SITE PRIORITIZATION FOR IBFI

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IWMI, Colombo

Inception Workshop on Index Based Flood Insurance (IBFI) for Agriculture Risk Management

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Hotel Gargee Grand, Patna
Objectives and Project Outputs

Outlines of presentation

• Historical flood events and its impact on agriculture and population in flood plain.
• Data integration and parameters for proposed IBFI site selection
• Data used to design IBFI for agriculture
• Selection of pilot area to implement IFBI

Key Outputs of Project

• Development of flood hazard models (FHM) to define flood risk zones
• Integration of FHM parameters with crop life cycle
• Design a index based flood insurance and implement that in pilot area
• Provide efficient and cost-effective Flood insurance program
Data Integration & Site Prioritization

**Physical**
- LULC
- Crop Pattern
- Census data

**Rainfall**
- Intensity
- Duration
- Amount of rain

**River Flow**
- Water Level
- Discharge

**Flood**
- Time of Occurrence
- Extent & Depth
- Duration
- Frequency

**Non-Agricultural area**
- Population affected
  - Households
  - Livestock
  - Infrastructure

**Agricultural area**
- Affected crop type
- Crop submerged area
- Duration of submergence
- Stage of crop

**Socio-Economic loss**
- Crop/Income loss
- Households and livestock
- Infrastructure
- Social Issues

**Site Selection**
Bihar is most flood-prone state in India and its 73% of land is flood affected.

North Bihar is more susceptible due to high discharge and sediment loads from river originating in Nepal.

2008 and 2007 are two major flood events in recent past from different origin.

2004 has witnessed largest extent of flood.

Source: 2007 Kosi flood report
Parameters and Data source

**Hydrological**
- Fluvial/Monsoonal/Combine
- Flood Parameters (Extent, Intensity, Frequency, time of Occurrence)
- River Flow (discharge, water level)

**Agriculture**
- Crop land under inundation
- Stage of crop during inundation
- Duration of crop submergence in water

**Economic**
- Crop Loss
- Number of Peoples affected/loss of life
- Loss of Live Stocks/Fodder, infrastructure

**Physical**
- Geography (Land use, individual’s land hold etc.)
- Farmer economic condition
- River basins

IWMI database (2001-2014, MODIS derived Data), state and federal Govt. agencies’ reports and other literatures, In-situ measurements and IMD grid data (1980-2012), WRIS

Reports and data from Agriculture dept., BDMA/FMIS (2001-2012), IndiaStat, Remote sensing derived data developed by IWMI, IFPRI etc.

Reports and data from Agriculture dept., BDMA/FMIS

Site Prioritization Analysis: Hydrological Data (1/2)

- Analyzed long-term historical rainfall data from IMD in different districts of Bihar.
- Prepared inundation map from MODIS and calculated flood extent, duration, frequency and compared with data from FMIS, BDMA and other reports.
- River flow information from altimeter and in-situ measurements.
Many of Districts in Bihar from MODIS images show high inundation

Flooding in Dharbhanga, Muzaffarpur, and Sitamarhi from MODIS shows high correlation in magnitude with literature data
Site Prioritization Analysis: Submerged crop, total area & crop loss

Crop Loss (million USD)

- W. Champaran: 3.874
- Vaishali: 2.326
- Supaul: 3.702
- Saran: 6.376
- Samastipur: 6.708
- Saharsa: 3.614
- Patna: 1.083
- Nalanda: 0.454
- Muzaffarpur: 2.917
- Munger: 0.489
- Madhubani: 3.074
- Khagaria: 3.286
- Buxar: 0.092
- Bhojpur: 3.074
- Bhagalpur: 286
- Begusarai: 7.698

Inundation (Km²)

- Inundated Crop Area
- Inundated Total Area

Source: 2007 Kosi flood report, Bihar Statistical Year Book,
### District(s) Selected For Pilot Area

<table>
<thead>
<tr>
<th>Districts</th>
<th>Rainfall</th>
<th>Submerged Total Area</th>
<th>Submerged Crop Area</th>
<th>Crop loss (million USD)</th>
<th>No of Villages</th>
<th>No of Peoples</th>
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</thead>
<tbody>
<tr>
<td>E. Champaran</td>
<td>1199.58</td>
<td>1655.7</td>
<td>838.8</td>
<td>6.376</td>
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</tbody>
</table>

- Some districts which records high rainfall, flood frequency and inundation but crop submerged and crop loss is comparatively low
Thank You!
In-situ & Altimeter based Hydrological stations

Hydro and Virtual Stations

- VS AltiKa/Evisat
- Hydro Station
- VS Jason/T-P
- River System
- Bihar_District
## Climate Of Bihar

<table>
<thead>
<tr>
<th>Agro-Climatic Zones</th>
<th>Districts</th>
<th>Soil Types</th>
<th>Annual rainfall (mm)</th>
<th>Water Logging</th>
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</thead>
<tbody>
<tr>
<td>Zone I (Northern West)</td>
<td>W. Champaran, E. Champaran, Siwan, Saran, Sitamarhi, Muzaffarpur, Sheohar, Vaishali, <strong>Madhubani, Darbhanga</strong>, Samastipur, Gopalganj, Begusarai</td>
<td>Sandy Loam, Clay Loam</td>
<td>1040-1450 (1245)</td>
<td>Flood prone</td>
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<td>Zone II (Northern East)</td>
<td><strong>Purnea, Katihar, Saharsa, Supaul, Araria, Madhepura, Khagaria</strong>, Kishanganj.</td>
<td>Sandy Loam, Clay Loam</td>
<td>1200-1700 (1450)</td>
<td>Flood prone</td>
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<tr>
<td>Zone III (Southern East-West)</td>
<td>Sheikhpura, Munger, Jamui, Lakhisarai, Gaya, <strong>Bhagalpur</strong>, Banka, Rohtas, Bhojpur, Buxar, <strong>Patna</strong>, Bhabhua, Arwal, Nalanda, Nawada, Jehanabad, Aurangabad.</td>
<td>Sandy Loam, Clay Loam, Clay</td>
<td>990-1240 (1115)</td>
<td>Drought prone</td>
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<tr>
<td>Districts</td>
<td>Rain (mm) IMD</td>
<td>no of rainy days</td>
<td>inundated Area (Km²)</td>
<td>Inundation days avg.</td>
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