Rainfed crop production systems  
Soil, water and nutrient management |
| IARI           | Irrigated crop production systems  
Monitoring of GHGs                |
| IIHR           | Horticultural production systems                                             |
| CIAE           | Energy efficiency in agriculture  
Improved machinery for adaptation and mitigation                                 |
| NDRI           | Livestock and Dairy sector                                                    |
| CMFRI          | Fisheries including Aquaculture                                               |
| ICAR – NEH     | All aspects covering the production systems in NE                           |

Other Collaborating Institutes: NRCPB, IIPR, IIVR, ICAR-RCER, DRR, NCIPM, DWM, IVRI, CIFRI, CRRI, CIBA, NRCAF, PDFSR, NIASM
Net Work Partner Institutions: Expanded in XII Plan

1. National Bureau of Plant Genetic Resources (NBPGR)
2. Indian Institute of Maize Research (IIMR)
3. Indian Institute of Wheat and Barley Research (IIWBR)
4. Directorate of Soybean Research (DSR)
5. Directorate of Onion & Garlic Research (DOGR)
6. Central Institute of Temperate Horticulture (CITH)
7. Central Potato Research Institute (CPRI)
8. Central Arid Zone Research Institute (CAZRI)
9. Central Soil Salinity Research Institute (CSSRI)
10. Indian Institute of Soil and Water Conservation (IISWC)
11. Indian Grassland and Fodder Research Institute (IGFRI)
12. Indian Institute of Soil Science (IISS)
13 National Bureau of Soil Survey & Land Use Planning (NBSS&LUP)
14 National Institute of Agricultural Economics & Policy Research (NIAP)
15 Central Institute for Research on Goats (CIRG)
16 Central Sheep & Wool Research Institute (CSWRI)
17 Directorate of Poultry Research (DPR)
18 National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)
19 Central Institute of Freshwater Aquaculture, (CIFA)
Strategic Research

(At 40 ICAR Institutes covering all sectors viz., Crops, Horticulture, NRM, Animal Science and Fisheries)
Climate Research Infrastructure - Established

- Field Crops
- Fisheries
- Biochar Kiln
- Livestock
- AWS
# NICRA-Automatic Weather Station Network

<table>
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<tr>
<th>Zone</th>
<th>State</th>
<th>AWS Number</th>
<th>(Research Station)</th>
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<tr>
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<td></td>
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<td>II</td>
<td>A&amp;N Islands</td>
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<td>Jharkhand</td>
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<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Tripura</td>
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<td>III</td>
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<td></td>
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<tr>
<td>V</td>
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<td></td>
<td>Rajasthan</td>
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<tr>
<td></td>
<td>Tamil Nadu</td>
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</tr>
</tbody>
</table>

Total: 100 stations (Real Time data)
Major Research priorities addressed

- Vulnerability assessment of major production zones
- Weather based agro-advisories for contingency planning
- Assessing the impacts and developing climate ready genotypes
- Adaptation & mitigation strategies – Soil, water, C, Nutrient, CA, AF
- Monitoring of GHGs in open field conditions in major production systems
- Pest dynamics under changing climate
- Adaptation in livestock – Nutritional & environmental strategies
- Fisheries - harnessing the benefits of elevated temperature
## Projects under Sponsored and Competitive Grants during earlier phase

<table>
<thead>
<tr>
<th>Category</th>
<th>No.</th>
<th>Major theme areas</th>
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<td>Sponsored</td>
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<td></td>
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<td>Arid and hill ecosystem</td>
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<td></td>
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<td>Fisheries in estuarian island habitats</td>
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<td>Hail storm management</td>
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<td></td>
<td></td>
<td>Small ruminants</td>
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<td></td>
<td></td>
<td>Socio economic response</td>
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<td>Competitive</td>
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<td>Marker assistance selection</td>
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<td>Impact on pollinators</td>
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<td>Climate change and water harvesting</td>
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<td></td>
<td></td>
<td>Post flowering drought tolerance</td>
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<tr>
<td></td>
<td></td>
<td>Conservation agriculture</td>
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<tr>
<td></td>
<td></td>
<td>Institutional and policy issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proteome analysis of N use efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Citrus based crops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-sequestration through ravine rehabilitation</td>
</tr>
</tbody>
</table>
Temperature Increase and Wheat Yield

- On all India basis, increase in temp by 1 °C for 1 week reduces wheat yield ~300 kg ha⁻¹.

- 5 °C increase for 1 week, yield reduction in wheat ~500 kg ha⁻¹.

District yields using A1b Scenario indicate

- Maize yield reduction of 100 kg/ha in 76 districts during 2021-50 and in 136 districts during 2071-98.

- Similar analysis in pigeonpea indicated a decrease of more than 100 kg/ha in 15 districts during 2071-98 period.
Screening Tomato Genotypes for High Temp & Flood

Temp Gradient Tunnels

- RILs (Punjab Chhuhara × H-88-78-1)
- Tested in open field (Feb-May 16)
- Heat tolerant lines (1 highly tolerant)
- Based on flowering and fruit setting
- Breeding lines for introgression of gene for high temperature tolerance

Artificial Flooding

- Wild and cultivated genotypes collected across country
- Water logging tolerant genotypes

In TGT temperature rises up to +5°C from the ambient and tunnel is divided into 6 gradients

24, 48, 72 hrs artificial flooding Vegetative (40 DAT) & Reproductive (70 DAT)
Development of Stress Tolerant Crop Varieties

- Wheat Genotypes with high yield potential and heat stress tolerance
- New rice submergence tolerant genotypes
- Rice lines for Nitrogen Use Efficiency (NUE).
- Maize genotypes with high yield potential and tolerance to water deficit
- Blackgram germplasm resilient to heat, drought and photothermoperiods
Conservation Agriculture

- CA practices in irrigated rice reduced GHGs besides rice residue mgmt improved soil C sequestration and soil health

- Reduced GHGs in Zero Tillage Maize over Tilled Maize

Wheat sowing by Turbo happy seeder in 6t/ha rice residue
Agroforestry Systems for Mitigation of Climate Change

Acacia based agroforestry

Khejri based agroforestry

Ailanthus + Neem based agroforestry

Soil organic carbon in existing agroforestry on farmer’s field under three districts of Rajasthan

<table>
<thead>
<tr>
<th>Soil depth (cm)</th>
<th>Dausa</th>
<th>Pali</th>
<th>Bikaner</th>
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<tr>
<td>0-30</td>
<td>25.44</td>
<td>28.95</td>
<td>14.95</td>
</tr>
<tr>
<td>30-60</td>
<td>14.27</td>
<td>19.53</td>
<td>14.20</td>
</tr>
<tr>
<td>60-90</td>
<td>13.52</td>
<td>16.93</td>
<td>12.68</td>
</tr>
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</table>
Web Enabled Pest Forecast Models
(http://www.ncipm.org.in/nicra/WeatherPrediction.aspx)

Yellow stem borer
No. of locations : 7 [Ludhiana(PB), Chinsura(WB), Raipur(CG), Karjat(MH), Hyderabad(TS), Mandya(KA), Aduthurai(TN)]

Brown plant hopper
No. of locations : 6 [Ludhiana(PB), Chinsura(WB), Raipur(CG), Hyderabad(TS), Mandya(KA), Aduthurai(TN)]

Green leaf hopper
No. of locations : 6 [Chinsura(WB), Raipur(CG), Karjat(MH), Hyderabad(TS), Mandya(KA), Aduthurai(TN)]

Leaf folder
No. of locations : 3 [Ludhiana(PB), Raipur(CG), Aduthurai(TN)]

White backed plant hopper
No. of locations : 1 [Chinsura(WB)]

Case worm
No. of locations : 1 [Raipur(CG)]

Gall midge
No. of locations : 1 [Raipur(CG)]

Empirical forecast models developed

<table>
<thead>
<tr>
<th>Crop &amp; season</th>
<th>Insect pests</th>
<th>Diseases</th>
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<tbody>
<tr>
<td>Rice (kharif)</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Pigeonpea (kharif)</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Groundnut (kharif)</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Tomato (kharif)</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Rice (rabi)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Groundnut (rabi)</td>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

Tobacco caterpillar *S. litura* on *Kharif* groundnut
Three locations [(Kadiri (AP), Dharwad (KA) and Junagadh (GJ)]

Early blight of Tomato for *Kharif*, Bengaluru (KA)
Target spot of tomato *Kalyani* (WB)
- Though the submerged area under aquaculture is less, agriculture and other areas predicted to be submerged can be potential areas for brackishwater aquaculture.
Catches of oil sardine, mackerel and lesser sardines show increasing trend over past 20 years, corresponding with the increasing trend in SST along TN coast.
Technology Demonstration

(Through KVKs and AICRP centers at 151 sites across the country)
150 Climate Resilient Villages
भारत में 150 जलवायु समुत्थान गांव

- Resilient Interventions
- Adaption towards weather aberrations
- *In-situ* moisture conservation practices.
- Soil health cards-SSNM
- Tolerant crops.-varieties, breeds, fodder
- Water saving paddy systems
- Crop residue recycling
- Community nursery and planting dates
- Farm machinery with CHC

@ Village Carbon Balance
@ GHG Mitigation Potential

- Village Climate Risk Management Committee (VCRMC)
- Custom hiring of farm machinery (revenue Rs 8 lakhs)
- Demonstrations in 6803 farmers fields covering 3431 ha
- 722 training programs organized covering 27887
- Smart farmer certificates awarded to 4605 NICRA farmers
- Identified 27 climate resilient practices for up-scaling under NMSA
NICRA Technology Demonstration Sites

Climate vulnerabilities of farming systems at sites

- Drought (41)
- Drought & Heat wave (13)
- Drought & Flood (5)
- Heat wave & High Temperature stress (3)
- Heat wave & Cold wave (4)
- Frost / Cold wave / Cold stress (2)
- Cold wave & Hail storm (2)
- Water stress & Cold stress (7)
- Scanty / Erratic rainfall (2)
- Flood / Cyclone / High rainfall (20)
Climate Resilient Village

**Weather**
1. Village weather stations
2. Automatic weather stations
3. Weather based agro-advisory
4. Documentation of aberrant weather conditions
5. Awareness building through extension
6. Real time measures adverse weather

**Water**
1. Aquifer recharge
2. Ground water recharge
3. In-situ moisture conservation
4. Farm ponds
5. Efficient application system
6. Drainage
7. Integrated farming system
8. Flood diversions
9. Community management of water

**Crop**
1. Drought tolerant varieties
2. Flood tolerant varieties
3. Saline tolerant varieties
4. Intercrop/systems
5. Efficient rice systems

**Fertilizer**
1. Soil health cards
2. SSNM
3. Legumes
4. INM
5. Precision application
6. Fertigation

**Carbon**
1. Village organic resource inventory
2. Residue recycling
3. Conservation agriculture
4. Tank silt
5. Agro forestry
6. Livestock management

**Institutional/Knowledge**
1. VCRMC
2. CHC
3. Seed bank and fodder bank
4. Commodity Interest groups
5. Community nursery
6. Capacity building

**ICAR-CRIDA-NICRA**
Modules & Interventions for Climate Resilience in Villages

1. Natural Resource Management
   - In situ resource conservation
   - Ex situ rainwater harvesting & efficient use
   - Land management
   - Soil health management

2. Crop Production Systems
   - Contingency crop planning
   - Multiple stress tolerant & short duration varieties
   - Resilient crops & cropping systems
   - Crop diversification
   - Adjustments in planting time
   - Planting methods BBF etc.
   - Soil test based nutrient management

3. Livestock & Fisheries Production System
   - Stress tolerant breeds eg., small ruminants
   - Feed & Fodder management
   - Shelter & Health management

4. Village level Institutional mechanisms
   - Establishment of Village Climate Risk Management Committees (VCRMCs)
   - Custom hiring centres for farm machinery
   - Seed & Fodder banks

CRIDA
In-situ Rain Water Harvesting Structures

Demonstrated on
67 ha involving 229 farmers
Value of convergence  Rs 800000

Umarani village, Nandurbar

Convergence with MGNREGA
# Direct Seeded Rice for Delayed Planting

<table>
<thead>
<tr>
<th>Yield (q/ha)</th>
<th>% increase</th>
<th>Economics of demonstration (Rs./ha)</th>
<th>Economics of Local (Rs./ha)</th>
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<tbody>
<tr>
<td>Demo</td>
<td>Local</td>
<td>Percentage</td>
<td>Gross Cost</td>
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<tr>
<td>35</td>
<td>30</td>
<td>16.67</td>
<td>24238</td>
</tr>
</tbody>
</table>

**What we could get through NICRA intervention**

- Saving in 5 hours in tractor operation
- Saving in 35 Man days in uprooting and transplanting of seedlings
- Pump set hours reduced by 3 /ha
Staggered Community Nursery

- To avoid transplanting of over-aged seedlings (medium to long duration var in lowlands)
- Nursery sowings on 15th June, 28th June and 12th July
- Technique adopted by the State Dept. of Agriculture, Bihar in 2013 (Rs 16500 /ac nursery)
## Community Seedbank: Dubri, Assam

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Maintenance of seed bank</td>
<td>Quality seed of submergence tolerant and short duration late transplanted rice varieties for flood affected area</td>
</tr>
<tr>
<td></td>
<td>Quality seed of summer rice and toria for rabi</td>
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</tbody>
</table>
Livestock Sector

@ Tolerant breed
@ Better Feed
@ Shelter management

@ Better Adapted
@ Higher productivity
@ Lesser GHGs (15% reduction)
Village level Institutions established

VCRMC

Custom hiring center

Seed Bank

Fodder bank

Commodity based organizations
Village Climate Risk Management Committee (VCRMC): Key Institutional Intervention

• Constituted in all NICRA villages
• Bank account opened for each VCRMC
• Custom hiring centres for farm machinery setup
• Proceeds of hire charges deposited in bank and managed by a sub committee
• New enthusiasm due to financial empowerment of village institutions
• Regular meetings held for resolving community related issues while implementing NICRA interventions
**Custom Hiring Centers – Spread of the Concept**

(5 states considering adopting the model under state funding)

- Facilitates timely sowing operations in narrow windows of moisture availability
- Precision planting, good germination and better crop stand
- Access to small & marginal farmers of costly machinery
- Crop residue recycling
- Water saving, in situ moisture conservation
- Increase in crop productivity
- Labor saving
- Multiple operations e.g. planter & rotavator

**Most Popular Implements in CHCs**

- Zero till drill
- Drum seeder
- Rotavator
- Happy seeder
- Ridge & furrow planter
- Multi crop planter
- Multi crop thresher
- Power tiller

Revenue generated: Rs. 18,00,000

Sustainability fund: 25% of revenue
<table>
<thead>
<tr>
<th>KVK</th>
<th>CROP</th>
<th>VARIETY</th>
<th>Quantity (q)</th>
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<td>Guna</td>
<td>Soybean, Gram</td>
<td>JS-9560, JG-6</td>
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<td>Wheat</td>
<td>JW-3173</td>
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<td>Dantewada</td>
<td>Rice</td>
<td>Samleshwari</td>
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<td>Green gram</td>
<td>Pusha Vishal</td>
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<td>Rice</td>
<td>Lalat, Khandagiri</td>
<td>250</td>
</tr>
<tr>
<td>Satna</td>
<td>Green gram</td>
<td>Samrat</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Chick pea</td>
<td>JG-11</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Mustard</td>
<td>Pusa Tarak</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>JW-17</td>
<td>3</td>
</tr>
<tr>
<td>Ganjam</td>
<td>Paddy</td>
<td>Khandagiri</td>
<td>2</td>
</tr>
</tbody>
</table>

Odissa, MP, Jharkhand, Bihar, Chattisgarh, UP, Rajasthan

Seed bank in Gunia village, Gumla

Nearby villagers purchasing seed from NICRA farmers
AICRPAM-NICRA-KVK network has evolved a pilot methodology for block/village level Agro Advisory Services
NICRA Impacts and Expansion

@ BBF technology in Maharashtra entire black soil regions
@ Farm pond technology “Million Farm Ponds”
@ Ground water recharge in Southern States
@ 150 IAS and IFS probationers were trained on district water resources and contingency plans under PMKSY
@ NABARD Action Plans
@ NICRA Village Model expansion in Assam
@ Madhya Pradesh : 20 Climate resilient practices strategy
@ Real time contingency response models in 23 locations in 15 states
@ Vulnerability assessment maps : Different Ministries and several NGOs/CBOs.
@ Custom hiring centres (CHC) policy paper
@ Resilience Indicators (to be presented in next HLMC)
@ Village level carbon balance, methodologies developed
@ GHG inventory going to India reports
@ Contingency preparedness workshops (2014=8; 2015 = 12 states; 2016= 7 so far)
@ 100 Automatic weather stations, 250 KVKs staff for agro-meteorological data sets
@ Strong synergy ICAR-IMD-Earth Sciences-MoEF-Water resources-Rural Development
614/651-District Agriculture Contingency Plans

- Updating of contingency plans with Universities/KVKs
- NICRA/CRIDA/AICRPDA Research outputs & Agri. Universities/KVKs
- NMSA
- Implementation of DCPs
- District (with State Government authorities)
- Taluq/Mandal (AICRPDA/AICRPA M network)
- Villages (through KVKs under NICRA-TDC

@ Able to reach State Action Plans – NMSA, several programs
@ Policy makers
@ District-Mandal-Village Level Implementation
@ 2014: 9% Sowing area reduction offset
@ Rabi area increased (ex. Pulses)
@ Large scale land treatments implemented
@ 2015: 12 State Interface Meetings; Pulses, millets area increased
District level contingency plans cover contingency strategies to be taken up by farmers in response to major weather related aberrations such as delay in onset and breaks in monsoon causing early, mid and late season droughts, floods, unusual rains, extreme weather events such as heat wave, cold wave, frost, hailstorm and cyclone. Read More

<table>
<thead>
<tr>
<th>Farming situation</th>
<th>Crop</th>
<th>6 weeks delay</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow red soils</td>
<td>Maize</td>
<td>Maize/ Blackgram/ Greengram/ Fieldbean</td>
<td>Maize: DHM- 2, Ganga-11, Deccan-103 Fieldbean: HA-3, 4</td>
</tr>
<tr>
<td>Shallow red soils</td>
<td>Groundnut</td>
<td>Groundnut (JL-24, K-134)</td>
<td></td>
</tr>
<tr>
<td>Shallow red soils</td>
<td>Cowpea</td>
<td>Cowpea Milton</td>
<td></td>
</tr>
</tbody>
</table>

Monsoon delay

www.crida.in:82/contingency_planning/
1) All the 614 district plans are placed ‘Farmer portal’ of the Ministry of Agriculture, Government of India (http://www.farmer.gov.in) and

2) ICAR / CRIDA website (http://www.crida.in) for downloading the full plan by stakeholders for operational use.

3) NABARD-Regional Groups: Included in Action Plan

4) PMKSY: 150 IAS/IFS officers trained on district irrigation plans (Inputs from NICRA CRVs + Contingency Plans)

5) International Dryland Development Commission (IDDC)

6) UNFCCC-Climate Change Negotiations (Website)

7) CoP-21: Side event on Climate Resilient Agriculture
Contributions of NICRA to National/International forum

NICRA

- NMSA
- Water Mission
- Green Fund
- UNFCCC
- SBSTA
- AFRICAN Council
- INDC’s
- BUR
- SAARC Committee
Agriculture Sector in India at Global Climate Change Negotiations through NICRA Outputs

@ 4 In-Session Workshops held so far under UNFCCC Climate Change Negotiation under Agriculture

1) Early warning systems and contingency planning
2) Risk and vulnerability assessment of agriculture systems
3) Adaptation strategies for climate change
4) Technologies for enhanced productivity for food security under climate change

NICRA : Developed and are under Implementation Stage
@ Across the SMDs: Synergy and packaging
@BBF technology in Maharashtra entire black soil regions
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National Mission for Sustainable Agriculture (NMSA)

Implementation strategies of contingency plans through national programs
Linkages & Upscaling

Rainfed Technology Up-scaling

- NMSA
- MGNREGA
- NHM
- ISOPAM
- IWMP
- NFSM
- Soil Health Programs
- Dryland Missions of Various States
- Gramina Krishi Mousam Yojana
Major Milestones

- Completion of the infrastructure at core institutes
- Extensive field phenotyping of germplasm of target crops (rice, wheat, maize, pigeonpea, tomato) to multiple abiotic stresses
- District level vulnerability mapping – Atlas prepared
- Technology development for climate resilient horticulture
- Role of NRM in adaptation – Biochar, CA, water foot prints and emission reduction through efficient energy management, quantification of carbon sequestration by agroforestry
- Unique traits for thermal tolerance in livestock mapped, heat care mixture for poultry ready for commercialization
- Relationship established between increase in SST and catch and spawning in major marine fish species.
- Four years of on-farm technology demonstrations came up with several models for upscaling under NMSA
NICRA- Way forward

Quantification of resilience and adaptation gains

Fully functional and interactive Consortia groups in selected theme areas
Integrated modeling and GHG emissions

Developing weather indices to design more farmer friendly weather insurance policies

Institutions and policy research for upscaling, adaptation financing / funding

Prioritization of out comes and outputs with climate dimension

Horizontal expansion of climate resilient technologies for enhanced adaptation gain and its co-benefits
Thank you