TD609: FIELD STAY AT MENDHI, SINNAR

By
Manasi Bhopale (173350010) Himali Mhatre(173350022)
Under the guidance of Prof. Milind Sohoni

Host NGO:
Yuva Mitra, Sinnar

CTARA, IIT Bombay
## Contents

| Scheme Analysis | 1. Pradhan Mantri Awas Yojana-Gramin  
<table>
<thead>
<tr>
<th></th>
<th>2. Swachh Bharat Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DR1</strong></td>
<td>• Analysis of the operation of Kadwa and Nandurmadhyameshwar canal minors and water user association</td>
</tr>
<tr>
<td><strong>DR2</strong></td>
<td>• Analysis of energy consumption based on crop water requirement</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
</tr>
</tbody>
</table>
Village Profile
Demographics

- Sex ratio = 961
- Child sex ratio = 932
- SC population = 5%
- ST population = 12%
- Workforce participation = 59%
- Male workforce participation = 59.57%
- Female workforce participation = 59.83%

<table>
<thead>
<tr>
<th></th>
<th>Main Male</th>
<th>Main Female</th>
<th>Marginal Male</th>
<th>Marginal Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivators</td>
<td>274</td>
<td>249</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Agri Labourers</td>
<td>70</td>
<td>87</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Household industry</td>
<td>16</td>
<td>15</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>27</td>
<td>6</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>744</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Method

Village Research

Primary data
- Participatory rural appraisal
- Household surveys
- Farmer surveys

Secondary data
- Grampanchayat
- Talathi office
- Schools
- Irrigation office
- Panchayat Samiti
- Substation
Daily Activity Clock

Fill water - During night shift of agriculture feeder supply
Timeline

1940
40 deaths in 10 days

1950
First school in Mendhi

1960
First ST BUS
Drought
Stone roads and Bandharas
First Tractor

1970
ELECTRICITY

1980
OUT MIGRATION
Rohini WUC

1990
Jaihind Sanstha & Bachat Gats
Marathi School begins to shut down
Current drinking water well

2000
Village Birthday
Drip Irrigation

2010
English Medium School

2020
Sahara VMK
Problem Ranking

- **MEN**
  1. Roads across the village
  2. Access to medical facilities
  3. Access and quality of education
  4. Quality of Drinking Water
  5. Electricity
  6. Connectivity to government offices

- **WOMEN**
  1. Access and quality of education
  2. Uncertainty of market price for crops
  3. Continuous Workload
  4. Safety of women
  5. Access to Toilets
  6. Access to medical facilities
Education

- Literacy
- Anganwadi
- Primary School
- Secondary
- Public Vs Private School

Literacy Rate

<table>
<thead>
<tr>
<th>Source: Census 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
</tr>
<tr>
<td>0.00%</td>
</tr>
<tr>
<td>20.00%</td>
</tr>
<tr>
<td>40.00%</td>
</tr>
<tr>
<td>60.00%</td>
</tr>
<tr>
<td>80.00%</td>
</tr>
</tbody>
</table>

Education profile

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uneducated</td>
</tr>
<tr>
<td>10%</td>
</tr>
</tbody>
</table>

Source: Household Surveys
Apart from these 8% of cropped area is covered by sugarcane and 2% by fruits.

Source: Agriculture office, sinnar
Water Resources

Water resources

Drinking water

Drinking water

Kadwa canal

Ground water

Canals

Groundwater

Rainwater Harvesting

Percolation Tanks
Drinking water

MJP Scheme

- Beneficiaries: Vadangali and 13 other villages
- Source: Kadwa Canal
- Filtration plant: Keertangali
- Quality of water

Drinking water scenario in village

- Houses in gaothan
- Houses in farms
Energy

Cooking Energy Sources

- Firewood: 8%
- Firewood+LPG: 1%
- LPG: 73%
- LPG+Electricity: 1%
- LPG+Biogas: 1%

LPG Cylinder Consumption Pattern

- 1-2 months: 52%
- 3-5 months: 43%
- 6 months: 4%

Access to sources
- Firewood: Nearby Farms
- LPG: Gas agency at Vadangali
**Energy**

**Status of Electrification**

- 72% Electrified households
- 19% Non-electrified households
- 9% Using electricity by hooking

**Energy Consumption**

- 39% Fan
- 28% TV
- 20% Refrigerator
- 7% LED
- 5% CFL
- 1% Tubelight
- 1% Mixer

Source: Household surveys
Solar Electrification of VMK

**SIZING**

- **Assumptions:**
  1. Average units generated per day = 5kWh
  2. Battery efficiency = 85%
  3. Depth of Discharge= 65%
  4. Battery storage not required for motor loads

- Panel Size: 8 kW
- Battery size: 47.33 kWh

**FINANCIALS**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Without subsidy</td>
<td>Rs.480000</td>
</tr>
<tr>
<td>With subsidy of 30%</td>
<td>Rs.336000</td>
</tr>
<tr>
<td>Savings annually</td>
<td>Rs.92614.86</td>
</tr>
<tr>
<td>Payback period</td>
<td>3.6 years</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Committee</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Water supply committee</td>
</tr>
<tr>
<td>2</td>
<td>Jay Bhavani Water User Association</td>
</tr>
<tr>
<td>3</td>
<td>Rohini Water User Co-operative</td>
</tr>
</tbody>
</table>
## Swachh Bharat Mission

### Additional expenditure in construction of toilets

| Source: Household surveys of 21 of the 80 beneficiaries |
| No of beneficiaries |
| 0-2000 |

### SBA beneficiaries

- **96%** APL
- **4%** BPL

<table>
<thead>
<tr>
<th>Panchayat Samiti</th>
<th>Gram Panchayat</th>
</tr>
</thead>
<tbody>
<tr>
<td>129</td>
<td>80</td>
</tr>
</tbody>
</table>

**Source:** Gram Panchayat
PMAY-G Beneficiaries 2016-17

- General: 67%
- SC: 22%
- ST: 11%

Type of houses

- Kaccha houses: 70%
- Half pucca: 17%
- Pucca houses: 13%

Eligible Beneficiaries: 27
Houses constructed: 10
Directed Research I: Analysis of the operation of Kadwa and Nandurmadhmeshwar canal minors and water user association
1) Kadwa canal
   • Distributary no. 3 of the canal with 3 minors in the village.
2) Nandurmadhmeshwar canal
   • Passes through the village
   • LIS by Rohini WUC

Jay Bhavani WUA is responsible for 2 minors and the distributary in its area. Rohini WUC is responsible for 1 minor, the distributary in its area and the LIS.
Total area under Jay Bhavani WUA = 648 acres

Area irrigated by Jay Bhavani WUA = 173 acres
Direct outlets:
Distributary: 14 (Functional: 9)
Minor 1: 0
Minor 2: 7 (Functional: 3)
Minor 3: 3 (Functional: 0)

Fallout structure
Distributary: 4
Minor 1: 0
Minor 2: 3 (Side wall broken: 1)
Minor 3: 0

Purpani structure
The purpani structures were a part of the old British lift irrigation scheme on Dev river. The same canal system has been rehabilitated in the Kadwa system and is used to collect rain water and avoid clogging of fields.
CTF:
1) Distributary enters Mendhi
2) Minor 2
3) Distributary enters Rohini WUC
4) Minor 3
As we can see, minor 1 does not have a CFT constructed on it. Technical design characteristics reflect the social differentiation.

The CTF on minor 2 has not followed the basic requirement that the canal should not turn

Distributary no. 3:
The distributary is 2.5 m- 3 m wide and 1 m deep.

Minor:
The minor is 1 m wide and 0.5 m deep.

Field channels:
The field channels were 0.5 m wide and 0.4 m deep
Rohini WUC:

Area irrigated: 32 acres
No. of rotations: 6 in a year
Permission to lift water in Kharif and Rabbi

- Well with a concrete pipe connecting to canal.
- Two 25 HP motors pump water to the main chamber.
- Water goes by gravity to the 3 sub chambers.

Area irrigated by Rohini WUC: 32 acres
1) Well:
Well next to the canal which is connected to the canal by a concrete pipe of 50 cm diameter

2) Main-chambers:
The main chamber has three gates and 3 pipes of 30 cm diameter each which carries the water to the three sub-chambers.

3) Sub-chambers:
Three gates for field channels. None of these sub-chambers have functioning field channels. Concrete pipes of 30 cm diameter connect the main chamber to the sub-chambers.
• The identified irrigable command area by the irrigation department.
• We can see that the area intended to be irrigated and the area being irrigated is very different.
These were the forms submitted at the irrigation office for kharif rotation.

We can again see that the farms irrigated and the forms submitted do not match for the farms outside Jay Bhavani WUA.
• These were the forms submitted at the irrigation office for rabbi rotation.
• While harbhara is named as the primary crop, many of these farmers have sown sugarcane or wheat
Based on the Waghad model, we calculated the amount of time each farmer should get water for each kharif rotation.

We calculated the amount of time on each of the minors.
Directed Research 2: Analysis of energy consumption based on crop water requirement
Feeder Level Consumption

Energy consumption and rainfall comparison

Assumptions:
- Technical losses = 15%
- Pump efficiency = 30%
- No of hours of usage = 4 hours
**Transformer level**

<table>
<thead>
<tr>
<th>Water required according to crop requirement</th>
<th>Water consumed according to energy consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>679751.5 m³</td>
<td>258950 m³</td>
</tr>
<tr>
<td>679751.5 m³</td>
<td>258950 m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demand</th>
<th>Total Kharif Protective Water Req. (TCM)</th>
<th>76.38</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rabi crop water Req. (TCM)</td>
<td>182.5</td>
</tr>
<tr>
<td></td>
<td>Irrigation requirement (TCM)</td>
<td>258.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
Farmer 1 water consumption

Cropping pattern

- Maize: 16%
- Onion: 5%
- Wheat: 5%
- Pomegranate: 5%
- Sugarcane: 26%
- Apple bore: 42%

Energy consumption at farmer level

- Water required = 65155.92 m³
- Water required = 51760 m³

For area of 23 acres
Farmer 2 water consumption

- Cropping pattern: 20 acres of pomegranate orchard

Energy consumption for pomegranate orchard

<table>
<thead>
<tr>
<th>Water required according to crop requirement</th>
<th>Water consumed according to energy consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water required according to crop requirement</td>
<td>Water consumed according to energy consumption</td>
</tr>
<tr>
<td>68175.3 m³</td>
<td>81490 m³</td>
</tr>
</tbody>
</table>

Demand

| Total Kharif Protective Water Req. (TCM) | 12.84 |
| Rabi crop water Req. (TCM) | 68.65 |
| Irrigation required (TCM) | 81.49 |
### Water consumption

<table>
<thead>
<tr>
<th>Water consumption</th>
<th>Estimated using energy (m^3)</th>
<th>Estimated using crop water requirement (m^3)</th>
<th>Ratio of water estimated using energy to crop water requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Level</td>
<td>24130504.95</td>
<td>2123000</td>
<td>11.36</td>
</tr>
<tr>
<td>Transformer Level</td>
<td>679751.5</td>
<td>258950</td>
<td>2.62</td>
</tr>
<tr>
<td>Farmer 1 (Mixed Cropping)</td>
<td>65155.92</td>
<td>51760</td>
<td>1.25</td>
</tr>
<tr>
<td>Farmer 2 (Pomegranate orchard)</td>
<td>68175.3</td>
<td>81490</td>
<td>0.84</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water consumption</th>
<th>Estimated using energy (m^3)</th>
<th>Estimated using crop water requirement (m^3)</th>
<th>Ratio of water estimated using energy to crop water requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Level</td>
<td>24130504.95</td>
<td>2123000</td>
<td>11.36</td>
</tr>
<tr>
<td>Transformer Level</td>
<td>679751.5</td>
<td>258950</td>
<td>2.62</td>
</tr>
<tr>
<td>Farmer 1 (Mixed Cropping)</td>
<td>65155.92</td>
<td>51760</td>
<td>1.25</td>
</tr>
<tr>
<td>Farmer 2 (Pomegranate orchard)</td>
<td>68175.3</td>
<td>81490</td>
<td>0.84</td>
</tr>
</tbody>
</table>

**DR2-Summary**

- Is decreasing from feeder to transformer to individual farmer level
- Water requirement as per crops
- Dependence on other water resources
- Dependence on other water resources
### Summary

<table>
<thead>
<tr>
<th>Village Research</th>
<th>• Overall scenario in village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sectors</td>
<td>• Analysis of sectors using primary and secondary data</td>
</tr>
<tr>
<td>DR 1 : Working of canals and WUA</td>
<td>• Operation of Kadwa, Nandur madhyameshwar and WUA</td>
</tr>
<tr>
<td>DR2 : Water requirement for agriculture</td>
<td>• On feeder level the energy consumed is greater than the estimated crop water requirement</td>
</tr>
</tbody>
</table>
THANK YOU!
## DR2-Feeder level calculation (energy based)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total energy consumed annually (kWh) =</td>
<td>3532400</td>
</tr>
<tr>
<td>Area under irrigation (sq.m)</td>
<td>7662678.94</td>
</tr>
<tr>
<td>Energy per unit area</td>
<td>0.4609876</td>
</tr>
<tr>
<td>Considering 15% technical losses energy supplied</td>
<td>0.39183946</td>
</tr>
<tr>
<td>Considering 30% efficiency of the pump, energy delivered to the pump</td>
<td>0.11755184</td>
</tr>
<tr>
<td>Pressure head (m³/sec)</td>
<td>196200</td>
</tr>
<tr>
<td>Flow rate</td>
<td>5.9914E-07</td>
</tr>
<tr>
<td>Water requirement per day mm/day</td>
<td>66110.9725</td>
</tr>
<tr>
<td>Water requirement per day m³</td>
<td>24130505</td>
</tr>
</tbody>
</table>
DR2- calculation (crop water based)

- https://drive.google.com/drive/folders/1IobO_aP4meApBJ5A1ZN_bq9L4MT-rpI3?usp=sharing_eip&ts=5aec0f9d