PROTEIN - Program to Revitalize Overall health of Tribals by Ensuring the Intake of Nutritious food products

Sourcing nutritious food to tackle malnourishment

Pathardi Village, Palghar District, Maharashtra
Pathardi is the remote tribal village in Mokhada block of Palghar district, Maharashtra, India with partial electric supply.

Malnutrition is highly prevalent due to poor access to nutritious food, lack of food diversity and poor economic status of the people.

Accessibility, quality and quantity of water is also a great challenge especially during dry summer months.

Women daily fetch more than 80 liters of water per family from an average distance of 1.5 km, thus suffering from immense physical stress.

Scarcity of water and stress discourages them to cultivate vegetables in their backyard for self-consumption.

This is one of the major reasons of severe malnourishment.
Significance of the project

- TERI’s ongoing project at Pathardi village aims at sourcing nutritious food to tackle malnutrition through use of available natural resources and processed grey water.
- Providing water as a key resource was of great relevance for cultivating vegetables round the year for self-consumption.
- Provision of local fresh food is expected to greatly help circumvent issues of malnourishment.
Focus of the project

Objectives:

- To make villagers/farmers independent and self-sufficient for the production of nutritious food.
- To make water available through conserving and maintaining a natural wetland to improve the water table of the area.
- To treat grey water to grow healthy, nutritious food in the backyard/kitchen garden.
- To establish and explore market linkages for nutritious products.
Awareness workshops

- **Approach 1:** Promotion of Nutri-Gardens
  - Awareness workshops and capacity building of stakeholders, especially women, anganwadi workers, and SHG members were carried out.

- **Approach 2:** Health Check up camps:
  - Health check up camp helped in analyzing the micro-nutrient deficiency within the children and women.
  - Accordingly, nutrition supplements were provided as an immediate source to improve their health status.

Above: Awareness workshops with SHG and aanganwadi members
Below: Gram Sabha to seek their participation in the program
Capacity building to make villagers self-sufficient to grow nutritious food

- **Approach 1: Competition on ‘Wholesome Nutri-garden’**
  - To encourage to grow variety of veggies in the backyard/ nutri-gardens through distribution of seeds
  - To generate awareness at village level about simple methods of irrigation and organic fertilizers
  - To encourage and make use of organic fertilizers by preparing an organic pit in the backyard

Seed distribution to the participating SHG members
Capacity building to make villagers self-sufficient to grow nutritious food

- 12 women enthusiastically cultivated a variety of vegetables including brinjal, spinach, okra, fenugreek and beans.
- Along with this, water conservation practices like bottle drip irrigation and reusing grey-water for irrigating plants was carried out effectively in their home gardens.

Nutri-gardens developed by the participants
Capacity building to make villagers self-sufficient to grow nutritious food

The criteria of selecting the winners was based on that and the variety of vegetables and fruits planted, along with the conservation practices undertaken at the individual level.

The awards were given by the hands of Mr. Nighojkar and Mr. Bhattacharjee from GKN Sinter Metals Pvt. Ltd.

Three winners were selected and were awarded with a ‘Smokeless Chulha’

Other participants were given with consolation prizes to appreciate their efforts and encourage them to continue such practices for the wellbeing of their family.
Fruit and Energy tree plantation, Afforestation activity

- Large scale plantation of fruit trees including Mango, Cashewnut, Jackfruit, Papaya, Custard Apple and Amla, was carried to ensure a long-term supply of seasonal as well as economically important fruits.

- Energy plantation was carried out with an objective to reduce the dependence of forest for fuel wood. Bamboo and acacia tree sapling were encouraged for plantation activity.

- Plantation of native tree species like Neem, Saag and Arjun was undertaken as an afforestation activity on the community land.
Capacity building of the youth of the village

- To introduce villagers/ farmers to new and improved agricultural practices

- The participants were given a structured training on “General Greenhouse Management” at Horticulture Training Centre, Talegaon.

- 3 youths participated for the training workshop

- The training exposed them to different types of farming practices other than traditional/ rain fed agriculture.

- Better understanding of Poly-house and Shade-net technique of cultivating vegetables

- Sale & market demands for organically cultivated vegetables
Salient Observations

- The women and youth were encouraged to take up cultivation of vegetables due to the competitive environment created through various activities.
- The villagers realized the significance of growing their own food through capacity building workshops and training programs.
- However, acute water shortage was a big challenge in scaling up the activity of promoting nutri-gardens.

* It was very important to provide immediate solution to make water available for local vegetable cultivation.
Approach 1. Analysis of the grey water generated

- Survey of households to assess availability of grey water

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantity per household (4 members) (Litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking and drinking</td>
<td>30-40</td>
</tr>
<tr>
<td>Bathing</td>
<td>70-80</td>
</tr>
<tr>
<td>Washing cloths and utensils</td>
<td>20-30</td>
</tr>
<tr>
<td>Cleaning the flooring and other applications</td>
<td>20</td>
</tr>
<tr>
<td>Cultivation of Nutri-gardens</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>125-160</td>
</tr>
</tbody>
</table>

Daily requirement of the water per household

- As observed from the table, around 60-80 litres of grey water could be recycled through some simple treatment methods and villagers may reutilize it for irrigation of kitchen gardens.
Demonstration and installation of the grey water treatment system

Objective
To train and build capabilities of village youth for better understanding of the process of treating grey-water and its applications.

Impacts
- Around 10 youths were trained to install grey water treatment systems at household level.
- 7 grey water treatment systems have been installed in Pathardi village.
- Created a livelihood option
Construction of Man-made Wetland to recycle grey water

The concept of Manmade-wetland was introduced effectively through installation of grey-water treatment system at household level.

Achieved benefits:
- Making water available for growing veggies even during the dry season.
- Provide water for secondary purposes.
- Minimize the trips of fetching water for secondary purposes.
- The requirement of fetching water was reduced by 40%.

Women in the village walk long distances to fetch water.

Food grown in the backyard - A sustainable initiative.
Feedback of the end users

The impact of the pilot grey water treatment unit installed at household level for irrigating nutri-gardens was assessed through interaction and video recording.

The very first system was installed at Ms. Heerabai Bendkule’s house.

She was pleased to inform that she doesn’t have to carry the load of water for watering plants and irrigating her nutri-garden.

She was also happy to inform that the availability of water at the door step has now made it possible to cultivate veggies even in dry period of the year.

TERI employees recorded the feedback of the end users. The video is recorded in the local language that is Marathi. Following is the link to access the same.
Visit to Natural Wetlands in the village

- A visit was arranged to assess the status of the natural and only water sources comprising of one pond and two wells in the village.

- It was observed that holding ponds and wells become dry in the early summer days leading to water scarcity for about 3 months until the onset of the monsoon.

Holding pond in the village

Wells during monsoon

Early drying of the wells

During Monsoon  →  During Summers
Portability test of well water

According to the survey carried out by TERI, it was reported that poor sanitation and un-hygienic practices lead to water borne diseases like dysentery and diarrhea which further leads to malnourishment.

Thus, water quality analysis of the two well was carried out to check the portability of the water used for drinking.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Parameters</th>
<th>Well 1</th>
<th>Well 2</th>
<th>Upper Permissible limit (IS 10500:1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>5.89</td>
<td>6.40</td>
<td>6.5 – 8.5</td>
</tr>
<tr>
<td>2</td>
<td>Electronic Conductivity</td>
<td>235.4</td>
<td>202.6</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Turbidity</td>
<td>14.08</td>
<td>4.91</td>
<td>10 NTU</td>
</tr>
<tr>
<td>4</td>
<td>Suspended Solids</td>
<td>10</td>
<td>11</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>TDS</td>
<td>143</td>
<td>134</td>
<td>500mg/l</td>
</tr>
<tr>
<td>6</td>
<td>TS</td>
<td>304</td>
<td>300</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>Acidity</td>
<td>&lt;5.1</td>
<td>NIL</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>Alkalinity</td>
<td>115.20</td>
<td>86.40</td>
<td>200mg/l</td>
</tr>
<tr>
<td>9</td>
<td>Chlorides</td>
<td>25.95</td>
<td>64.87</td>
<td>250mg/l</td>
</tr>
<tr>
<td>10</td>
<td>Fecal coliform</td>
<td>23</td>
<td>23</td>
<td>10per 100ml</td>
</tr>
<tr>
<td></td>
<td>E Coli</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>11</td>
<td>Sulphate</td>
<td>103.24</td>
<td>108.76</td>
<td>200mg/l</td>
</tr>
<tr>
<td>12</td>
<td>Phosphate</td>
<td>1.138</td>
<td>1.055</td>
<td>--</td>
</tr>
<tr>
<td>13</td>
<td>Total hardness</td>
<td>114</td>
<td>57</td>
<td>300mg/l</td>
</tr>
<tr>
<td>14</td>
<td>Nitrite</td>
<td>0.173</td>
<td>0.178</td>
<td>--</td>
</tr>
<tr>
<td>15</td>
<td>Nitrate</td>
<td>0.515</td>
<td>0.522</td>
<td>45mg/l</td>
</tr>
</tbody>
</table>

The water quality of both the wells are within the permissible limit, except for Total coliforms.

The presence of E. Coli is twice the permissible limit.

This could be due to poor maintenance or intrusion of sewage water into the wells.
Hydrogeological investigation of the pond was carried out at the site in order to ascertain the hydro-geology located at Village Pathardi.

The study further helped to determine the action plan to conserve the natural pond in the vicinity of the village. The study results are as follows:

**Geology of the area**

- Major formation is basalt.
- Secondary porosity is developed due to fracturing.
- Thin soil cover (1m thickness).

**Groundwater status of the area**

- Groundwater occurs in the pore space of basalt.
- Presence of confined & semi confined aquifer.
- The groundwater is mainly recharged due to precipitation and seepages.

**The location of the water table**

- Location was identified through Electrical Resistivity Tests (ERT).
- Water table is identified at the depth of 100-120 m.
Hydrogeological investigation of the pond

Electrical Resistivity Tests were carried out in order to identify locations for groundwater table at Pathardi.
A participatory activity to conserve natural wetlands

**Objective**
- To de-silt the dry pond to increase its water holding capacity.

**Benefits**
- Enhance collection of surface runoff
- Recharge groundwater table
- Avoiding early drying of wells due to holding pond.

**Impact**
- Around 25 women offered ‘shramadan’ (help) for silt removal. De-siltation of up to 4ft was further carried out by deploying additional mechanical devices
- This has enhanced the water holding capacity of the pond by 30%
**Objective**
- To get a baseline of the health status of the target population i.e. children and women
- To analyze the prevailing micronutrient deficiency or any other water related problem

**Update**
- A health check up camp with the help of “Thyrocare technologies” was organized in the village on December 21, 2015.
- The participants were:
  - Children between age 2 to 12 years
  - Women below age 40
- The baseline report would help in devising the further strategies of promoting nutri-gardens.
The major deficiency observed is:
- Vitamin D
- Iron

Both are interdependent as Vitamin D helps in enhancing intestinal absorption of calcium, iron, magnesium, phosphate, and zinc.

Health check up camp at Pathardi

Health check of school student between age 9 to 12 years
Results: Vitamin D and Iron Deficiency

Percentage distribution of status of Vitamin D across all samples

- Due to a fixed diet pattern which lacks in diversity in the diet leads to deficiency of certain important micro-nutrients
- Other reason could be impaired absorption of the nutrients, increased requirement, or increased excretion.
**Recommendations**

**Iron**

- TERI vouch for consumption of green leafy vegetables which would be locally cultivated.

- Thus, to encourage and increase the consumption of the green leafy vegetables, TERI provided them with the seeds and saplings of plants mentioned in the table below.

<table>
<thead>
<tr>
<th>Vegetable per 100 gm</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Moringa oleifera</em>, raw leaves</td>
<td>4</td>
</tr>
<tr>
<td><em>Beta vulgaris</em>, tender leaves</td>
<td>3.57</td>
</tr>
<tr>
<td><em>Amaranthus purple</em>, cooked leaves</td>
<td>3</td>
</tr>
<tr>
<td><em>Colocasia esculenta</em>, steamed leaves</td>
<td>1.7</td>
</tr>
<tr>
<td><em>Basella alba</em>, cooked</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Dr. Anjali explaining the status and implications of iron deficiency
Highly nutritious locally available leafy vegetables rich in iron

- **Moringa oleifera** (Shevga chi pane)
- **Basella alba** (Mayalu)
- **Amaranthus purple** (Laal Math)
- **Beta vulgaris** (Beet leaves)
- **Colocasia esculenta** (Allu chi pane)
**Recommendations**

- **Vitamin D**
  - Dry mushroom powder was introduced to the villagers
  - Facts: *Mushroom is the only vegetarian source of Vitamin D*
  - A workshop was conducted to elaborate its use in daily cooking practices and its health benefits
  - Mushroom cultivation workshop was carried out to encourage growing and consuming mushrooms at the household level

- **Benefit**
  - It is Rich in vitamin D and Protein
  - It was easily accepted by the children

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- Drumstick with mushroom powder as an ingredient prepared by locals
- Distribution healthy recipe book
Summary

TERI strategically aimed at tackling malnutrition at the local level by-

- Promoting and implementing nutri-gardens as a sustainable source of nutritious food
- Reusing grey water for developing nutri-gardens/kitchen gardens at the house-hold level.
- Conserving natural pond to collect surface run-off and provide water for various purposes in the future.
- Organizing “World Wetlands Day” to enhance overall understanding of conserving and creating wetlands for water and food.
Discussions and constraints during implementation of the program

- The possibility of drilling a bore-well has been explored but following were the physical constraints faced by TERI:
  - Terrain difficulties and the remote location of the village made it difficult for the bore-well drillers to arrange for a vehicle.
  - The possibility of failure of bore-well is high due poor water holding capacity of the aquifer. Thus, it is important to make a strategic plan for a recharge pit of the bore-well.
  - Grey-water treatment systems were installed only in 7 house-holds as other houses did not have properly constructed bathrooms in place.
Thank you

School children of Pathardi village and TERI representatives during the awareness workshop carried out on “World Wetlands Day”, 2nd February, 2016