Contents
Chapter 1. Introduction – Water Security Plan ................................................................. 2
Chapter 2. Module 1: Gram Panchayat Information ...................................................... 5
Chapter 3. Module 2: Water Availability ..................................................................... 12
Chapter 4 - Module 3: Water Utilization ..................................................................... 22
4.1. Drinking & Domestic sub-module ........................................................................ 22
4.2. Irrigation water utilization/draft .......................................................................... 23
4.3 Industrial water utilization/draft .......................................................................... 25
4.4 Other uses utilization/draft .................................................................................. 25
Chapter 5. Module 4: Total Water Balance .................................................................. 28
Chapter 6. Module 5: Water Demand & Budget (projections) .................................... 30
  6.1 Domestic Water Budget ...................................................................................... 30
  6.2 Irrigation Water Budget ...................................................................................... 30
Chapter 7. Module 6: Water Security Plan .................................................................. 33
  7.1 Demand side interventions or Demand decrease plan ...................................... 33
  7.2 Supply side intervention measures or Supply increase plan ............................ 37
Annexure – 1 Step-wise registration process .............................................................. 39
Annexure 2 – Methods to estimate agriculture water demand .................................... 40
INTRODUCTION
Chapter 1. Introduction – Water Security Plan

The purpose of this User Manual is to outline procedure for the compilation of GP level WSP, along with description of various modules and sub-modules. User can be a member of State/District Project Management Unit (S/DPMU) personnel, staff of District Implementation Partner (DIP) or a member of GP of Water Management Committee (WMC).

There are six sub-modules in the WSP of the current Atal Jal MIS. The following are the steps to be followed to create the complete water security plan.

i) **GP Information module** – This module covers the complete GP related information like demographic profile, socio-economic profile, land use, land cover, power supply, local institutions, social organization, etc which will be discussed in greater detail in chapter 2.

ii) **Water Availability module** – This module is sub-divided into sections i) Total water available; ii) Groundwater available; iii) Surface water available which has been discussed in detail in chapter 3.

iii) **Water utilization/draft** – This module is further divided into four sub-modules i) Drinking/Domestic water utilization; ii) Irrigation water utilization; iii) Industrial water utilization & iv) Other uses (like recreational activities, etc) which has been discussed in detail in chapter 4.

iv) **Water Balance module** – This module further includes sub-modules like i) groundwater availability; ii) groundwater utilization/draft; and iii) groundwater balance; iv) water budget, which are discussed in greater details in chapter 5.

v) **Water Budget** – This module calculates the future water allocation of ground and surface water for domestic/drinking and irrigation sector. This has been discussed in chapter 6.
vi) **Water Security Plan module at GP level** – This module further contains sub-modules like i) Demand side intervention measures & ii) Supply side intervention measures. This has been discussed in chapter 7.

The step wise process of registration is provided in the Annexure – 1, which will guide the users in the state to login in the MIS and access the different modules.
Module 1:
Gram Panchayat Information
Chapter 2. Module 1: Gram Panchayat Information

<table>
<thead>
<tr>
<th>Steps</th>
<th>Tools/Methods</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>• GP related Information</td>
<td>• Data collection through primary and secondary sources</td>
<td>• Comprehensive GP profile/baseline data and participatory water management committee formed</td>
</tr>
<tr>
<td>• PGWM (Participatory Groundwater Management) Committee - Local Institutions</td>
<td>• Participatory (PRA, transect walk, FGDs)</td>
<td></td>
</tr>
<tr>
<td>• VWSC (Village Water &amp; Sanitation Committee)</td>
<td>• Capture: photos, date, time &amp; participation (social and gender segregated data)</td>
<td></td>
</tr>
<tr>
<td>• SHGs (Self Help Groups)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• WUAs (Water User Association)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The module 1 – Salient Features familiarizes the GP giving basic and crucial information for proceeding further on compilation of WSP. This module captures the basic GP information along with the details of PGWM committee working along with District Implementation Parties (DIPs); also captures training/workshops/transect walks, etc.

Sharing of the information compiled in Modules 2 to 4 of WSP is the first step in initiating the planning process at the community level. Following activities have to be completed on the road to preparation of community lead WSP:

- Generation of GP level data for all listed parameters in module 1 are shown in Figure 2.1
- Ensured availability of complete census of village/GP on household socio-economics, land use and water resources
- Facilitated discussions between different social and economic groups, farmers collectives, landless and women on the need to sustain groundwater levels
- This will sharpen the farmers’ ability to make critical and informed decisions on crop plans as well.
- Held ward/ habitation level consultations with community institution, WUAs, farmer’s collectives on need for developing water allocating water for different uses, based on the principle of equity
- Based on the ward and habitation level consultations prepared the aggregated GP level water budget.
- Shared the draft aggregated water budget with representatives of WUAs, farming community, agricultural laborers, pastoralists/ dairy farmers, landless, women members and other non-agri (industrial/ commercial) users of water for feedback and improvement.
• On the basis of finalized water budget, prepared a Draft GP Water Security Plan detailing the principles for allocating water for agricultural and nonagricultural purpose, between large and small holders, shifts in cropping pattern and acreage reduction required for conserving water.
• Listed out activities where landless families can be engaged in the short term.
• Held separate consultations with members of socially marginalized communities, smallholders, women’s groups, landless and agricultural laborers to seek their feedback and suggestions on the plan.
• Presented the detailed Plan to the Gram Sabha listing out a) specific benefits to be provided to smallholders b) benefits for the landless c) shifts in cropping pattern expected from large landholders.

Figure 1.1 gives a step-wise planning process that has to be followed as part of evolving a GP level Water Security Plan.

There are three sub-modules under this module viz., i) A GP related Information; ii) Participatory Groundwater Management committee (PGWM), a provision to add a table & documents showing people’s participation in conducted trainings, workshops meeting, workshop, training and other events; iii) Image upload sub-module, this module allows the user to upload the GP level administrative map, Aquifer map, Drainage map and Water shed map. These maps can be downloaded from Atal Jal webGIS application and uploaded in this module.

![Figure 1.1: The GP related information under module 1](image)

Figure 1.3 is an example of sub-module 2, which lists the Participatory Ground Water (PGWM) committee-based institutions, both formal and informal, whose active role in the planning process, lead to compilation of the Water Security Plan.
Figure 2.2: Community Based Institutions involved in preparation of WSP

The figure 1.4 is an example of sub-module 3 - UPLOAD MAPS. Different kind of maps like administrative maps, aquifer map, drainage or watershed maps can be uploaded here.

Figure 2.3: Maps upload section
2.1. Activities or methods that can be adopted while capturing water data at GP/Village level

2.1.1 Collection of general information / assessment

- Organize a general meeting with the local authorities to inform them of the assessment objectives and activities and request their support;
- Collect and review available secondary information sources where available;
- Identify key stakeholders and relevant projects and NGOs located in the area;
• Conduct an initial field visit, ideally before the focus group discussion (FGD) with the selected communities

2.1.2 Community Focus Group Discussion

The objective of the community focus group discussion (FGD) is to obtain information about the range of water users, their individual and communal management regimes and the history of the area.

**Water:**

- What changes (over the last 10-20 years?) have there been in the amount and quality of water resources in the study area? (e.g. trends in rainfall amounts and seasonal distribution; drying up of water points, changes in levels of water in wells and boreholes; changes in river/stream flow, changes in water quality (salinity, pollution)). Is water used for irrigation and where is it sourced (e.g. rainwater harvesting, streams/rivers or wells/boreholes)?
- What crops are irrigated, when (all the growing season or only during specific critical period) and by whom (few/most farmers; large/smallholders, public/private sector)?
- Do community members pay for water and under what circumstances?
- Has the study area experienced i) drought, ii) flooding or any other extreme weather event (e.g. intense storms) in the last 10 years? Is the frequency and severity normal or exceptional?
- What are the strategies and coping mechanisms adopted i) during drought or unusual dry years or ii) to reduce risk of flooding or iii) to reduce damage from wind/storms?
- What are the livestock management strategies and related problems in terms of degradation or related benefits in terms of sustainable land management? Strategies could include, for example, range enclosures, rotational grazing, ranching, stall fed animals, seasonal livestock movements (agropastoralism), permanent livestock movements (nomadic pastoralism), cattle grazing corridors, as well as relevant byelaws (e.g. relating to the control of livestock numbers or burning etc.)
• Are there any conflicts in relation to land and water uses in the area?

2.1.3 Study area mapping

Sketch mapping is used to provide a graphical representation of the study area, or the part of it relating to the community territory, from the perspective of community members (at least 4-5 members, male and female) who have participated in the community focus group discussion. This sketch map should be prepared by the land users (farmers, herders, forestry workers, state farm managers etc.) but other persons knowledgeable of the study area, such as extension workers or local authorities, could provide suggestions of other things that the land users should add to the map (taking care that they do not take over!).

The map should show and give relative locations of:

• Boundaries of the study area;
• Main areas for settlement, the roads and locations of markets and other services;
• Important land units differentiated by the community in terms of slope, quality of soils, vegetation, water resources etc. as well as by land use (cropping, orchards, grazing, forest, wetland, etc.) and management practices, etc.; water sources (natural and manmade) in the territory such as rivers, streams, lakes, ponds, wells, boreholes etc.;
• Types and locations (distances – either in km or estimated time to walk) of key resources located beyond the community boundaries but used by the community such as communal pastures and water sources;
• Areas suffering from land degradation (significant erosion features – sheet wash, rills, gullies, landslides, etc. and other significant areas/types of soil, vegetation and water degradation and any land use/management features they seem to be associated with (e.g. newly planted forest, recent logging, poorly developed (thin) forest stand, roads, water points, etc.).
• Areas of successful soil and water conservation/land degradation control / specific sustainable land management measures. Remember that the map should clearly show the legend/key for the different symbols used.
Module 2: Water Availability
Chapter 3. Module 2: Water Availability

The Module 2 – Water Availability gives an account of status of water resources. It contains 3 sub-modules viz., i) Total water available; ii) Groundwater available iii) Surface water available. The parameters of this module can be understood at the community level by the following training workshop module.

In the sub-module – Total water available, Rainfall and Evapotranspiration are two important parameters used in the estimation of the water resources of the GP. Evapotranspiration data is used in computing Actual Annual Evapo-transpiration (AAET) and used for estimating evapotranspiration losses.

The real-time evaporation data is not available; however, the data can be downloaded from the IndiaWRIS site, under Indian Space Research Organization (ISRO). The data is at the district level. State authorities are advised to identify reliable research institute/s, preferably operating under the Indian Council of Agriculture Research, whose research findings, especially the crop ET and crop irrigation requirement estimations are crucial input to WSP.

In this module, the total water availability is computed using the parameters shown in Figure 3.1. The total water available at GP level is calculated by adding total GW available (source-
Water security planning (WSP) Guidelines

GEC, 2017) after GW recharges minus total discharges and total surface water storages minus losses. All the computations are depicted clearly under ‘i’ information icons in WSP module.

\[ \text{Total GW available (Ha. m)} = \text{Total recharge from rainfall} + \text{Total recharge from other sources} - \text{losses due to natural discharges} \]

\[ \text{Total SW available (Ha. m)} = \text{Storage capacity of structures} - (\text{storage capacity structures X losses %}) \]

The data/information on number and total storage capacity of those structures has to come from the state. Total Storage Capacity of Water Harvesting Structure minus the losses (if any) becomes the quantum of surface water available for productive use. The total water available for utilization is the sum of GW available and total SW available. However, not all the surface water will be available unless harnessed through water harvesting structures and made available from future use. The surface water available by rainfall for future use is also computed in MIS by using following formula:

\[ \text{Utilizable rainfall runoff (Ha. m)} = \text{Rainfall available for future use X weighted average runoff coefficient (0.30)} \]
3.1. Community participation in the preparation of Water Security Plan

In order to engage the local community in acquiring the water resource information at the GP level the following activities or workshops should be conducted. These informative workshops can educate local people and enhance their interest for the support of Water Security Planning.
3.1.1. Hydrological unit area

Objective: To discuss about the Hydrological Unit Area
Rationale: To discuss about various types of resources, water inflow and water outflow by the members through a model.
Material Required: Mud heap, colours - Blue, Red, Green, Yellow, Water, and Mug.
Process:
   a) Give a shape of a model Hydrological Unit area to a heap of mud / soil portion of earth selected previously (rising and falling ground).
   b) Show streams, rivers of the Hydrological Unit area with blue colour, villages with red colour, trees, forests and fields with green colour, roads with yellow colour.
   c) The water poured on the elevated area flows down through various routes and ways and finally reaches the plain area.

Discuss with the members how a Hydrological Unit area looks like, water inflow, water outflow of the Hydrological Unit area.
A model of the Hydrological Unit area can be prepared as shown below and discuss about it.
Material Required: 12 mm Plywood (3 x 2 feet), Wood beading (10 feet), Plaster of Paris (10 kgs.), 1-inch Nails, 2-inch Nails, Packaging rope, Foot Rubber, Paints of different hues, HU Topo sheet, Paint, Brush, Carbon Paper.
Method of Preparation:
   a) Fix wood beading round the plywood board (3x2 feet) already readied. Fix plastic rubbers below.
   b) First place a carbon paper on the board, then put a HU map on it and identify borders or extent of the Hydrological Unit area, Rivulets or water courses, streams, lakes, ponds, roads, villages, rainfall recording centers and observational bores.
   c) Fix 2-inch Nails to identify the upper reaches and middle area of the Hydrological Unit area and lower or last area with 1-inch nails. Put a plastic rope around the nails.
   d) Apply Plaster of Paris paste on the board and make it smooth by hand or with a brush.
   e) Let it dry for an hour and apply white paint on it. Place a map of the Hydrological Unit area on the board after the white paint dries. Identify streams, rivulets, villages, rainfall recording centers, observational bore wells and roads, and apply different colours to all these landmarks.

Process:
The model of the Hydrological Unit area (villages, streams, rivulets, lakes, ponds and other water resources) prepared can be used to discuss about various issues or landmarks.
Ask the members to identify various landmarks and ask them to discuss among themselves.
3.1.2. Water inflow, water outflow in the hydrological unit area

Objective: Discussion about water outflow and water inflow into the Hydrological Unit area.

Rationale: The General belief is that the large percentage of the rain water that lashed earth would sink into the ground. But, only a fraction of it would sink and form as groundwater. The rest of the rain water is released into oceans through rivers. The following experiment will allow you to understand this concept.

How rain water reaches Hydrological Unit area? How a part of it absorbs into the ground? How it flows out of Hydrological Unit area?

Material Required:

a) 45 x 30 cm. Tray with a hole on one side
b) Polythene cover
c) Empty bottle
d) 4 liters water
e) Mud
f) Small pebbles, small twigs
g) Pin heads

Method of Preparation

a) Wet the mud with water
b) Prepare a model of the Hydrological Unit area by keeping a tray on the wet mud Put a hole to the tray towards slope portion Process:
c) Pour 2 liters of water in polythene cover and hold it on the tray at a height
d) Prick the polythene cover with pin head to show it as pouring of rain
e) The water that fall on the tray comes out of it through the slope

Advice: More water would come out of the tray if the mud is wetted more.

Discuss about water inflow, water outflow of the Hydrological Unit area by preparing the following module:

Material Required: Plastic tray, polythene cover, vessel to receive water, pinheads, mud, pebbles, and leaves.

Method of Preparation:

a) Fill the plastic tray upto the brim with wet mud. Create elevated areas and mountains with pebbles with slope.
b) Put leaves, twigs (Flora) in the mud to show it as Hydrological Unit area.
c) Show the origin of the stream at height, and the last area of the stream towards the slope of the tray.
d) The tray module prepared as a Hydrological Unit area model should be kept at height to the farmers to view from the distance also.
e) Prick the polythene cover filled with water, hold it on the tray to make fall as Rain on the Hydrological Unit area.
f) Pouring Rain Water (In Flow) will dampen the most part of the area, flows down the course and see that it comes out of the tray (Out Flow).
g) Explain to them that rain water received by the mountains and upper reaches of the area would enter rivers via rivulets and streams and finally merges into the seas (confluence).
3.1.3. Ground water

Objective: Creating awareness on Groundwater Recharge through rainfall in a Hydrological Unit

Zone of Aeration: Upper soil layers that hold both air and water.
Zone of Saturation: Lower soil layers where all spaces are filled with water.
Water Table: Top of zone of saturation.
Rationale: Generally, the rain water after a heavy down pour would reach lakes, ponds and canals. At the same time a portion of it will sink through the surface earth. Farmers would understand this phenomenon more easily by showing a model given below:


Method of Preparation:

a) Fix two rectangular shaped thermocool sheets one above the other with Fevicol.
b) Delineate Hydrological Unit area with the help of a toposheet kept of the thermocool sheet.
c) Cut the delineated Hydrological Unit area of the thermocool sheet with the help of a hexa blade.
d) Draw streams, rivulets, canals, ponds and lakes of the Hydrological Unit area on the lower thermocool sheet.
e) Remove the thermocool sheet along the lines drawn for indicating streams rivulets, lakes, ponds on the lower sheet.
f) Make small holes on lakes, ponds, streams and rivulets with a pin head.
g) Show the village and other important resources of the Hydrological Unit area with different colours.
h) Take a plastic cover and wrap around, below the thermocool sheet surface to prevent water leak.
i) Make a small hole at the mouth point and fix a plastic pipe to outside.

Process:

Pour water slowly like on artificial rain on the Hydrological Unit area of the model.

Some of the water will be retained by the lakes, ponds and the rest comes out of the plastic pipe at mouth point through streams and rivulets. Some water reaches down through the holes made by pin head.

Thus the part of rain water flows through streams and rivulets and crosses the boundary of Hydrological Unit area (Discuss with members about inflow, outflow).

Discuss also with the members about the recharge of rain water into the sub surface depends upon the rock types, nature of soil and also on the rocky layers inside our earth.

Groundwater recharge can also be discussed by using the following module.

Material Required: Thermocool sheets (02), colours, tape, paint brush Process:

Paste two thermocool sheets

Draw picture vessels, 100 in number by leaving 10 cm. spaces from the top.

Leave a 5 cm. space below the 100 vessels and draw pictures of land topography (Trees, Mountains, and Water). Draw 4 vessels below this.

Discuss with farmers that out of 100 vessels of water only 4 vessels of water will sink into the earth layers and 96 vessels water reach seas.

Thus, using this model it can be discussed that out of 100% of rain water only 4% would go down into earth layers and form as groundwater.


3.1.4. **Ground water recharge method**

*Objective:* Discuss about the way rain water seeps into the earth.

*Rationale:* Farmers generally believe that most of the rain water seeps into the earths but contrary to this popular belief most of the rain water reaches rivers through streams and rivulets. Explain farmers about the phenomenon that only part of rain water (1-12%) seeps into the earth by conducting on experiment. Materials Required: Sponge, water, glass

*Process:*

a) Take a dry sponge  
b) Pour 100 ml. of water on sponge like rainfall.  
c) Collect water into a glass by squeezing the sponge

Observe that less water is collected in the glass. Explain to farmers that entire rainfall will not seep into the earth, but it depends upon the rock layers of the area.

3.1.5. **Factors that influence groundwater recharge**

*Objective:* Discussion about the factors that influence the groundwater recharge.

*Rationale:* Entire water that reaches earth as rain water will not seep into the earth. There are various factors that influence groundwater recharge. Water holding capacity will change according to earth slope, rocky layers and type of the soil. The following experiment will be useful to the farmers to understand the factors that influence ground-water recharge.

*Materials Required:* Three plastic trays, two types of soil (Red soil, sand), Bucket full of water, Mug

*Process:*

a) Take three plastic trays (30 x 20 cm)  
b) Fill the two trays (fully) upto the brim with red soil  
c) Fill the third tray with sand and red soil mixed (1 : 1) in ratio  
d) Keep earth tray in a big tray respectively to collect water separately.  
e) Keep one of the two trays filled with red soil in a slope position, and other tray, tray with red soil + sand in horizontal position only.  
f) Pour 3 mugs of water with same speed into the trays  
g) Collect the water gathered in the three trays and measure their volume after two minutes  
h) Observe more water being collected in the tray in slope, less water in tray with red soil, very less water in tray with red soil with sand.

3.1.6. **EXPLANATION OF CUBIC METER**

*Objective:* Discussion about cubic metre

*Rationale:* As part of crop irrigation water plan farmer’s measure water in cubic meters. In order to make farmers to convert the cubic meters into litres, explain to them what is a cubic metre, how many litres a cubic metre makes, etc. through pictorial diagrams and models.
Materials Required: Picture of a cubic metre (1/4 metre 64 cubic metres), 1/4 metre cube model, 1 litre measuring cylinder, 1 vessel with water.

Process:

a) Chart should depict that length, width and height is 1 metre on all sides is a cubic metre.
b) there are 64 such 1/4 metre cubicles in one cubic metre.
c) Introduce 1/4 metre cube made of iron sheet 1000 litres of water fill into a space of 1 cubic metre. Extract from farmers that how many litres will fill in 1/4 cubic metre.
d) Pour water into 1/4 cubic metre model and ask them to measure using one litre measuring cylinder. Explain that there are 64 such 1/4 cubic metres in the picture and multiply the water measured by 64 times that will be equal to 1000 litres.

Tell the members that the cubic metre model can be prepared in the following way.

Materials Required: Match box, colour pens, iron box / iron sheets.

Method of Preparation:

a) Make a cardboard box with length, width and height equal on all four sides.
b) 16 squares on all 4 sides (16 x 4) would make a cubic metre on the box.
c) Make an iron box of one cube which is 64th of a cubic metre.

Process:

a) Give a cube made of cardboard to members in small groups and ask them to count how many cubes are there in it.
b) Tell them that any cube can be equally divided into 64 cubes.
c) Give the cube made of iron sheet to the members and ask them to measure how many litres it would accommodate. 15.65 litres will fill and ask farmers to tell no. of cubes in cubic metre, and how many litres would accommodate in cubic metre can be calculated, ask farmers. Show these two models to the members and discuss that 1000 litres of water would fill a cubic metre.

Other Information:

It is difficult to carry the model of the cubic metre to all places where the sessions are conducted, and farmers understand easily if discussed with them.
Module 3: Water Utilization
Chapter 4 - Module 3: Water Utilization

<table>
<thead>
<tr>
<th>Steps</th>
<th>Tools/Methods</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic/Drinking / domestic animals sector utilization</td>
<td>(Total population x LPCD x 365)</td>
<td>Annual drinking/domestic consumption</td>
</tr>
<tr>
<td>Irrigation utilization</td>
<td>Area under irrigation x avg. crop water requirement</td>
<td>Annual irrigation water requirement from surface water &amp; ground water</td>
</tr>
<tr>
<td></td>
<td>Individual crop area under irrigation (ha) x crop water requirement</td>
<td></td>
</tr>
<tr>
<td>Industrial utilization</td>
<td>Industrial water requirement per day x no. of operational days</td>
<td>Annual industrial requirement</td>
</tr>
<tr>
<td>Others uses (recreational activities)</td>
<td>Other uses water requirement x no. of days</td>
<td>Annual Other uses requirement</td>
</tr>
<tr>
<td>Total water utilization</td>
<td>Sum of all sectors water utilization (SW+GW)</td>
<td>Annual SW utilization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annual GW utilization</td>
</tr>
</tbody>
</table>

In WSP, module 3 is Water utilization/draft module which is further divided into sub-modules i) Drinking/Domestic; ii) Agriculture irrigation; iii) Industrial and iv) Other Uses to estimate the groundwater and surface water utilization by these sectors. The screenshots of these sub modules are shown in figure 4.1

4.1. Drinking & Domestic sub-module

Non-agriculture water utilization for domestic (water consumption by human being, including drinking water) and livestock (water used at the domestic or farm level in upkeep of the cattle) sector is estimated by using the simple computation methods.

Annual human water requirement (Ha. m) = No. of population X Daily per capita water requirement (lpcd) X 365 days

The human and livestock daily water requirement could vary from state to state thus there is a provision provided in the MIS to enter the specific daily water requirement in order to calculate the annual surface water and ground water utilization/draft.
4.2. Irrigation water utilization/draft

It is a well-known fact that the bulk of the water utilization is by the agriculture sector. The agricultural perspective plan of the GP, for the year 2020-21 should be prepared in consultation with the farmers at village level and compile at the GP level.

In MIS-WSP, the irrigated water demand/utilization can be calculated either using the parameters like Area under surface water irrigation (Ha) into Average crop water requirement to estimate surface water utilization for irrigation or user can also individually calculate the irrigation water demand by providing the individual crop information like crop area in hectare under irrigation and crop water requirement.
The individual crop water requirement has also been incorporated in the WSP for the state’s reference. These values can be changed by the user if data is available from other authenticated sources.

The total irrigation water utilization is sum of GW utilized (values from GEC, 2017 downscaling from block to GP) and SW utilized (Area under SW irrigation X crop water requirement). The figure 1.7 depicts the interface of the sub-module water utilization by agriculture sector.

Figure 4.2: The irrigation sub-module interface in MIS- WSP water utilization section.
4.3 Industrial water utilization/draft

In WSP, the industrial water utilization can be calculated by capturing industrial daily water requirement and its operational days in a year and the source of water supply (ie. Groundwater or surface water). The parameters used in calculating the industrial water utilization in the specific GP.

\[
\text{Annual water utilization/demand (Ha. m)} = \text{Industrial daily water requirement} \times \text{No. of operational days}
\]

This information can be gathered by the locals of the GP. The screenshot of this sub-module can be seen in figure 1.8.

![Image of industrial sub-module](image)

Figure 4.3: The industrial sub-module interface under MIS-WSP water utilization

4.4 Other uses utilization/draft

The water utilization by the other uses in the GP could be for recreational activities like water parks, theme parks, etc used to entertain the tourist also utilizes the large volume of water. In order to gather information on this sector MIS provides the provision to enter the parameter in this sub-module as shown in figure 1.9.

\[
\text{Annual water utilization/demand (Ha. m)} = \text{Industrial daily water requirement} \times \text{No. of operational days}
\]
Figure 4.4: The other uses sub-module interface under MIS-WSP water utilization

The summary report can be generated by clicking on the summary button showing all the inputs parameters in different sectors sub-modules with graphical presentation.
Module 4: Total Water Balance
Chapter 5. Module 4: Total Water Balance

In this module, the total water balance is estimated simply by deducting the total water available (calculated in module 2) with the total water utilization/draft by all sectors (calculated in module 3). The total water balance calculated in the MIS-WSP is estimated as shown figure 5.1.

Figure 5.1: The water balance interface in MIS-WSP
The summary report can be generated and downloaded by clicking on the summary button.
Module 5: Water Demand and Budget (Projections)
Chapter 6. Module 5: Water Demand & Budget (projections)

<table>
<thead>
<tr>
<th>Steps</th>
<th>Tools/Methods</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future allocation of GW/SW for different sectors</td>
<td>Population growth rate &amp; LPCD</td>
<td>Annual SW/GW budget for drinking &amp; domestic &amp; Irrigation sector only</td>
</tr>
</tbody>
</table>

The last Census information available is for the year 2011. The next census exercise is underway and it is expected to be completed by 2021. Publication of Census 2021 information would take some more time and we can expect that the District Census Handbooks can be only expected earliest in 2023. We are herewith facing a task of projecting the water demand from different sectors, at least for the next five years. Decadal Growth Rate (from 2001 to 2011) is available in Census 2011 books. The same growth rate is applied for 2011 to 2021 and repeated for 2021 to 2031. Therefore, the projections made in this document are for 2031, applying decadal growth rate of 2001 to 2011.

This module – Water demand is broadly divided into 3 sub-modules viz., i) Drinking & Domestic water demand; ii) Agriculture Water Demand; and iii) Total Water Demand

6.1 Domestic Water Budget
The decennial growth of rural and urban population is computed based on the population data from Census of India 2011. Indian Standard Norms of 85 liters per capita per day (lpcd) in rural areas and 135 lpcd in urban areas are used in computation of domestic water demand. Steps in computation of projected (next 30 years) domestic water demand (rural/urban) are:

- i) projected population as in 2050 is present population X population growth rate;
- ii) allocation for drinking & domestic (Ha.m) = projected population X per capita requirement (litres) X 365 days

However, as there is no urban habitation, in the study area, the computation was limited to projection of rural domestic drinking water only.

6.2 Irrigation Water Budget
The irrigation water budget is computed in WSP by simply subtracting the total water balance available at GP level (calculated in module 3) with total water demand/budget calculated for drinking & domestic use in above section. The figure 5.1 will depict the interface and the parameters used to calculate the water budget for drinking & domestic and agriculture sectors.
There are several methods like crop water requirement, soil water holding capacity, drip and double ring irrigation method, etc to calculate the agricultural water demand at field level is explained in detail in Annexure 1. This document can be used to estimate the irrigation water demand in consultation with local farmers and landholders.

The Indian Council of Agriculture Research (ICAR) Institution located near the GP/Block or district would have worked out on the Crop Water Requirements, Crop Evapo-transpiration (ET Crop), Effective Rainfall and Irrigation Requirement for each of the crop grown in the agro-climatic zone. Table 4.5 shows the computation of ICAR Institution with regards to these parameters, apart from the computed results of the irrigation requirement of the cropping pattern planned by farmers of the GP.
Module 6: Water Security Plan
Chapter 7. Module 6: Water Security Plan

The entire input for Module 6 shall come from the community level planning process. Module 6 - Water Security Plan consists of 2 sub-modules viz.: i) Demand side interventions - measures to reduce agriculture water demand; and ii) Supply side interventions - supply increasing activities including rain water harvesting and artificial groundwater recharge.

### 7.1 Demand side interventions or Demand decrease plan

Demand Decrease Plan (DDP) refers to agreed changes in agriculture including: i) Drip irrigation, ii) Sprinkler irrigation, iii) Irrigation through underground pipelines, iii) switching to low-water consuming crops (crop diversification); and iv) reduction in GW by added use of surface water, and v) other measures for saving water.

The data in the above-mentioned sub-modules need to be populated by DIPs along with the community participation.

The figure 6.1 depicts the interface for drip/sprinkler/UG pipelines from MIS-WSP demand-side intervention module. The MIS listed all the major crops grown in season Kharif, Rabi and summers with their pre-populated average crop water requirement. These values can be edited at the user end as well.
Micro-irrigation method – Drip & Sprinkler irrigation demand decrease measures.

Figure 7.1: Drip, sprinkler & UG pipeline measures interface in MIS-WSP.

As shown in figure 6.1, the data need to be populated by DIPs after consultations with the locals in form of tables first then will be incorporated into the MIS.
Crop diversification sub-module has two types of pages, one type for usage at the community level another for computation within the MIS. Table 6.1 is an example of one the two-community type page. Table 6.1 can generated at a centrally organized GP level Workshop or series of village level workshops, in which case the information needs to be consolidated at a later date as input into the MIS as shown in figure 6.2. Last two columns of table 6.1 may or may not be carried into the community exercises. The table seeks simple information in terms of area under each crop type, during the current year and plan year. MIS computes change in area by deducting planned area from the current area.

**Table 7-1: Demand Decrease Plan (Crop Diversification), GP**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Original crop</th>
<th>Changed crop</th>
<th>Area (Ha)</th>
<th>Water requirement (Ha.m)</th>
<th>Water use (Ha.m)</th>
<th>Water requirement (mm)</th>
<th>Water demand (Ha.m)</th>
<th>Reduction in GW demand (Ha.m)</th>
<th>Possibile funding source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Khari paddy</td>
<td>Rag i</td>
<td>50</td>
<td>1175</td>
<td>58.75</td>
<td>550</td>
<td>27.5</td>
<td>31.25</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Annual reduction in Ground Water Demand (ha.m)

Data about use of micro-irrigation equipment has to be collected from the Horticulture or any other concerned department. It is assumed the decrease in water demand will be about: i) 30 percent in case of buried pipeline; ii) 30 percent for sprinkler and other similar MI equipment; and iii) 40 percent in case of sprinkler irrigation.
Table 6.2 is an example of one of the two demand decrease mechanisms. This one deals with piped/Micro-Irrigation. Table 5.9 can be generated at a centrally organized GP level Workshop or series of village level workshops and information needs is consolidated as input into the MIS. The table seeks simple information in terms of crop-wise current area under each MI system type, during the current year and plan year.

Table 7.2: DDP with Piped/Micro-Irrigation, in GP

<table>
<thead>
<tr>
<th>S. No</th>
<th>Season</th>
<th>Crop</th>
<th>Area (Ha)</th>
<th>Water requirement (mm)</th>
<th>Water Demand (ha.m)</th>
<th>Area proposed for sprinkler Irrigation (ha)</th>
<th>Reduction in water demand (%)</th>
<th>Net Water Demand (ha.m)</th>
<th>Reduction in GW demand (Ha.m)</th>
<th>Possible funding source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kharif</td>
<td>Paddy</td>
<td>1175</td>
<td>14.1</td>
<td>10</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Annual reduction in Water Demand (Ha.m) = \((b) - \{(b) - (e)\} * (c) * 0.001 + (e * c * (1 - f/100) * 0.001)\) = \((b) - d - g\)

WSP computes change in area by deducting planned area from the current area and calculates the annual reduction in water demand using pre-defined computation methods. Figure 6.3 shows the fields that depict the annual reduction in irrigation water demand after adopting certain demand side intervention measure, list of schemes to choose the intervention scheme and the estimated cost.

![Figure 7.3: The interface of demand side measures in WSP](image)

The entire data input in MIS-WSP will come from community consultation, using platforms such as street corner meetings and other similar gatherings at the community level. It is
advisable to present to the community the existing cropping and irrigation practices, in their village/GP and then invite them to think and decide what changes they plan to make in order to bring down the groundwater demand. It is advisable to use laptop and a big presentation screen to facilitate playing with the numbers in the table.

Here, support of technical personnel may be required to assist the community is design and estimates. The source of funding may be finalized at a GP level meeting with officers of line departments.

7.2 Supply side intervention measures or Supply increase plan

Supply i.e., groundwater (secondary) recharge can be increased through artificial groundwater recharge structures. Any impounding water through rain water harvesting to increase the area under surface water irrigation would also indirectly increase secondary groundwater recharge, though marginally.

Therefore, Supply Increase Plan (SIP) will include two sets of activities viz., i) Artificial Groundwater Recharge (AGR) Structures; and ii) Water Conservation Structures (WCS). While AGR is aimed at increasing groundwater recharge, WCS structures primarily provide supplemental or critical irrigation to crops. Supply Increase Plan (SIP) has to come from the community level, though some technical help may be needed in site selection and design of structures.

Supply Increase Plan (SIP) is generated as a result of transect walks with the community leaders, followed by brainstorming at a larger community gathering. The leaders-technicians group started deliberations with community members, at village and GP level, to assess the social feasibility of taking up SIP structures at suitable locations. After the working group consolidated their SIP, it is put up for discussion in a specially convened GP meeting. Officers of line departments were also present in the meeting to discuss possible funding sources under state or centrally sponsored existing schemes.

There are three sub-modules under this section in MIS-WSP, i) Artificial recharge structures, ii) Water conservation structures & iii) Other intervention structures. The data in the tables and then in MIS can be generated through community consultation, where the annual water recharge can be generated automatically in the MIS.

After entering all the relevant information in the MIS-WSP the final comprehensive report will be available to download in the PDF format. It will include the complied information of all the modules discussed in the chapter 2 to 7.

The figure 6.4 shows all the parameters for which data need to be entered in MIS to calculate the annual groundwater recharge by the particular type of artificial recharge structure. The funding source and the estimated cost to construct that structure can also be captured in this module.

Annual groundwater recharge (ha.m.) is computed by: Number of fillings X Storage Capacity X Recharge Factor. The groundwater recharge can also compute for Kharif and rabi season. The list of geo-tagged structures can also be edited, deleted and downloaded by the users,
Figure 7.4: The interface of Artificial recharge structures in WSP

The similar template is developed in MIS-WSP to estimate the annual groundwater recharge through conservation structures as shown in figure 7.5.

Figure 7.5: Water conservation structure interface in WSP
Annexure – 1 Step-wise registration process

A user can register online (http://ataljal.in/) at GP/DPMU/SPMU/NPMU level to access the different modules in the MIS portal by following the below steps.

Step 1: User can fill the data in the prescribed mentioned form and press ‘REGISTER’ button as shown in Figure 1. After successful registration, user will get the account activation mail on registered email-id.

Figure 1: The MIS login registration page
(http://www.ataljal.in/WspNew/WSP_GWM_HOME)

Step 2: Once the login credentials get authenticated by the concerned authority the user can enter these credentials and access the different modules in the MIS. The Figure 2 shows the MIS login page.

Figure 2: The MIS login page (http://www.ataljal.in/WspNew/WSP_GWM_HOME)
Annexure 2 – Methods to estimate agriculture water demand

The following are the different methods which helps the water users to understand the several parameters which are essential to calculate the agricultural water demand.

Water requirement for various crops

Objective: Discussion about amount of litres of water required for various crops, per acre.

Rationale: The difference in the quantity of water used for various crops and the water for various cultivated crops could be easily understood by the following process.

Materials Required:

a) Glass tank
b) Fix metre scale on glass tank vertically
c) wooden stand for the glass tank
d) Water mixed with Potassium Permanganate or Blue colour

e) Plastic trays with various crops for exhibition

Method of Preparation:

a) Prepare a glass tank in rectangular shape
b) Paste the edges (leak proof) to prevent leakage of water
c) Paste a metre scale on one side of glass tank.
d) Pour water mixed with Potassium Permanganate or blue.
e) Keep plastic tray with crop saplings on glass tank

Process:

a) Explain to them that the extent of glass tank is equal to one acre field. The water accumulated in pits dug in meters in one acre would be sufficient to the same as crops shown in exhibition.
b) while the water required for a crop is shown in meters explain to them the water required for that crop.
c) Show the water requirement for
d) Various crops (in metres), first show the crops which require minimum quantity, followed by crops with maximum quantity of water.
e) Explaining in litres and comparing with the capacity of a water tank which is quite familiar or known to the members in the Hydrological Unit area required for various crops.
f) Exhibiting water requirement for every crop in this way make farmers to understand exact water requirements for all crops.

Water Holding Capacity

Objective: Discuss that soils which use organic fertilizers will have maximum water holding capacity.

Rationale: Farmers are using chemical fertilizers in large quantities and because of this not only the character of soils will change but also the water holding capacity would also decrease. Whereas the use of organic fertilizers would increase the water holding capacity of the soil and discuss the same with the members.

Materials Required: Transparent plastic bottles (3 No’s), Soil, Vermi- Compost, Water, Three Cloth pieces, Physical Balance, 250 grams measuring weight, 1 litre bottle, Three trays

Method of Preparation:

a) Take three transparent plastic bottles
b) Take same type of soil and make it into three parts
c) Put 500 gm. soil in one bottle, 250 gm soil + 250 gm Vermi-Compost in second bottle, 250 gm soil + 250 gm fertilizers in third bottle.

Method of Preparation:

a) Pour 1 litre water in each bottle, keep it for 5 minutes
b) Place thin cloths cover on top of the vessels
c) Keep each vessel upside down in a tray
d) Bottle with only soil will give off more water into the tray
e) From this experiment it become very clear that the soils which used organic fertilizers has maximum water holding capacity.

The following experiment will help to explain the important of organic fertilizers.

Materials Required: 6 water bottles, 6 plastic trays, cotton cloth, three soil varieties (each 500 grams), thread, water

Method of Preparation:

a) Remove the lower base portion of all water bottles
b) Close the mouth portion of the bottle with cotton cloth tightly
c) cut the card board to bottle shape, show the water requirements for various crops in bars.
d) Put seeds or fruits of each crop on the bar for easy recognition
e) Mention water requirement details for various crops on top of the graph bar.

Process:

This model can be used in Farmer Zonal School (Rythu Kshetra Pathasala) or Crop-Irrigation water plan (Panta Neeru Pranali) workshop to explain water requirements for various crops per acre / hectare.

a) Ask farmers how many wets they are giving to each crop, and discuss in terms of lakhs of litres.

b) Discuss about the water requirement differences between various crops, dry crops and crops which require maximum water.

c) Fill the three bottles with three soil varieties

d) Fill the other three bottles with soil mixed with organic fertilizers (3 parts soil + 1 part organic fertilizer)

e) Hang the soil filled bottles upside down with the help of coir thread tied to it.

f) Pour water slowly on top of the soil in each bottle

g) Collect water after a brief period and measure

h) Measure water collected from 3 bottles with soil and discuss the difference

i) Measure water collected from 3 bottles filled with organic fertilizers and discusses the difference.

k) Discuss with members about the water holding capacity of different soil types and their differences in holding the water.

l) At the same time, explain and discuss with the members about how organic fertilizers increase the water holding capacity of soil.

---

**Drip and Double Ring Irrigation Method**

**Objective:** Discussion about drip and double ring irrigation method.

**Rationale:** If it is not possible to take farmers to demonstrate drip and double ring irrigation method practically, then show this model and discuss with them.
Materials Required: 12 mm Plywood (2 x 2 feet), wood board (2 feet x 7 cm) L x W, Thermocool sheets, Plaster of Paris powder, Plastic tree, Paint.

Process:

a) Fix 2 x 7 wood plank or plywood with the help of nails and hammer.
b) Release two thermocool sheets into the box make a hole of 20 gm. circle.
c) Keep plastic tree in the hole, and put plaser of paris mixed with water.
d) Fix a drip pipe and show drip irrigation for mosambi plant.
e) Discuss with members about drip and double ring irrigation method to Mosambi plantation and highlight the water that could be saved by this process.

Alternate Ridge and Furrow Method

Objective: General irrigation practices in Mirchi crops and alternative ridge and furrow irrigation method.

Rationale: Instead of prolonging discussion about general irrigation practices and alternative ridge and furrow with farmers. It is better to show models or take them to a nearby field for better understanding.

Materials Required: PVC tins (2), water mirchi / chilli plants. Process:

a) Graduate the empty PVC tins from below with 10 - 20 - 30 - 40 - 50 numbers.
b) Write general irrigation practices on first tin pour water upto level 30. Keep a plant in this tin.
c) It may be informed that 30 lakh litres of water is required by this process to cultivate mirchi crop.
d) Write year after year water (Alternate years) on second tin and pour water upto level 20. Keep a plant in it.
e) It may be informed that only 20 lakhs litres of water is required by this method.
f) The difference between the water requirements of Mirchi crop by the two methods can be understand quite easily by showing this model.

There are several and activities that can be conducted with locals to estimate crop water demand, groundwater recharge, water budget, groundwater usage, etc as shown in several handouts below.
<table>
<thead>
<tr>
<th>S.No</th>
<th>Crop</th>
<th>Crop Area (Acres)</th>
<th>Water Quantity (Feet)</th>
<th>Water Required for Crop (Cubic Meter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Coriander</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Tomato</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Potato</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Brinjal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Malbahi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Sugar-cane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Chilly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Kankambaram</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Ground Nut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Cabbage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Piper Betle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Finger Millet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Sunflower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Corn</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Crops**

**Total Estimated Cost**
Crop water Budget Key Activity

**Hydrological Unit**

**Name of H U**

**Water Draft Through Ponds, Lakes, Checkdams**

November: ____________ To May: ____________

- Ponds ____________
- Lakes ____________
- Checkdams ____________

↓

Ground Water

________________ (m³) + _____________ (m³) + _____________ (m³)

Total Groundwater Draft: ____________

**Hydrological Unit**

**Crop Water Budget** ____________

**Name of H U**

**Estimation of Ground Water Recharge**

November: ____________ To May: ____________

Estimated Rainfall: ____________ (mm)

**Types of Soil:**

- Granite Land with Clay
  - 8% (Ref: G.E.C 1997)
  - 686.80 Acres
- Granite Land without Clay
  - 11%
  - 2435.77 Acres

Ground Water

________________ (m³) + _____________ (m³) = _____________ (m³)

Total Ground Water Estimated Draft
Hydrological Unit

Crop Water Budget

Ground Water Situation by the End of October

Recharge Balance Draft

______________ (m³) ____________ (m³) ____________ (m³)
### Hydrological Unit

#### Water Usage

<table>
<thead>
<tr>
<th>Time to fill 1 Drum</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Minute</td>
<td>Liters</td>
</tr>
<tr>
<td>Per Hour</td>
<td>Liters</td>
</tr>
<tr>
<td>Per Day</td>
<td>Liters</td>
</tr>
<tr>
<td>Total Days</td>
<td>Liters</td>
</tr>
</tbody>
</table>

**Functional Bores**

Average Working Hours: 
Average Working Days: 

**1000 Liters = 1 Cubic Meter**

**Total Borewells**

Working Borewells in Watershed × Total cost per Borewell

\[
\text{Working Borewells} \times \text{Total cost per Borewell} = \text{Total Extraction (m}^3\text{)}
\]

**Water Extraction from Well**

\[
\text{Water Extraction from well (m}^3\text{)} = \text{Total Extraction (m}^3\text{)}
\]

#### Hydrological Unit

**Name of H U**

**Water Draft Through Ponds, Lakes, Checkdams**

June: ____________  To  October: ____________

- **Ponds:** _________
- **Lakes:** _________
- **Checkdams:** _________

\[
\text{Ground Water} = \text{Ponds (m}^3\text{)} + \text{Lakes (m}^3\text{)} + \text{Checkdams (m}^3\text{)}
\]

**Total Groundwater Draft:** ____________
Hydrological Unit

Crop Water Budget

Name of H U

Ground Water Recharge

June : ____________  To  October : ____________

Rainfall : _______________ (mm)

Types of Soil:

- Granite Land with Clay
  - 686.80 Acres
  - 8% Ground Water

- Granite Land without Clay
  - 2435.27 Acres
  - 11% Ground Water

Total Ground Water Draft

_______________ (m^3) + _______________ (m^3) = _______________ (m^3)
Hydrological Unit

Crop Water Budget

Name of HU

Ground Water Recharge

June : __________ To October : __________

Rainfall : __________ (mm)

Types of Soil:

- 8% (Ref: G.E.C 1997)
  - Ground Water
- 11%
  - Ground Water

Ground Water + Ground Water = Total Ground Water Draft

(m³) + (m³) = (m³)

Hydrological Unit

Crop Water Budget

As per crop plants __________ Estimated Ground Water till May __________

Available Water by October __________

November : __________ To May : __________

Recharge by Tanks & Ponds __________

Recharge by Rainfall __________

Total of above by May __________ Estimated available water by end __________

Water for Crop (80%) __________

Water Draft for Rabi & Summer Crop __________

Recharge __________ Draft __________ Available Water __________

(m³) + (m³) = Deficit __________

Surplus __________ (m³)