COMPARATIVE ASSESSMENT OF VARIOUS WATER APPLICATION METHODS FOR IMPROVING WATER PRODUCTIVITY DURING DRY SEASON AGRICULTURE

Contributed by
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PRESENTED BY
Bhesh Raj Thapa, IWMI
Study Area

- Six Intervention sites
  - 2- Saptari, Nepal
  - 2- West Bangal, India
  - 2- Madhubani, India
  - DSI4MTF funded by ACIAR

- Three Intervention sites
  - 1- Mellekh, Doti, Nepal
  - 1- Punebata, Doti, Nepal
  - 1- Kuti, Kailali, Nepal
  - DJB funded by USAID
Context

- Large gap in access to land
- Large proportion - Landless, tenant, smallholder and Marginalized
Context

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- Large proportion - Landless, tenant, smallholder and Marginalized

### Farmer Typology

<table>
<thead>
<tr>
<th></th>
<th>Mellekh</th>
<th>Punebata</th>
<th>Kutti</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH with land</td>
<td>95%</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>HH without land</td>
<td>7%</td>
<td>20%</td>
<td>5%</td>
</tr>
</tbody>
</table>

### Types of Land Ownership

<table>
<thead>
<tr>
<th></th>
<th>Kuti</th>
<th>Mellekh</th>
<th>Punebata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own</td>
<td>100%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Rented in</td>
<td>0.0%</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Rented out</td>
<td>0.0%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Unregistered</td>
<td>0%</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Context

- Large proportion of land fallow in winter and summer.
- STW and pump ownership skewed towards large farmers.

Cropping Pattern

- Kanakpatti
- Koiladi
- Bhagwatipur
- Mahuyai
- Dholaguri
- UC

Legend:
- Cultivated
- Fallow
Motivation

- Low cropping intensity
- Large gap in access to land and water
  - Poor, landless, marginalized and tenant farmers
- Knowledge gap in Ag. water management
- Access to Gov. and Non-Gov. Institution

Research Question?

- Can farmer’s behavior change through techno-social intervention?
- Which type of water application methods is more suitable for efficient management of both water and energy?
Technical Intervention (What we did)

- Installation of Solar pump, Sun flower pump, Diesel pump, Electric Pump
- Promotion of Micro irrigation techniques and methods (Sprinkler, Drip, Furrow)
- Rehabilitation of available earthen ponds (for conjunctive use and reuse)
Social/Institutional Intervention (What we did)

Approach

- Collective farming models
  - Pure collective
  - Partial collective
- Group formation and strengthening through
  - Regular meeting
  - Intervention planning
  - Regular savings
- Capacity building – trainings and exchange visits
- Stakeholder consultation and engagement (including landlord)
Why understanding of irrigation demand is important?

- How much water the plant needs for optimum growth (Critical)
- Matching Supply to demand = efficient use of the resource (both water and energy)
What data we are collecting?

- Weather data (ET, R, T)
- Pond water level data
- Weekly water level data
- Data is entered into the DSI Applet “Water Level Tool”
What data we are collecting?

- Channel Loss assessment
- Pipe loss assessment
- Drip and sprinkler uniformity test
- Furrow assessment test
- Diesel pump assessment
- Solar pump test
- Economic data collection
Cropping system/pattern/intensity

• **Year 2015 (Beginning of the project)**— No crops (Fallow Land)

• **Year 2016**

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>KP1F1</td>
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<td>KP1F2</td>
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<td>KP1F3</td>
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<tr>
<td>KP1F4</td>
<td></td>
<td></td>
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</tbody>
</table>

• **Year 2017**

  | KP1F1| Egg plant | Cow pea | Tomato |
  | KP1F2| Egg plant | Cow pea | Cauliflower |
  | KP1F3| Egg plant | Zucchini | Egg plant |
  | KP1F4| Tomato    | Zucchini | Tomato    |

• **Similar situation in rest of the intervention sites**

• **Significant improvement in cropping system/pattern/intensity**

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May 2-4, 2018, Kathmandu, Nepal
Change in Farmer’s behaviour

- Improved vegetable production
- Shifted irrigation methods
- Perception/Choice for
  - Crop selection
  - Irrigation method selection
  - Farming approach (shifted towards collective/semi collective)
- Regular communication with all the stakeholders
# Conveyance Loss Assessments

What we have found??

<table>
<thead>
<tr>
<th>Location</th>
<th>Discharge at the pump (L/s)</th>
<th>Discharge after 100m of channel (L/s)</th>
<th>Discharge after 100m of 3” pipe (L/s)</th>
<th>Conveyance loss (L/s) Or reduced flow</th>
<th>Conveyance Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>5.7</td>
<td>3.0</td>
<td>2.7</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>5.7</td>
<td>5.1</td>
<td>0.6</td>
<td>89%</td>
<td></td>
</tr>
</tbody>
</table>

Channel losses are significant volume of water pumped
### Irrigation Efficiency

#### Field Application Efficiency

<table>
<thead>
<tr>
<th>Combination</th>
<th>Drip</th>
<th>Furrow</th>
<th>Sprinkler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drip</td>
<td>91%</td>
<td>57%</td>
<td>87.4%</td>
</tr>
<tr>
<td>Furrow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sprinkler</td>
<td></td>
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</tr>
</tbody>
</table>

#### Irrigation Efficiency

- **About 63% water can be saved for same quantity of water using drip in comparison with Furrow**

- **Earthen Canal + Furrow:** 32.49%
- **Pipe + Furrow:** 49.59%
- **Pipe + Drip kit:** 79.17%
- **Sprinkler:** 87.4%

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**Irrigation Efficiency**

- Drip and furrow assessment for same plot (KH1F7): egg plant crop
  - Length: 20
  - Breadth: 13
  - No. of laterals: 26
  - R/R: 0.8
  - Total length of lateral: 338
  - No of emitter 40cm/cc: 482.8571429
  - P/P: 0.7
  - Depth of irrigation if applied same qty water as in furrow
    - Volume: 5656
    - Area of irrigation: 94.78875 plants/emitter
    - Depth of water: 59.66952829 mm
    - Depth of water by furrow: 21.75384615 mm
    - Water saved: 37.91568214 mm
    - Volume required to reached: 59.66952829 mm
    - 15514.0736 ltr
    - Saved water: 9858.077356 ltr
    - 63.54278846 %

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8th ASIAN REGIONAL CONFERENCE
May 2-4, 2018, Kathmandu, Nepal
Crop Productivity

Production (Kg/mm) of irrigation

- It gives suitable crop list for farming with effective use of water

Production (Kg/Kattha) in Saptari, Nepal

We have found:

- Crop Productivity
  - Production (Kg/mm) of irrigation
  - Suitable crop list for farming with effective use of water
Crop Productivity

- It gives suitable seasonal crop, which may provide higher gross margin

What we have found??

Average gross margin by crop type

- Cauliflower
- Chilli
- Cowpea
- Cucumber
- Eggplant (brinjal)
- Gourd (bitter)
- Gourd (luffa)
- Gourd (sponge)
- Lady finger (okra)
- Lentil
- Moong
- Onion
- Peas
- Potato
- Radish
- Spinach
- Tomato

May 2-4, 2018, Kathmandu, Nepal
What we are planning??

- Recommendation of suitable farming approach based on the lesson learnt from different geographical and cultural settings
- Identification of best suited crops for efficient use of water to improve the water productivity for dry season agriculture
- Estimation of water productivity/unit of water in different water application method
- Disseminate the findings to farmers in understandable format, which will help them to change their behavior
THANK YOU FOR YOUR KIND ATTENTION

COMMENTS AND SUGGESTION PLEASE......