EXPERIMENT 1  ROOF TOP WATER HARVESTING FROM A HOUSEHOLD

Structure

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1.2 Experiment
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1.0 OBJECTIVE

After completing this practical exercise, you should be able to calculate the volume of water harvested from individual household.

1.1 INTRODUCTION

Rainwater harvesting is the technique of collection of precious natural resource i.e. rainwater. The rainwater harvesting from roof of an individual house (Fig. 1.1) as well as cluster of houses can help in storing rainwater for its subsequent domestic use during lean season and recharging ground water in declining water table areas. The rainwater harvested on house roof is collected through rain pipe and stored in a tank or in ground water structure. In order to design water storage/ground water structure it is of utmost importance to estimate the volume of water in response to different intensities and duration of rainfall. This practical exercise will help the students to determine the volume of rainwater harvested from roof of a house or cluster of houses (Fig. 1.1).

1.2 EXPERIMENT

1.2.1 Principle

To collect and save every drop of precious rainwater before it is lost as runoff or evaporated back to atmosphere.
1.2.2 Requirements

- Rainfall data
- Measuring tape

1.2.3 Procedure

1) Collect rainfall depth data for a particular event.
2) Estimate effective rainfall by multiplying rainfall depth with coefficient $k$ generally value of $k = 0.8$.
3) Measure length and width of the roof of a house.
4) Calculate area of the house roof by multiplying length and width.
5) Calculate the volume of water harvested from individual household and cluster of households by multiplying effective rainfall with area of a household. Alternatively, volume of harvested water can be determined by using the following table:

**Ready Reckoner to Determine the Volume of Harvested Water from Roof Top**
(assuming value of coefficient $k = 0.8$)

<table>
<thead>
<tr>
<th>Rainfall, mm</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>800</th>
<th>1000</th>
<th>1200</th>
<th>1400</th>
<th>1600</th>
<th>1800</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof top area, m$^2$</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.6</td>
<td>3.2</td>
<td>4.8</td>
<td>6.4</td>
<td>8</td>
<td>9.6</td>
<td>12.8</td>
<td>16</td>
<td>19.2</td>
<td>22.4</td>
<td>25.6</td>
<td>28.8</td>
<td>32</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>32</td>
<td>40</td>
<td>48</td>
<td>56</td>
<td>64</td>
<td>72</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
<td>48</td>
<td>64</td>
<td>80</td>
<td>96</td>
<td>112</td>
<td>128</td>
<td>144</td>
<td>160</td>
</tr>
<tr>
<td>500</td>
<td>40</td>
<td>80</td>
<td>120</td>
<td>160</td>
<td>200</td>
<td>240</td>
<td>320</td>
<td>400</td>
<td>480</td>
<td>560</td>
<td>640</td>
<td>720</td>
<td>800</td>
</tr>
</tbody>
</table>

Source: Central Ground Water Board, Faridabad (Haryana - India)
1.3 OBSERVATIONS AND CALCULATIONS

Example

1) Effective rainfall (mm) = Rainfall (mm) \times 0.8

2) Roof area (m²) = Length (m) \times \text{width} (m)

3) Volume of rainfall (m³) = Effective rainfall (mm) \times \text{roof area} (m²)

Rainfall = 200 mm

Roof top area = 150 m²

Effective rainfall for water harvest = 200 mm \times 0.8

= 160 mm

Volume of rainwater harvested = \frac{160 \text{mm} \times 150 \text{m}^2}{1000}

= 24 m³

Depth of water harvested = \frac{24 \text{m}^3}{150 \text{m}^2}

= 0.16 m or 16 cm

Water harvested (% of rainfall) = \frac{16}{20} \times 100

= 80%

Exercise

<table>
<thead>
<tr>
<th>Rainfall depth, mm</th>
<th>Length of roof, m</th>
<th>Width of roof, m</th>
</tr>
</thead>
</table>

Rainfall

Roof top area

Effective rainfall for water harvest

Volume of rainwater harvested

Depth of water harvested

Water harvested (% of rainfall)

1.4 RESULTS

Depth of water harvested = ......................... mm

Water harvested (% of rainfall) = ......................... %