Linking climate forecasts to rural livelihoods: Mapping decisions, knowledge networks and value chains

Uday Nidumolu, Peter Hayman, Mark Howden and many other colleagues
Talk outline

• Scope of this presentation
• Challenge of valuing Seasonal Climate Forecasts (SCF)
  • An approach that integrates SCF into evaluation of decisions
  • Ensuring access and effective dissemination of climate information: a social networks perspective
  • Seasonal climate forecasts across the value chain
• From science to delivery - Climate Information Centres (CLICs)
• In Summary
Scope of this presentation

Lifetimes and sizes of atmospheric phenomena

- **Climate Science**
- **Agriculture**

This presentation

(source WMO)
The challenge of communicating innovations...

- A new cultivar of pigeon pea
- Sowing rule based on measured rainfall
- Short term weather forecasts
- *Seasonal climate forecasts*

- *Seasonal climate forecasts* expressed as shifts in probabilities present challenges for communication and use in decision making
Seasonal climate forecast

<table>
<thead>
<tr>
<th>Deficient</th>
<th>Below normal</th>
<th>Normal</th>
<th>Above normal</th>
<th>Excess</th>
</tr>
</thead>
<tbody>
<tr>
<td>29%</td>
<td>13%</td>
<td>35%</td>
<td>19%</td>
<td>4%</td>
</tr>
</tbody>
</table>

India Meteorological Department, Long Range Forecast issued in April

India Meteorological Long Range Forecast (LRF) framework which uses five categories of growing season rainfall viz., ‘deficient’ (<90% Long Period Average (LPA), ‘below normal’ (90–96% LPA), ‘normal’ (95–104% LPA), ‘above normal’ 104–110% LPA) and ‘excess’ (>110% LPA) with respect to long period average (LPA) rainfall data for the kharif (monsoon season)
An approach that integrates SCF into evaluation of decisions
- Interactive multiple goal linear programming model - integrates SCFs to develop **what-if scenarios for crop choice**

- includes season type, crops, soil, yields, input use - fertiliser, biocide; labour, costs, prices, subsidies (as $Tco$)

- Choice of crop/soil/area based on forecast

- Outputs variables –crop choice, fertiliser, biocide, labour, machinery use, revenue, costs & profit; can include subsidies & other policy instruments
### Scenarios

**With no forecast (equal chance of any season):**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Soil</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>Black</td>
<td>40</td>
</tr>
<tr>
<td>Paddy</td>
<td>Red</td>
<td>12</td>
</tr>
<tr>
<td>Redgram</td>
<td>Red</td>
<td>4</td>
</tr>
<tr>
<td>Redgram</td>
<td>Sandy</td>
<td>80</td>
</tr>
</tbody>
</table>

**With forecast skewed to a ‘wet’ season:**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Soil</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Sandy</td>
<td>5</td>
</tr>
<tr>
<td>Maize</td>
<td>Black</td>
<td>40</td>
</tr>
<tr>
<td>Paddy</td>
<td>Red</td>
<td>16</td>
</tr>
<tr>
<td>Redgram</td>
<td>Red</td>
<td>0.5</td>
</tr>
<tr>
<td>Redgram</td>
<td>Sandy</td>
<td>75</td>
</tr>
</tbody>
</table>

**With forecast skewed to a ‘dry’ season:**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Soil</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Black</td>
<td>40</td>
</tr>
<tr>
<td>Paddy</td>
<td>Red</td>
<td>9</td>
</tr>
<tr>
<td>Redgram</td>
<td>Red</td>
<td>7</td>
</tr>
</tbody>
</table>

**With IMD forecast:**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Soil</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>Black</td>
<td>40</td>
</tr>
<tr>
<td>Cotton</td>
<td>Sandy</td>
<td>54</td>
</tr>
<tr>
<td>Paddy</td>
<td>Red</td>
<td>11</td>
</tr>
<tr>
<td>Redgram</td>
<td>Red</td>
<td>5</td>
</tr>
</tbody>
</table>
Opportunity costs & loss for crop choice decisions based on seasonal forecast
Ensuring access and effective dissemination of climate information: a social networks perspective
Social Network Analysis

- information sources and networks used by farmers in the villages
- how farming-related climate information flows at the farming village level
- highlighted particular individuals, groups or/and institutions who are central in information networks

*Social networks differ*

Village in Tamilnadu  
Village in Telangana  
Village in Sri Lanka
Social network implications

• Identifies points for intervention to facilitate equitable access to and effective dissemination, communication of climate information

• Helps to target different sub-groups of farmers with context-appropriate information

• Can support or build the capacity of key nodes

• SNA should be combined with other approaches to better understand the social, cultural and political dynamics and contexts in which information is accessed (i.e. by whom), shared and used
Seasonal climate forecasts across the value chain
SCF decision-making: Simplified Sri Lanka paddy value chain

- Government: Irrigation
  - Inform planning for areas and extent of cultivation, advice on crop choice

- Banking sector
  - Manage risk profiles; decision to release or hold loans

- Gov’t: Fertiliser & seed
  - Inform decisions on extent, crop subsidy, fertiliser import quotas

Manufacturer → Input supply → Farmer → Intermediary → Miller

- Input for planning import volumes, contracts; inventory rates; sales forecasts
- Influence stocking rates
- Decide on where to crop (upland, lowland); extent of cultivation
- Forecasting for incoming stock; Plan to source from alternative regions
- Plan for stock rates – hold for high prices,

Legend
- Expressed decision
- Potential decision

Lilly Lim Camacho et al (2015)
Key Findings

• Formal and informal mechanisms of sharing the information are available, and provide avenues to:
  – support improved decision making at multiple stages of the chain

• SCF is considered one-of-several forms of information that would influence planning and decision-making

• Size of the business or strategic scope is a key factor in the utility of SCF (bigger seems better)

• Barriers to understanding SCF need to be addressed
From science to delivery

Climate Information Centres (CLICs)

• Towards digitally-enabled rural advisory services for inclusive agricultural transformation

• Building capacity to record, observe, interpret and act on climate information
Journey towards CLICs

• Developing practical adaptations to climate variability using participatory methods to elicit local ideas

• Testing these ideas both through simulation analysis and with farmers to ensure that they can be adopted

• Harnessing a broad range of formal science skills - climatology, modelling, agronomy and social anthropology through to experiential and practical development knowledge embodied in NGOs and collaborating farmer groups
CLICs framework

Local Rainfall Measurement: rain-gauge station in each village; regular measurement & recording

CLICs framework

Agro-met advisory – weather forecast further processed to an agriculture related advisory provided twice a week

SCF

Accumulated heuristics knowledge base on crop performance in the past, outbreaks of pest and diseases etc

Graphic courtesy WASSAN
CLICs

- Infrastructure facilitating easy **access to external support systems** (extension system, agriculture universities & departments)

- Reliable & easily accessible **database to supplement & strengthen local knowledge base**

- Tools to **analyze information & build capacities for decision making at farm level**

- **Connect & strengthen informal networks;** extend networks to socio-economically weak & disadvantaged groups within the farming community; participatory and customized to community requirements
Outscaling CLICs

Initially in 3 case study villages

Expanded to 30 from other funding sources

New IFAD project in India (2017-22) – 300 CLICs one each for a cluster of 5-6 villages
Summarising

- Managing agriculture production risk in rainfed conditions requires information rich farming systems.

- Climate Information has potential in reducing production risk of intensification & enhance stability aspects of food security.

- Seasonal climate forecasts - important component in the portfolio of agric risk management tools.

- Probabilistic nature of forecasts a challenge to communicating and including in decision making.

- Whole-farm bio-economic models – an effective way to engage farmers and other stakeholders.
Summarising

- Mapping social networks enable identifying key-nodes of influence and communication - SNA

- Differentiated Value of climate information across the nodes in the value chain - targeted information delivery

- In terms of translating of science to the community
  
  - Approaches such as CLICs act as important platforms for capacity building on climate risk management
  
  - Packaging our research; messaging; thumb rules
  
  - Embedding NGOs, academia and policy from research formulation to delivery
  
  - Identifying/ targeting an enabling platform that can outscale research ‘products’ earlier on in the research process
Thank you
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