Value Assessment of Rainwater Harvesting for Climate Change Adaptation

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Pakistan
Background

• Rainwater harvesting technique for rainfed areas is as old as human civilization
• In Pakistan 12 million hectares (40% of Pakistan’s cultivable land) entirely dependent upon rainfall
• Potohar – the northern Punjab Province (5.51 million ha) reported to have 958 mini dams developed since 1970’s with a total investment of Rs. 6,198.669 million (56.35 million USD)
• Rain-fed agriculture share is not accounted in national GDP
• Long term investment: lesser impact
• Climate is changing, financial resources are scarce and population is increasing thus it is necessary to view this problem in “management” perspective
Rationale

What is the effect of changing climate in Potohar Region?
- Climate Variability in all 04 districts of Potohar
- Climate Change in Farmer’s Perspective

How farmers are adapting to climate change through Rainwater Harvesting Dams?
- Financial investment of Farmers for Climate Change Adaptation
- Farming activities driven by rainwater harvesting and their financial benefits

What are intangible benefits of rainwater harvesting?
- Long term impacts
- Environmental impacts
- Farming Employment

What are the gaps in complete adaptation of climate change through RWH Dams?
- Farmer’s actual needs (Subsidies + Knowledge)
The Study Area: Potohar

Total Population: 10 million
Rural Population: 6.0 Million
## Study Methodology

### Sources of Primary Data

- **Farmers**
- **Organizations:** PMD, PCRWR, Barani Agricultural Research Institute (BARI) and National Agricultural Research Centre (NARC), ABAD (Agency for Barani areas Development)

### Data Collection Method

- Farmers through Interviews (21 Farmers: Purposive)
- Costs (Farmer share, O&M) (Farmers and ABAD)
- Business activity (Farmers)

### Data Analysis Method

- **Cost Benefit Analysis** comprising of:
  - Benefit Cost Ration (BCR)
  - Return on Asset Managed (ROAM)
- **Cost Effectiveness** (Farmer’s response)

### Limitation of the Study

- Approaching a large number of farmer groups
- Farmer’s reluctance to reveal their actual income from farms
- Farmer’s time to participate in interviews
- Lack of flood and drought records in Potohar region
Analysis: Climate Anomaly Rawalpindi

Ref. to Baseline:
Kharif: (0.19) °C
Rabi: 3.77 °C rise

Ref. to Baseline:
Kharif: 5.52 mm/day
Rabi: 1.53 mm/day
Analysis: Climate Anomaly in Jhelum

Ref. to Baseline:
Kharif: (0.64) °C
Rabi: 1.06 °C rise

Ref. to Baseline:
Kharif: 0.98 mm/day
Rabi: 1.6 mm/day
Analysis: Climate Variations in Attock

Increase from Baseline:
Kharif: 1.05 °C rise
Rabi: (0.49)°C

Increase from Baseline:
Kharif: 16.29 mm
Rabi: 3.38 mm
Analysis: Climate Variations in Chakwal

Ref to Baseline:
Kharif: (0.8) °C
Rabi: (1.04) °C

Temperature Variations in Chakwal (2000-16)

Ref to Baseline:
Kharif: 0.42 mm
Rabi: 0.60 mm/day
(Going to increase further in 2017)
Value Assessment Construct

- Recoding/surveying farmer’s adaptation of public sector funded projects
- Farmers and climate needs to maximize the benefits
- Accounting for all costs
- Accounting for all benefits

- Benefit cost analysis
- Cost effectiveness analysis
- Determine total value of adaptation
Farmer’s Perspective of Climate Change

<table>
<thead>
<tr>
<th>Climate Change Impacts</th>
<th>No. of Reporting Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea of Climate change</td>
<td>11</td>
</tr>
<tr>
<td>Disturbed Rainfall frequency</td>
<td>13</td>
</tr>
<tr>
<td>Temperature rise</td>
<td>12</td>
</tr>
<tr>
<td>Monsoon shift</td>
<td>12</td>
</tr>
<tr>
<td>Drought</td>
<td>10</td>
</tr>
<tr>
<td>Wind and Hail event</td>
<td>6</td>
</tr>
<tr>
<td>Delay in Sowing</td>
<td>7</td>
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<tr>
<td>Loss of crop</td>
<td>4</td>
</tr>
<tr>
<td>Shift to cropping</td>
<td>5</td>
</tr>
</tbody>
</table>
Cost Benefit Balance of Farmers

- Small dams constructed during (2000-15)
- Benefit Cost ratio was calculated for 2-3 year old dams
- ROAM (Return on Asset Managed) was calculated for (5-17) year old dams
- No such thing like “Dam Life” applied to these structures
- Farmers continue to invest both “in kind” and in cash
Distribution of Economic Activities by Farmers

- Total land studied: 1098 Ha
- Rain-fed land shift to irrigated land: 343 Ha
- Land Covered by lakes: 100 ha
- Balance: Development of barren and marginal lands (meeting the balance)

Farming Activities through RWH (No. of Farmers)

- Fisheries: 13
- Orchard: 3
- Livestock: 12
- Fodder: 11
- Crop diversification: 8
- Water Selling: 7
Cost Effectiveness

Intangible Benefits, Cost Effectiveness

<table>
<thead>
<tr>
<th>Non monetary benefits</th>
<th>No. of Farmer Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought Mitigation</td>
<td>16</td>
</tr>
<tr>
<td>Flood Control</td>
<td>14</td>
</tr>
<tr>
<td>Improved Environment</td>
<td>10</td>
</tr>
<tr>
<td>Groundwater Recharge</td>
<td>3</td>
</tr>
<tr>
<td>Replication</td>
<td>5</td>
</tr>
</tbody>
</table>
Lessons Learnt

• Actual value and use pattern for harvested rainwater is yet to be realized
• Rainwater harvesting enables farmers to stay engaged in farming business preventing workforce migration
• There is a need to adopt to Innovative learning approaches for farmers to achieve higher degree of adaptation
• The existing rainwater harvesting dams need optimization rather than constructing new ones
• Farmers can be more efficient in water use if cost of their produce is justified
• Limited communication/coordination mechanism between progressive and reluctant farmers has affected regional progress as a whole
Glimpses of Farmer Operated Rainwater Harvesting Facilities
Glimpses of diverse Farming/Economic Activities
In Climate Change there lies an opportunity for Pakistan towards self-sufficiency and a future founded on their own knowledge resources …..

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