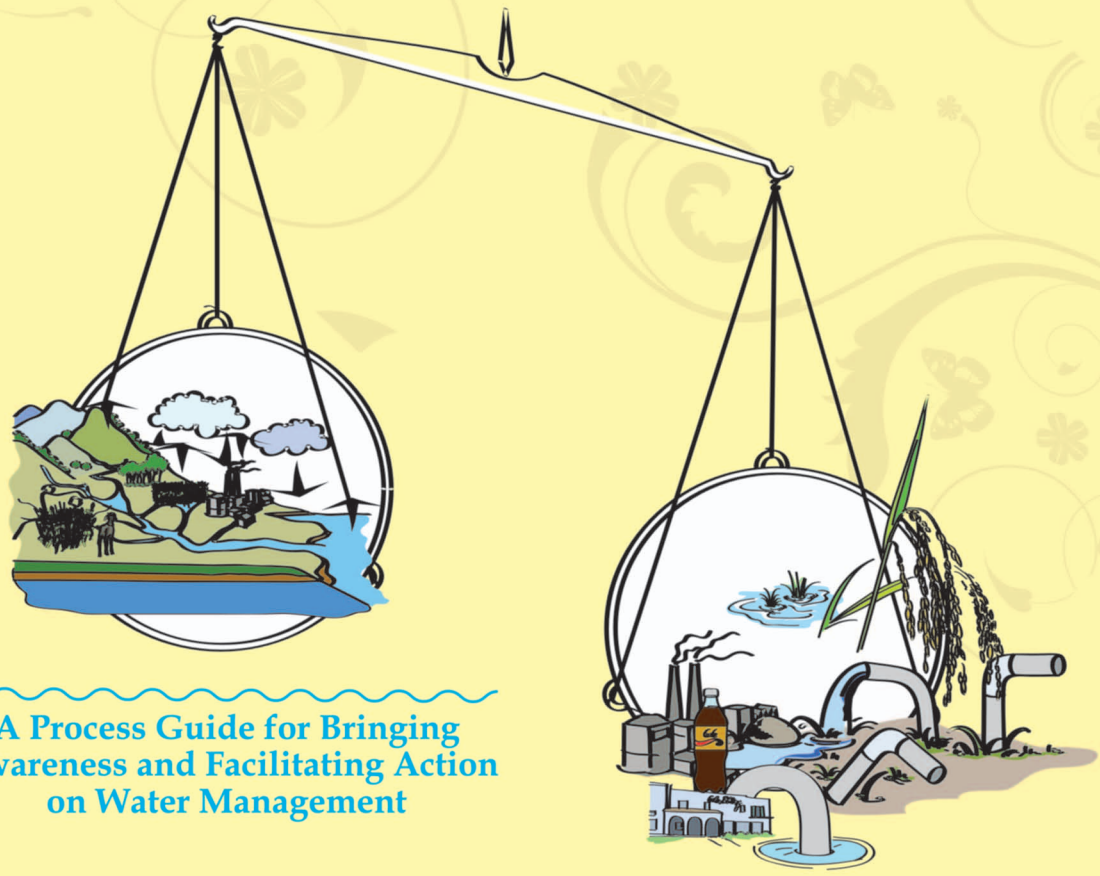
How to facilitate "Crop Water Budgeting" by Watershed Communities?



A Process Guide for Bringing Awareness and Facilitating Action on Water Management

KFW IGWDP NABARD Arghyam WASSAN

How to facilitate

"Crop Water Budgeting"

by watershed communities?

A Process Guide for Bringing Awareness and Facilitating Action on Water Management

This Process Guide is developed based on the Experiences, Reflections and Lessons Learned from Indo- German Watershed Management (IGWM) Projects in Telangana

WASSAN

How to facilitate "Crop Water Budgeting"
by watershed communities?

Copies: 2000

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NABARD and KfW are funding Indo German Watershed Development Projects in Telangana state since 2008. With an outlay of Rs 56 Crores, IGWDP covered 36 projects. These are being implemented by 12 NGO partners, in Medak, Warangal, Adilabad and Karimnagar districts. Watershed Support Services and Activities Network (WASSAN) and Poverty Learning Foundation are functioning as Resource Support Organizations for this project. These projects reached final stages of execution, during 2014-15.

These projects have demonstrated several innovative interventions at grassroot level and enhanced the policy and practice of watershed management projects in the state. Groundwater recharge is one of the important benefits of this project. All projects have made considerable efforts to conserve soil, moisture and rainwater. Crop diversity, livestock, promotion of System of Rice Intensification - are some of the newer elements that are part of IWGWP.

As these projects have focused on water in a significant manner, there is a need for promoting "water sense" among the communities, for better governance and management of water resources. As these regions are traditionally dependent on groundwater for drinking purpose and irrigation, it is necessary to develop a direction among the communities on the appropriate choices of water use. This direction could eventually help in making appropriate choices on water use and norms for regulated use of water resources, particularly groundwater management.

For this purpose, WASSAN has developed this protocols for conducting "crop water budgeting" exercise, in the context of IGWDP. WASSAN conducted an assessment of relevant experiences and protocols on this themein the state / country, before contextualizing the "Crop Water Budgeting" method for watershed projects.

This document is prepared not only to capture the "processes" followed for conducting crop water budgeting exercise, but also to convert these processes into useful "process steps and guidelines" for repeating this exercise in other parts of the country. Thus, this document is expected to function as a "manual" for the facilitators, who would conduct this crop water budgeting exercise.

Contents

What is Crop Water Budgeting Exercise?

Crop Water Budgeting Exercise is a community led process, where local communities come together to make an assessment of water resources in a given village.

In this process, villagers basically explore answers to these three sets of questions…

- **What is the quantity of water available in the village?**
  - Estimating the available water resources – by collecting the data related to rainfall in the village, water stored in different water harvesting structures of the village, quantity of water that has gone into recharging the groundwater aquifers, water that flows to this villages in streams from neighbourhood villages and any other form of water resources in the village.
- **What is the quantity of water that is used in the village, for different purposes?**
  - Estimating the water use patterns – by assessing nature of use (for what purpose – drinking, irrigation, livestock, etc) and quantity of water used (for each purpose). They also analyze the variations across seasons and years, if need be.
- **What is the balance of water available in the village?**
  - Understanding the situation of the villagers, whether it is positive balance ("surplus") or negative balance ("deficit").
  - Discuss various options for conservation, use, management and regulation of water resources in the village.

- These decisions are expected to change the practices, beliefs and norms that could improve the water balance.

As agriculture / crops are predominant user of water resources in villages, this exercise is largely perceived as “Crop Water Budgeting Exercise”. In reality, this covers all types of water uses in a given village.

WASSAN designed this process and conducted the Crop Water Budget Exercise in 32 projects of IGWDP. Project Facilitating Agencies (NGO Partners); resource persons, community resource persons are part of this initiative. Village leaders – members of Village Watershed Development Committee members; farmers and other opinion makers participated in these events, during September 2014 to March 2015. This document captures these processes and also converts them into guidelines; useful tips for facilitators and lessons learned from this exercise.

Process of Conducting Crop Water Budget in Watershed Villages

Part - I: Preparations

Process Step - 1: Preparing the Minds

Presenting a case for promoting Water Management Practices in IGWDP Villages - Potential Role of Crop Water Budgeting Exercises at Village level

WASSAN team conducted Crop Water Budgeting Exercises in selected watershed villages of IGWDP during January - April 2014. WASSAN conducted similar exercises in Anantapur district, where WASSAN is promoting Participatory Groundwater Management by networking bore wells. These exercises are well appreciated by farmers and there are visible changes in the water management practices at local level. Based on these experiences, WASSAN impressed on the IGWDP team to take up similar process in IGWDP village and motivate the farmers for taking up participatory water (surface and groundwater) management practices. PSU, IGWDP agreed for this initiative and asked WASSAN to conduct Crop Water Budgeting Exercises in all project villages. This consent from PSU, IGWDP and NABRAD is the trigger for initiating this entire process.

Process Step - 2

Preparing Grounds - Planning Meeting with Decision Makers

After the consent from PSU, IGWDP the idea of conducting Crop Water Budgeting Exercises has to be taken to 36 projects within March 2015. For this purpose, WASSAN conducted a planning meeting on 2nd Sep 2014. In this meeting Deputy General Manager, NABARD (Karimnagar); representatives of Project Facilitating Agencies and watershed level supervisors and para workers participated. WASSAN team facilitated this meeting. In this meeting, WASSAN team presented the background, methodology, datato be collected from project records and villages and so on. During this meeting, a broad consensus was developed on the importance and relevance of this communication campaign on water

management in the project villages. This also helped to develop role clarity of each partner in the process. A tentative time table and schedule of programs/ events (mile stones) was developed in consultation with the Project Facilitating Agencies. (*Annexure No 1*) The information that was needed from the field was presented in*Annexure No. 2 (Village level information for Crop Water Budgeting)*

Process Step - 3

Preparing Facilitators

This campaign on Crop Water Budgeting required considerable preparations at WASSAN level. After the initial consent from partners, WASSAN completed these preparations within a short period. These preparations included the following:

❑ Identification of Facilitators (Resource Persons)

As this exercise has to be completed within a short period of time, it was decided to develop two or three teams of facilitators, who would conduct these exercises at field level, in different villages simultaneously. To enable this, a cadre of resource persons (pool of resource persons) with necessary expertize (skills and knowledge) is required. WASSAN team identified potential members from Khammam, Adilabad, Karimnagar and Mahabubnagar, Anantapur and RR districts. About 36 members were selected for this purpose.*(Annexure No. 3)*

Criteria for Selecting Facilitators

Facilitators for conducting Crop Water Budget are selected, based on the following criteria:

1. At least 12th Class Passed
2. Should be able to do some basic calculations
3. Should have watershed relate experience
4. Should have facilitation skills

❑ Training for Facilitators on Crop Water Budgeting

A training program was conducted (9 to 12 September 2014) for the above facilitators at Arnold Bhavan, Ramathapur, Hyderabad. C. Bakka Reddy and MB Vali (WASSAN) conducted this training program. This training program mainly focused on basics of watershed management; water resource development in watershed development projects; water used patterns for different crops; method of estimating water for agriculture and other purposes; method of estimating water stored in different water harvesting structures and other related issues. There was focus on communication skills and facilitation skills. The training program concluded with a session where action plans is developed by resources persons in consultation with partner organizations. As per the convenient dates of each partner, the field days for Crop Water Budget Exercises are decided, during this session. Schedule of the programis presented in *Annexure No 4.*

After this training program, the field work for Crop Water Budgeting Exercises was initiated in the project villages.*(Schedule of the Program - Annexure No 5)*

❑ Preparing for Field work

Before going to the village, it is important collect some basic details of the village. This information is essential for the facilitator to facilitate the Crop Water Budget in the village. For this purpose, WASSAN develop a template / format.*(Annexure No. 1)*. This formats / templates were shared with all Project Facilitating Agencies and RSO, well in advance (in fact, during the training program itself). This advance preparation is useful for reducing the time of facilitation at the village level, given the short attention span of villagers. The field work for facilitating Crop Water Budget was initiated in those villages, where this data is available in advance, to the facilitator's team. AsKRUSHI, SAVES and MARI provided this information during the training program itself, the field work was initiated in these villages, immediately after the training program.

❑ Preparing the Partners on Facilitating Crop Water Budget:

While this field work is going on, PSU (IGWDP) realized there is a need for conducting intense training programs for staff of Project Facilitating Agencies and watershed supervisors / para-workers. As these members are actually closely associated with watershed communities, it is expected that these members could motivate the farmers and ensure better follow up of decisions taken, during the Crop Water Budget Exercises in the village.

WASSAN conducted two training programs on this theme (18th to 21stNovember 2014 at Jannaram, Adilabad district and 2nd to 5th Jan 2105 at Balavikasa, Warangal). The first training program covered the partners of WASSAN as RSO, while the second training program covered partners of Poverty Learning Foundation. These training programs focused on the role of Project Facilitating Agency and watershed para-workers, apart from basics of Crop Water Budgeting exercises. These training programs also had a field component, where the participants got an opportunity to conduct Crop Water Budget exercise and / or witness the event in any particular village.

Process Step - 4

Preparing Tools

The methodology of Crop Water Budget involves several calculations and estimates about water resources in the villages (available water and water used for different purposes). This process is simplified by using standard templates and formats.

Communication Materials

a) Brochures

- ❑ Collectivization of groundwater / participatory groundwater management
- ❑ Situation of water availability in the village
- ❑ Crop water budget (CWB)

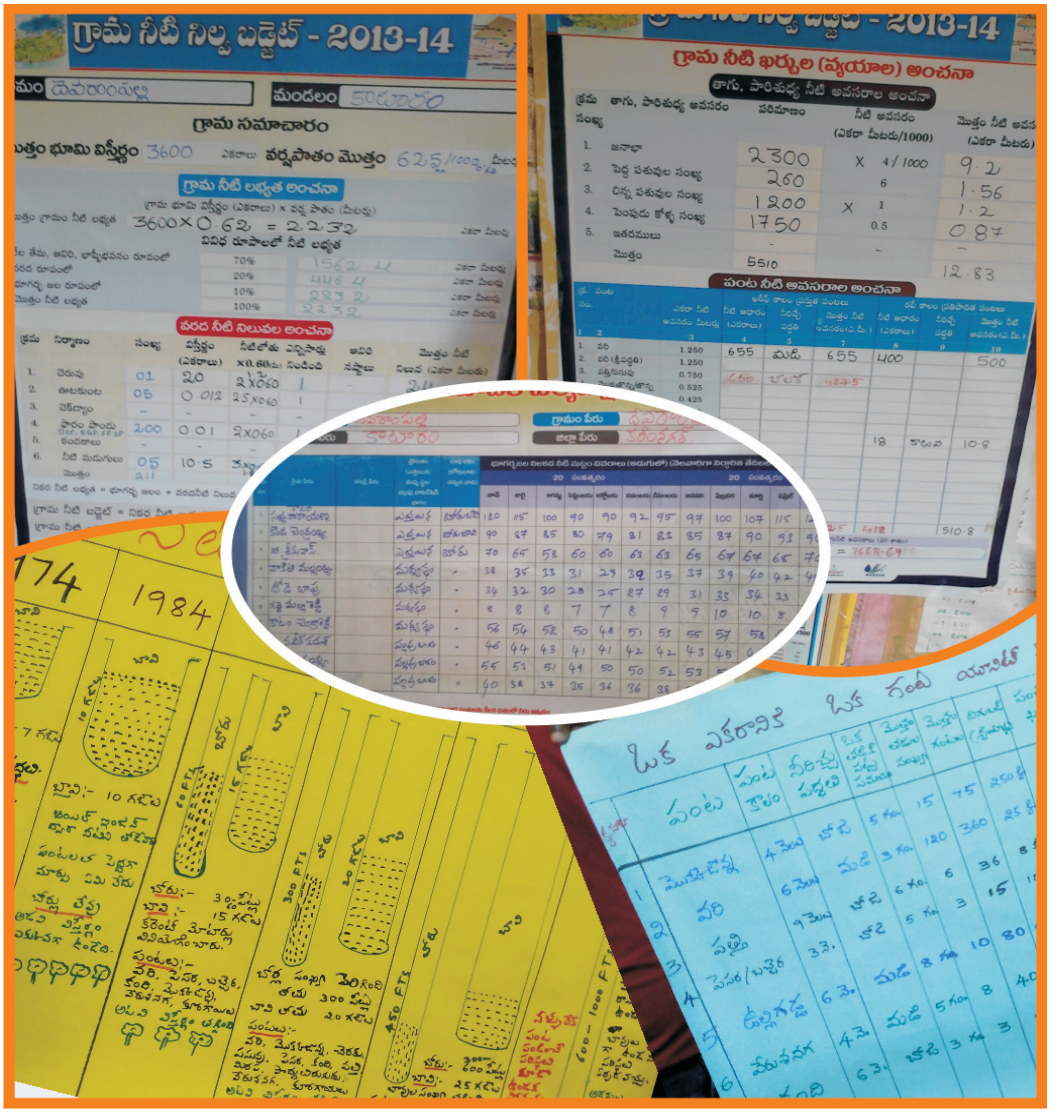
b) Flexies

- ❑ Water availability in the village
- ❑ Water demand
- ❑ Crop wise water usage / requirement
- ❑ Monthly rainfall data
- ❑ Water level details of observations borewells (atleast 10)

c) Step by step on water sharing flexies.

These templates are developed on flexi sheets *(Annexure No. 6)*. For improving awareness on water resource management and collective action on water resources, WASSAN developed a set of communication materials.

These tools / communication materials not only helped to standardize the methodology and also simplify the process of estimating the water use and availability of water, in a given village. WASSAN shared these tools / materials with RSOs well in advance.



Process of Conducting

Crop Water Budget

in Watershed Villages

Part - II: Facilitating Crop Water Budgeting Exercise

Facilitating Crop Water Budgeting Exercise

Typically, each event would take about two days. In this event, a team of three facilitators took the responsibility of facilitating this event. The schedule of this team is well defined and training program was conducted as per this schedule. Project Facilitating Teams, watershed level functionaries – para workers; volunteers, village watershed development committee members and others supported this process and performed their respective roles at step of this exercise.

Step - 1: Taking Project Facilitating Agency into Confidence

After arriving at the PFA's office, facilitating team introduced itself to the PFA staff, CEO and others. They also explained the background, purpose, schedule and expectations from Crop Water Budget Exercise to the PFA team. This process helped to develop greater level of common ground between the both the teams (PFA and Facilitating Team of CWB). The logistics and time schedules are clearly negotiated between both of them.

After this, the facilitating team also verified the data of the selected village from the records of PFA. Though the facilitating team has all the data of this village, it was necessary for them to cross check some details and develop greater clarity on each and every aspect of the project

Data Collected from Project Records

a) No of Water Storage Structures whose water depth is more than 0.5 mt

b) Length of Water Absorption Trenches Basic details of Watershed - population, area, crops, livestock, rainfall data,

c) List of VWDC members with contact numbers

d) Details of PFA Staff working on watershed program with contact numbers.

village. For this purpose, PFA shared the Project Completion Reports and MIS data of the selected village.

Step - 2:First Meeting with Village Watershed Development Committee

After the meeting with PFA, the facilitator's team reachedthe village and met the members of VWDC and other functionaries. During this meeting, facilitator team introduced itself and explained the purpose of the meeting to the committee members. The program schedule is also explained to them, so that they could make necessary arrangements for the event. After this, the village leaders (mainly VWDC members) and facilitating teams discussed about the village, watershed development project with a specific focus on water resources. During this process, there was an opportunity to cross check the data collected from project documents with the village leaders. Depending on the time of the day, the facilitating team also conducted a transact walk in the village, to visit majority of the water harvesting structures in the village. This visit helps the facilitating teams to get an idea of water harvesting structures in the village and current status. During this visit, the facilitator team also gets an idea on agriculture and crops of the village, throughdiscussions and direct visits to fields, on the way. The facilitating team and members of VWDC get to discuss about the water spread, number of days for which the water is stored, what is the trend of water flows in the streams, what are the changes induced after the project interventions, etc. Depending on the situation, the facilitator team also measured the water spread, depth of water (at different locations of water body), with a measuring tape. These discussions helped to make an assessment of trends in water use and associated trends in agriculture in the village. Facilitators also took photos of the water harvesting structures, during this field visit. This orientation process may take about 4 to 5 hours.

Step - 3: Meeting with Farmers–Analysis of Water Use and Net Incomes

This is the first step to interact with farmers in the selected village to discuss on water management related issues. The facilitator team interacted with selected farmers (opinion makers) in the village, during this state. The VWDC members arranged this meeting. The place and time are decided by the VWDC members.

- **Trend Analysis:** During this meeting, the facilitators inquire about the trends in the village about water availability, water use, number of bore wells, green cover, area under crops, types of crops, etc. This trend analysis also focuses on type of crops, type of machines used for water lifting (open wells, bore wells, diesel oil Photo of Trend Analysis based pumps, etc). The trend analysis captures the changes in each decade, from 1974 onwards. (Refer Table and Pic on Trend Analysis)

Trend Analysis in Thigulnarsapur, Medak

Parameter		1974	1984	1994	2004	2014	2024
Depth of Dug well in yards	Minimum	5	8	10	16	20	no more water
Depth of Dug well in yards	Maxi	8	10	16	20	21	
Depth of Dug well in yards	Avg	6.5	9	13	18	20.5	
Depth bore well in feet	no bore well	no bore well	no bore well	150	300	800	
Ground water level in yards		3	6	10	16	20	
Lifting device	Mota	Rahat, Diesil engine	Electric mono block pumps	Electric sub mersible pumps	Electric sub mersible pumps		
Crops		Paddy, Maize, Bajra, Wheat, Green gram	Paddy, Maize, Red gram, Horse gram	Paddy, Chilli, Haldi Paddy, Maize, Cotton	Paddy, Maize, Cotton, Sunflower		

- **Water Balance:** In this stage, water availability and water consumption are estimated. This exercise is largely based on the secondary data of the village and primary data collected from watershed plans / MIS reports and other local sources.

- **Water Availability:** Based on the areas of the village, rainfall, water harvested in the village (in different water harvesting structures) – total quantity of available water is estimated.

- **Water Consumption:** The quantity of water consumed / annually is estimated by calculating

  a) the drinking water needs of the human beings and livestock population of the village

  b) the irrigation water requirements of different crops (as per the areas under each crop).

  For this purpose, the standard norms (e.g. 'X'litres of water / head / day for drinking purpose and local practices (e.g. 'X' number of watering per season for a given crop) are used.*(Refer Annexure No 7 – Water Balance Template)*

- **Water Balance:**Based on the above two steps, the water balance is estimated (available water – used water), in each village. This gives a broad direction about the water situation of the village – whether the village has surplus and deficit of water resources.

- **Cost of Cultivation:** During this discussion, the facilitators also inquire about the cost of cultivation of major crops in the village; yields and incomes. This is linked to water consumption patterns for each crop.

  - **Step 1:** The cost of cultivation includes a variety of costs such as – labor, seeds, fertilizer, pesticides, hiring of machinery, electricity / number of pumping hours, etc. These costs are calculated per

acre of land, for each crop. There is a special attention on number of pumping hours for each crop, for a given season.

- **Step 2:** Production and yield of different crops is calculated as per the prevailing trends in the village. The income from sale of crops / bye-products is estimated from the prevailing local markets. This information is used to arrive at gross income from each plot –Rs / Acre.
- **Step 2:** The net income from the crop (Rs / Acre) is estimated for the given year, by deducting the total cost in Step 1 from total gross income from Step 2. The net income could be positive (surplus) or negative (loss) to the farmer.

Step - 4: Crop Water Budgets

During this step, the entire team discusses the results of this exercise. The efforts would be made to connect quantity of water used (in terms of number of pumping hours of bore wells / open wells) and net income from the crops. These two measurable indicators give a very different perspective on the agriculture in the village. Farmers would get to know about the incomes from different crops and quantity of water used for them. As water is always given high importance in agriculture, this analysis gives a new message to farmers - “crops that consume more water do not necessarily give higher income” and “crops that need low quantities of water may actually give higher profits / incomes”. This realization is quite a surprise for many farmers. They keep on discussing this analysis, trends, general beliefs about water, changing market rates and related incomes, etc.

This entire exercise may take about three to four hours. The flexy sheets developed by WASSAN are used for this exercise to save time and develop uniformity in different villages. About two to three crops are selected for this exercise / analysis. Accordingly, two to three sub-groups are formed in

each village to complete this exercise. It is not a simple exercise to get it done quickly. The facilitator team has to orient the farmers in step by step manner, to engage in the discussions and analysis.

This meeting concludes with a note of thanks to the farmers. Before this, the meeting for the next day is scheduled – (time, location, who will take the responsibility of inviting other villagers, etc). This meeting on the next day is expected to be like a Grama Sabha, where large number of farmers and grama panchayats members are expected to participate.

During the evening time, the facilitator team consolidates these outputs from group exercises and prepares the consolidated sheets (on flexies). This is necessary for presentation of the main findings / observations from the group discussions to a larger group.

Process of Conducting

Crop Water Budget

in Watershed Villages

Part - III: Awareness and DecisionMaking

Sharing the Highlights of Analysis - Creating Awareness

The purpose of Crop Water Budgeting is to create awareness on water utilization patterns and link the same with income / profit at farm level. The group exercise on the first day paints a good picture of the village in terms of – trends in water availability, water use, agriculture (crops and areas) in the village. An analysis of profits / incomes from the agriculture per unit of water consumed – is also conducted with the selected farmers in the village.

On the second day morning, a gramasabha is organized in the village, as per predetermined time and location (Generally 8 to 10 AM in the morning). Para-workers / supervisors ensure that VWDC members, Gram Panchayat representatives, farmers, opinion makers in the village, women and others are present in this meeting. When all the expected members are gathered, the process of sharing and thinking begins. Members of Project Facilitating Agency introduce the guests to the gathering and also explain about the theme of – Crop Water Budgeting Exercise.

All the outputs that are generated from previous days meeting are displayed in the village meeting. (Charts and Sheets). These include – trend analysis of water resources and crops; water balance in the village; crop per drop – productivity of unit water and income / profit / deficit per unit water.

After the initial introduction, the facilitator team narrates the process of conducting Crop Water Budgeting Exercise, which has several elements / themes. The facilitators explain about each step and the related outputs

from each step. The broad understanding of the situation that emerges at each step is also explained to the gathering. During this presentation and sharing, the farmers in the village and VWDC members who were present and conducted this analysis share their own insights on this exercise.

During this stage, the facilitating team typically makes the following type of statements:

- ✓ Our village has 700 mm of rainfall. During watershed management project, we could harvest XXX Acre Mts of water. Total water that we get from rain and other sources is AAAA Acre meters.
- ✓ We are growing paddy under XXX acres of land, maize under YYY acres, vegetables under ZZZ acers. The total water required for these crops is “XXXPPP” Acre meters.
- ✓ As a result of these, we have a water balance of “PPP” Acre meters.
- ✓ During 1974, we had XX number of open wells. However, we have now “PP” numbers of bore wells. Of these bore wells, only 65% of functional. The depth of water table increased from 20 ft in 1974 to 276 ft in 2014. After 30 years (during 2044), what could be the water table depth? Could it be “ZZ” ft?
- ✓ We are pumping “XX” hours for irrigating an acre of paddy; “YY” hours for irrigating an acre of vegetables, etc. However, we are getting “PP” Rs / Pumping hours from paddy, “QQ” Rs / Pumping hour from vegetables.

Debates and Discussions

This presentation generates considerable discussion among the participants. Sometimes, they agree with these observations / analysis and sometimes they do not. There are heated arguments and debates on the findings and methodology of estimating the water requirements, pumping hours, etc. The farmers who did this exercise on the previous day share the details of this process and explain the logic / rationale behind each step, to the gramasabha. The discussions focus on water needs for each crops and the potential incomes / profits from each crop in the given local conditions. This exercise also focuses on the incomes / profits that could be generated from the same crop, when the farmers switch from intense irrigation (more number of pumping hours) to "Critical irrigation" (less number of pumping hours). This exchange of thoughts between them drives the point that "higher water consumption does not always means higher incomes / profits". Some of the popular crops are producing very low incomes / profits, while consuming high quantities of water.

As the entire exercise focuses on the relationship between water consumed (number of pumping hours / acre / crop) and net income, farmers could easily relate to the discussion. They realize that a particular crop produces lower incomes per water consumed than other crop, which gives higher income / profits per unit of water consumed.

It is also a realization that several villages have "negative balance" of water in the village. This means that the water that is pumped from the ground is more than the water that is allowed to percolate into the local aquifers. It was also a strange realization that there is even drinking water scarcity in some villages, as the withdrawal of groundwater is much more than the water recharge.*(Annexure No. 8)*Villagers are very keen on exploring the ways and means of addressing / reverting to "water positive" situation.

Thinking of Alternatives and Arriving at Decisions

By the end of the above discussions and debates, the facilitator team introduces the need for thinking about alternatives. It is important for the farmers to appreciate the situation of water resources in the village and take appropriate decisions to improve the situation. Facilitating teams support this process and encourage the farmers to make some decisive shifts.

Some of these alternatives are the following

- ✓ Switch over to crops that require low water, but give good profits
- ✓ Switch over to irrigation systems – from intense irrigation to critical / protective irrigation.
- ✓ Conserve more water, if there is any opportunity
- ✓ Improve water use efficiency, by improving soil moisture and fertility; by using drip and sprinkler systems; by promoting water sharing arrangements among farmers

Some farmers come forward to take new choice and travel in a new direction. However, there are several challenges in this process of change.

- ✓ If any farmer wants to shift to dry crops, less water consuming crops – where will they get seeds?
- ✓ If any farmer wants to improve water use efficiency, how will he / she get necessary equipment such as drip system and sprinkler system?

Several options are explored to address these challenges through a thorough discussion among all concerned members including farmers, VWDC members and PFA members. PFA and VWDC members agree to provide necessary support in this process of transformation. The process concludes with a list of decisions and farmers who took these decisions.

Process of Conducting Crop Water Budget in Watershed Villages

Part - IV: Lesson Learning

Crop Water Budgeting Exercise in different watershed villages gave several new insights on the water use, water efficiency, incomes and profits from different crops in each village. A sensitivity analysis of the "profits - net incomes per unit of water" gives a different picture of the water economy in watershed villages. There are several "new" realizations to the farmers and also to the facilitators. The consolidated data on Key Indicators of Crop Water Budgeting Exercises is presented in*Annexure No. 9 (Crop –Water-Profits)*. Some of the key lessons learned / observations are presented here.

The Crop Water Budget Analysis is conducted in 32 villages. This analysis covered 15 crops. Obviously the cropping pattern and main crops in all villages is not uniform.

Ironically, paddy which is most commonly grown crop (25 out of 30 villages) consumes highest amount of water (437 Pumping hours / Acre / Season), while its profitability is lowest among all crops - 37 Rs / Pumping Hour. It is observed that paddy requires 190 to 840 pumping hours / acre / season in different localities. This is because of the variations in the soils in the agricultural fields and geological formations (yields and water holding capacity of rocks), from which the water is pumped. When there is low yield / water holding capacity, the number of pumping hours is high. Accordingly, the profitability from paddy also ranged from 12 to 86Rs / Pumping Hour of water.

It may be observed that paddy as a food crop was introduced only about 30to 35 years back in these villages (which were revealed during trend analysis) and slowly it replaced other food crops in the village. Farmers tried to rationalize the acreage under paddy as it was food crop. However, when the trend analysis was presented / discussed, there were thoughts on the choice of food crops itself. The millets which needed low quantity of water used to be staple food, earlier. "Can we go back to the millets as food crop, particularly when there is water crisis and profit from paddy is also low?" – was the question that lingered in the minds of farmers.

Other point was about net incomes from each acre of land. Farmers observed that crops (Onion, Chillies, Paddy, Brinjals, etc) gave relatively "high" incomes, as the yield of these crops is relatively high (volume of output / produce) and they could get relatively high income. On the other hand, some crops (Eg: Bengal gram Red Gram, Soghum, etc) are profitable, from water point of view. But the income from these crops is fairly small, as the volume of the produce / output of these crops is fairly small.

There was considerable discussion on net incomes and profits (Rs / Unit of Water). While several crops that gave good incomes (Eg: Chillies, Haldi,

Relationship between Water Use and Net Income AND Water Use and Profit (Rs/ Hour of Water Pumped) for Different Crops

High – Income	**Nil**	**Chilies, Haldi, Brinjals, Onion**
Low - Income	Tomato, Cotton, Groundnut, Green gram, Maize, Red Gram, Bengal Gram, Sorghum, Wheat, Black Gram Low Water	Paddy High – Water
High Profit (per unit of water)	**Red Gram, Green Gram, Bengal Gram**	**Chillies**
Low Profit (Per unit of water)	Ground nut, Tomato, Cotton, Sorghum, Maize, Wheat, Black Gram Low Water Use	Haldi, Onion, Brinjal, Paddy High Water Use

Brinjals, Onions), they are not necessarily “profitable” from water point of view. These crops consume “more”water, in comparison to other crops. Similarly, paddy consumes more water (than other crops), but gives relatively high income. But profitability of this crop is lowest.

Similarly, there are other crops which consume low water, but give high profit, per unit of water consumed. These crops are Red gram, Green Gram, Bengal gram. However, the net income from these crops is not high. Crops like Groundnut, Tomato, Cotton, Sorghum, Maize, Wheat and Black gram consume low water and also give low net incomes. These crops also give low profit (per unit of water).

The yields of crops are influenced by water availability at critical stages of the crop. As these villages are largely dependent on groundwater for irrigation, the survival and yields of crops is dependent on groundwater. The availability of water (particularly yields of water from bore wells) is dependent on aquifer characteristics. The number of hours for irrigation / acre could be very high, when the aquifer has low yields and vice versa. From this, it is very clear that local geo-hydrological features and aquifer characters have a strong role in influencing the “profitability” of crops, from water use point of view.

Given the scarcity and negative water balances in most the villages, it is desirable to move towards “crops that require less water”.

Similarly, the value of “critical irrigation” was well appreciated by the farmers, during the discussions. The crops and area under crops could be defined in such a way that all crops get critical irrigation. This ensures the survival of crops and good yields, from all rain-fed crops. The choice of crops could focus on food security, income security and water security; if critical irrigation based water management is promoted.

These discussions also established the dilemmas among the farming community on the choices they make on agriculture. The new dimension – "profit – net income per unit of water pumped" gave another dimension in the analysis. Some of the key questions that emerged from this discussion are the following.

- ✓ When water is very important and life-saving, how judiciously, should we use this resource?
- ✓ Where do we apply water and where do we not apply water?
- ✓ What is the balance between net income and profit (net income per unit of water)?
- ✓ What combination of crops could help in reducing the water demand and maintain income and food security?
- ✓ Can we completely stop crops that require high quantities of water? Can we completely shift to crops that require little water? If so, can we secure our incomes?
- ✓ If we opt for changes in cropping pattern, where do we get required seeds? What is the method of growing millets? What is the method of cultivating paddy under System of Rice Intensification? How do we face market fluctuations? What the likely incomes (profit and net incomes) from these changes?
- ✓ When aquifers are playing important role in water management, how do we change our cropping systems that are in tune with local aquifers and groundwater availability? What kind of norms and practices are essential for maintaining the water balance in the village? (Ensuring water for drinking at the basic level)

Crop Water Budgeting Exercise-A New Starting Point for Watershed Management

While the Crop Water Budgeting Exercises are being conducted, the facilitator team got new insights on the local conditions – aquifer situation, climate related variations / trends, crops and water use; incomes and profits per unit of water, food habits and other aspirations of the farmers (also dilemmas). Farmers and village leaders wondered about the timing of this exercise. They argued that this exercise could be the "starting point" of watershed management project. They were little annoyed that this "water knowledge" dawned upon them at the fag-end of the project through this exercise and it is very likely that the village may get little support in "transforming" the water related practices. "As the Project Facilitating Agencies and others are likely to withdraw from the village very soon, who will support them in this change process?" was a pertinent question.

From this feedback and observation from farmers, it is a good idea to begin the watershed management projects with "crop water budgeting exercise" and instill the sense of urgency and responsibility among the farmers on importance of prudent systems, regulations, practices and decisions related to water use in villages. Through this process documentation report, which is also like a "manual on Crop Water Budgeting Exercise", we hope that the project facilitators opt for a different starting point for watershed management – Crop Water Budgeting Exercise.

Annexure No 1

Key Mile Stones of Crop Water Budgeting Program - in 4 Districts

Sl.No	Steps	Date of completion	Each stake holder Responsibility						
			PGWM team	RSO team (IGWDP)	PFA	VWDC	WASSAN training team	WASSAN Resource Centre	Others
1	Identification of PRPs	30/8/2014	✓						
2	Data collection on cropping practices etc(primary)	10/9/2014	✓	✓	✓	✓			
3	Content finalization for crop water budgeting	3/9/2014	✓						Bakkareddy
4	Finalization of module on CWB	8/9/2014	✓				✓		Bakkareddy
5	Developing communication material	8/9/2014						✓	MV Ram, Bakkareddy
	Organizing TOT	15/9/2014	✓				✓		
	1st batch (orientation to PFA on 9th & 10th sep)	10/9/2014	✓						
	2nd batch (PRPs)	15/9/2014	✓						
	3rd batch (PRPs)	15/9/2014	✓						
6	Village Watershed wise crop water budget preparation plan a. awareness building b. facilitation of crop water budgeting plan	15/9/2014	✓	✓	✓	✓			
7	Completion of Crop water budgeting at watershed level	20/10/2014	✓	✓	✓	✓			
8	Program monitoring systems	20/10/2014	✓	✓	✓	✓			
9	Report submission by PRPs	30/11/2014	✓	✓					PRPs
10	Establishing GW monitoring systems (50 farmers)	14/12/2014	✓	✓	✓	✓			
11	Process documentation (Impact etc)	20/1/2015	✓						support from NOK/ HID

Annexure No 2

Village level Information for Crop Water Budget Planning

1	Reporting person:	Reporting date:
2	District:	Mandal:
3	Average Rain fall in mm:	Average Rain fall in mm:
4	Name of the watershed:	Gram Panchayath:
5	Average Rain fall in mm:	Average Rain fall in mm:
6	Total watershed area in acre:	

Village wise drinking water demand

S.No.	Information	Unit	Village1	Village 2	Village 3
1	Village	Name			
2	Total geographical area	Acre			
3	Total Human Population	Nos			
4	Total large ruminant / cattle (Cow / Bullocks / Buffalos / etc.) population	Nos			
5	Total small ruminant (Goat and sheep) population	Nos			
6	Total poultry population	Nos			

Contd....

S.No.	Village wise irrigated crop details															
	Village name	**Unit**	**Village 1**				**Village 2**				**Village 3**					
	Cropping year		**2013-14**		**2014-15**		**2013-14**		**2014-15**		**2013-14**		**2014-15**			
	Cropping season and cop	**Acre**	Rabi	Summer	Kharif	Proposed Rabi	Rabi	Summer	Kharif	Proposed Rabi	Rabi	Summer	Kharif	Proposed Rabi		
1	Paddy	Acre														
2	Ground nut	Acre														
3	Red gram	Acre														
4	Sweet Orange	Acre														
5	Caster	Acre														
6	Jowar	Acre														
7	Chillies	Acre														
8	Tomato	Acre														
9	Onion	Acre														
10	Sugarcane	Acre														
11	Bendi	Acre														
12	Banana	Acre														
13	Bengal gram	Acre														
14	Green gram	Acre														
15	Bajra	Acre														
16	Finger millet	Acre														
17	Wheat	Acre														
18	Maize	Acre														
19	Sun flower	Acre														
20	Cotton	Acre														
21	Any other specify	Acre														
	Total irrigated crop	**Acre**														

Annexure No 3

List of Resource Persons wo facilitated Crop Water Budgeting Exercises

Sl.No	Name of the Participant	Age	Caste	Qualification (Academic/ Technical details)	Organisation/ Designation	Experience in Years	Poster Address/ Mobile/ Email
1	G.Uthappa	36	BC	Degree	WASSAN	16	D.NO:1-1092, Vema Reddy circle, Bypass road,kadiri, Dist - Ananthapur. 9490694987 uthappawsn@gmail.com
2	P.Chandramohan	40	BC	MA	WASSAN	15	WASSAN RSO, HNO:11.192, Utnoor, Adilabad. 9490694986 poodari.chandramohan@gmail.com
3	A.Vasanth Rao	40	ST	B.Tech	CCD (centre for collective dev)	16	CCD above TVS Show Room, Mainraod, Utnoor 9440615952ccd. adilabad@gmail.com
4	M.Surendranath	30	SC	MA	AF, Ecology, ATP	2	D No:3-93, K, Kothuru (V), karthanaparthi(P),kambadur(M) ATPdist 9704275647 afsurendra2014@gmail.com
5	D.MarriSwamy	56	BC	B.Com	AF,Ecology, ATP	31	S/o. D.Dasappa, D No: 8-42. Kadiri, ATP-515766 9652210318
6	A.Gopal	29	BC	BA	AF,Ecology, ATP	2	Dno:1/64, kurakuntalatota (V) Kalyandurgammavedi (M), ATP 9000464561
7	M.Ramesh	27	BC	MA,B.Ed	AF,Ecology, ATP	1	DNo:1/138, rudranpalli(V), kundrup(M), ATP 9963414766 www.rameshraju@gmail.com
8	K.Vijayalakshmi	27	BC	BA(RD)	AF,Ecology, ATP	4	w/o: G.Manohar, HRpalli(V), Beluguppa(M), Atp 8106439920
9	D.Thirumal Reddy	38	OC	Inter. ITI	WASSAN	-	S/o:Kunaram. PP Colony(V), Kalwasrirampur(M), Karimnagar 9553085777 emureddy@gmail.com
10	D.Yadaiah	42	SC	BA	WASSAN APMAS	16	D.Yadaiah,PO Reddy palli(V) basnapur(P), Koheda (M), karimnagardist 9948173810/ 9440087045 ydabbeda@gmail.com
11	SK.Gouse	32	BC	BA	Mari C.C	7	Katrapally(V), Shyampet(M), Warangal dis t9848436322/ 9396939463

Sl.No	Name of the Participant	Age	Caste	Qualification (Academic/ Technical details)	Organisation/ Designation	Experience in Years	Poster Address/ Mobile/ Email
12	Ch.Tirupathi	42	SC	BA	APMSS	3	TSMSS, Hno:28-3-210/5,Coltex, Bellampalli 9533855033 thiruchelvatkari@gmail.com
13	K.Sagar	28	BC	B.Com	APMSS	3	TSMSS,Hno:28-3-210/5, Coltex, Bellampalli 7569325505 sagar.kaleshwar@gmail.com
14	B.Kesava Rao	26	BC	BSc. Biotech	WASSAN		Papakollu (V)&(P), Julurpad(M), Khammam Dist 9642476243 kesava.baluguri@gmail.com
15	J.Rambabu	27	ST	Civil & BA	BOW & ARROW	4	Pokalagudem,Chandrakonda (M), Khammam 9912367022/8374427311 rambabusampala@gmail.com
16	NN.Mohan	37	SC	B.Com	DSSS	6	S/o: VaraprasadRao, Christianpeta(V), Gangaram(P) Sattupally(M) Khammam 9866869624/9542454566 chandrabn99@gmail.com
17	CV.Rajesh	27	SC	Degree	Jagruthi	5	Kaikondagudem, Khammampura(M), Khammam 9573922144 vanguri.rajesh@yahoo.com
18	K.Veeraraju	23	SC(B)	Diploma Civil	CHESTD/ Engineer	3	S/o:Mutaiah,Plot No:410, Manchkantinagar, Nayabharat, Palvocha, Khammam 8790097040 vraju.kankam@gmail.com
19	B.Rajender	22	SC (B)	Diploma Ag.	WASSAN	1.5	S/o:pochaiah,Hno: 4-62/1, Doddopally, KMR 9676099823 rajenderboragall@gmail.com
20	G.Hanmandlu	22	BC-D	BA	CRD	1.5	Hno:1-41pardi(V) Kubeer(M), Adilabad 9848061934 hanmandlu934@gmail.com
21	J.Rajkumar	27	BC-B	MBA	RETWS	1.5	Ghanpur(V),, Nennel(M) Adilabad 9177507159 rajkumargoudjakula@gmail.com
22	G.SrinivasGoud	30	BC-B	BA	NPM,CA	4	Gollapalli(V), Nennela(M), Adilabad 7702872874 gsrinivasgoudnpm@gmail.com
23	S.Sainath	30	BC	BA	CRD	2	pardi(V), Kubeer(M), Adilabad 9951172621
24	K.Balaraju	27	BC	MSW	WASSAN I & CB	1	pinnamacherla(V), Atmakur(M), Mbnr 9912684866 kharthi.balu@gmail.com

Sl.No	Name of the Participant	Age	Caste	Qualification (Academic/ Technical details)	Organisation/ Designation	Experience in Years	Poster Address/ Mobile/ Email
25	B.Vijaya Karimnagar 9701194697	31	BC	MSW	APMSS	3	metapply(V), Metapally (M).
26	G.Laxmi	28	BC	MSW	APMSS	3	gambhiraopet(V), gambhiraopet(M), Karimanagar 9959769282
27	K.Rajani	26	BC-B	MA,TPT,MSW	APMSS	2	Maddikunta(V), Mustabad(M), Karimanagar 9492006932 / 8978356042 prgoud.kadiri@gmail.com
28	P.Venkatesh	26	BC-A	BSc.Agril	WASSAN	2.5	Doultabad(V), Doultabad(M), Mbnrdist 8985702405 venky.wassan@gmail.com
29	S.Gopal	30	BC-D	MA	MMS	5	gokatasalur(V), Doultabad(M), Mbnr 9989159065 gopaljaisri@gmail.com
30	T.Ramesh	20	ST	Diploma Agril	WASSAN	.3	Thimalapur(V), kukacherla(M), Rangareddy 8179355507 tagpramesh@gmail.com
31	E.Narsimhulu	22	BC	CRP	WASSAN	2	sultanpur(V), parigi(M), Rangareddy 9177116472 narsimhulusv@gmail.com
32	K.Saichand	22	BC	BSc.Agril	WASSAN	1	Thimalapur(V), kukacherla(M), Rangareddy 8978204841 saichand165@gmail.com
33	B.Swamy	28	SC	Bcom, MC	JAPMSS R.P	1.5	laxmapur(V), Bejjavli(M) 9440056380 swamy12882@gmail.com
34	B.Raj Kumar	22	SC	B.Com	APMSS FI	1.5	pothavarm(V), Bejjanath(M), karimnagar 9494361634 rajkumarboini205@gmail.com
35	K.Sateesh Kumar	40	OC	PhD	WASSAN / SPO	13	WASSAN 9490694983 k_satya2000@yahoo.com
36	B.Ravinder	41	BC	Diploma Ag.	WASSAN / PO	14	WASSAN 9440621869 battula.ravinder@gmail.com

Annexure No 4

Schedule of the Training of Trainers Program on Crop Water Budgeting and Ground Water Management under IGWDP

Session	Starting time	Closing time	Subject / Topic	Method	Facilitator
			Day one: 10th September 2014		
I	09:30 AM	10:00 AM	Opening remarks		DGM,IGWDP-AP
	10:00 AM	10:30 AM	Introduction, expectations of trainees and setting training norms	Self, Writing on flash cards and group discussion	C. Bakka Reddy
	10:30 AM	11:30 AM	Training objectives and expected end results of Training program	Guided question and consolidation of learning's	
	11:30 AM	11:45 AM	Tea break		
II	11:45 AM	1:30 PM	Hydrological cycle	Presentation / Group discussion	Dr.KV Rao / Bakka Reddy
	01:30 PM	02:15 PM	Lunch Break		
III	02.15 PM	04.15 PM	Concept of crop water budgeting	Presentation, Exercise	Bakka Reddy / MV.Ram
	04:15 PM	04:30 PM	Tea Break		
IV	04:30 PM	05:30 PM	Different Irrigation methods , constraints, and water saving technologies	Interactive lecture / PPT	Dr.KV Rao / Bakka Reddy
	05:30 PM	06:00 PM	Day 1 Review & Consolidation	Review	Satish / Ravindar
			Day two: 11th September 2013		
I	09:30 AM	10:00 AM	Reporting and review	Review	Bakka Reddy
	10:00 AM	11:30 AM	Calculation of crop water requirement	PPT and Exercise	
	11:30 AM	11:45 AM	Tea break		
II	11:45 AM	01:30 PM	Introduction to hydro geology, behavior of the ground water	Presentation and discussion	K.Sridhar
	01:30 PM	02:15 PM	Lunch Break		
III	02:15 PM	04:00 PM	Importance of Participatory ground water monitoring systems	Presentation with exercise	K.Sridhar / Kumar Swamy Reddy
	04:00 PM	04:15 PM	Tea Break		
IV	04:15 PM	05:30 PM	Discussion on Unit water income	Small group discussion and presentation	Bakka Reddy
	05:30 PM	06:00 PM	Day 2, Review and consolidation	Review	Satish / Ravindar

Session	Starting time	Closing time	Subject / Topic	Method	Facilitator
Day three: 12th September 2013					
I	09:30 AM	10:00 AM	Reporting and review		
	10:00 AM	11:30 AM	Discussion on training methodology	Small group discussion and presentation	Bhaktar Vali
	11:30 AM	11:45 AM	Tea break		
II	11:45 AM	01:30 PM	Base line survey format	Format explanation	Bakka Reddy
	01:30 PM	02:15 PM	Lunch Break		
III	02:15 PM	04:00 PM	Introduction of ground water collectivization	Posters	Uttappa / Kumar Swamy Reddy
	04:00 PM	04:15 PM	Tea Break		
IV	04:15 PM	05:00 PM	Group formation and field task preparation	Exercise	Bakka Reddy and RSO coordinators
	05:00 PM	05:30 PM	Day 3, Review and consolidation	Review	C.Bakka Reddy

Annexure No 5

Schedule of Crop Water Budgeting awareness Program organizing report under IGWDP-NABARD, Telangana

Reporting person: C.Bakka Reddy, WASSAN Date Reporting:30th March 2015

Sl.No.	District	PFA	Watershed	From	To	Resource persons from PGWM WASSAN	Remarks
				Sep-14			
1	Karimnagar	SEWS	Nizambad	16th	17th	Bakka Reddy demo and resource persons team (Thirumal Reddy, Rajini, Laxmi, Ajay, Saichand, Ramakanth, Vijaya and Laxmi	Demonstration program to PRPs
2	Karimnagar	SEWS	Nemali gundlapally	17th	18th	Ajay,Laxmi and Vijaya	
3	Karimnagar	SEWS	Surampet	18th	19th	Ajay,Thirumal Reddy	
4	Karimnagar	KRUSHI	Laxmipur	17th	18th	Sai Chand, Rajini and Yadaiah	
5	Karimnagar	SAHAYA	Battulapally	22nd	23rd	Rajender, Rajini and Yadaiah	
6	Karimnagar	SAHAYA	Mettubabd	23rd	24th	Rajender, Rajini and Yadaiah	
7	Karimnagar	SHARP	Bayyaram	22nd	23rd	Sai Chand, Laxmi and Thirumal Reddy	
8	Karimnagar	SHARP	Devarmpally	23rd	24th	Sai Chand, Laxmi and Thirumal Reddy	
9	Karimnagar	SHARP	Dhanwada	23rd	24th	Sai Chand, Laxmi and Thirumal Reddy	
10	Warangal	MARI	Gopirajpet	17th	18th	Rajender,Krishna and Keshavarao	
11	Warangal	MARI	Kakatiya	18th	19th	Rajender,Krishna and Keshavarao	
				Oct-14			
12	Adilabad	SISS	Emaikunta	13th	14th	Bakka Reddy ,Chandra Mohan Demo along with resource person team (Thirupath, Sagar, Sainath and Hanmandlu)	Demonstration program to PRPs
13	Adilabad	SISS	Harkapur	14th	15th	Thirupathi, Sainath, Sai chand and Sagar	Kailasnagar and Machapur
14	Adilabad	SISS	Indravelly	14th	15th	Ajay, Hanmandlu,K.Sagar	
15	Adilabad	Dhan Foundation	Dharma Sagar	15th	16th	BakkaReddy,Sainath	
16	Adilabad		Durvaguda	15th	16th	Ajay, Hanmandlu	
17	Adilabad		Rampur	15th	16th	Sai chand,Ramakanth	
18	Adilabad	COFA	KohiBnur B	30th	31st	Hanmandlu,Nandu	
19	Adilabad	COFA	Shetti Hadpanur	30th	31st	Thirupah,Sainath	
20	Adilabad	COFA	Kerimeri	30th	31st	Ajaya, Sagar	
21	Warangal	MARI	Kakatiya	31st	31st	Ramakanth, Rajini	2nd round orientation
22	Warangal	MARI	Bharath	29th	30th	Sathish, Ramakanth and Rajini, Yadaiha	Kusumbai Thanda

Sl.No.	District	PFA	Watershed	From	To	Resource persons from PGWM WASSAN	Remarks
23	Warangal	MARI	RC Gudem	30th (9.00AM)	30th (9.00PM)	Ramakanth,Rajini	
24	Warangal	PSS	Sri Venkate-shwara WS,	29th	30th	Sai chand ,Thirumal Reddy and Laxmi	Lachathanda
25	Warangal	PSS	Veeraram	31st (8AM)	31st (9.30PM)	Sai chand ,Thirumal Reddy and Laxmi	
26	Warangal	PSS	Abbayipalem	30th (7AM) Nov-14	30th (9.30PM)	Sai chand ,Thirumal Reddy and Laxmi	
27	Warangal	PSS	Cheekataya-palem	8th	9th	Thirumal Reddy and Sai chand	
28	Warangal	Lodhi Society	Ayyagari pally	7th	8th	Thirumal Reddy and Saichand	
29	Warangal	Lodhi Society	Chinthapalli	7th	9th	Lakshmi and Rajani	
30	Warangal	Lodhi Society	Gollacherla	8th	9th	Laxmi and Rajini	
31	Medak	PEACE	S.Venkata pur	15th	16th	Ramakanth and Rajini	
32	Medak	PEACE	T.Narsapur	16th	17th	Thirumal Reddy and Rajini	
33	Medak	PEACE	Kashi Reddypally	15th	16th	Saichand and Thirumal Reddy	

Annexure No 6

రోజువారీ వర్షపాత వివరాల సమాచారం (మి.మీ) 20 -

వాటర్‌షెడ్ పేరు	గ్రామం పేరు
మండలం పేరు	జిల్లా పేరు

రోజువారీ వర్షపాతం (మి.మీ)

	20___ సంవత్సరం							20___ సంవత్సరం				
తేది	జూన్	జులై	ఆగష్టు	సెప్టెంబరు	అక్టోబరు	నవంబరు	డిసెంబరు	జనవరి	ఫిబ్రవరి	మార్చి	ఏప్రిల్	మే
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భూగర్భ జలాల సామాజిక పర్యవేక్షణ బోర్డు 20 -

వాటర్‌షెడ్ పేరు

గ్రామం పేరు

మండలం పేరు

జిల్లా పేరు

క్రమ. సం.	రైతు పేరు	తండ్రి పేరు	ప్రాంతం (ఎత్తయిన/ మధ్య స్థం/ పల్లపు వాటర్‌షెడ్ భాగం	బావి రకం (బోరుబావి/ తవ్వినబావి)	భూగర్భజల నిలకడ నీటి మట్టం వివరాలు (అడుగులో) (నెలవారిగా నిర్ధారిత తేదీలలో సేకరించాలి											
					20 సంవత్సరం							20 సంవత్సరం				
					జూన్	జులై	ఆగష్టు	సెప్టెంబరు	అక్టోబరు	నవంబరు	డిసెంబరు	జనవరి	ఫిబ్రవరి	మార్చి	ఏప్రిల్	మే
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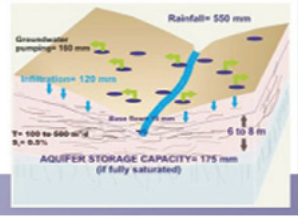
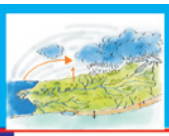
సూచన:

మొదటి ప్రాధాన్యత : ఎక్కువ నీరు అవసరమయ్యే పంటలు తగ్గించి, వర్షాధార పంటలకు కీలక దశలలో నీరు ఇవ్వడం

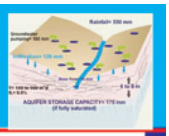
రెండవ ప్రాధాన్యత : పెసర్లు, శనగ, కంది, పొద్దు తిరుగుడు, రాగి, టమాట, వేరుశనగ/ పల్లి, సజ్జ వంటి ఆరుతడి పంటలకు ప్రాధాన్యతనిస్తూ నీటి ఆదా పద్ధతులు పాటించాలి

మూడవ ప్రాధాన్యత : గోధుమ, ఉల్లి, ఆముదం, మొక్కజొన్న, జొన్న వంటి ఆరుతడి పంటలకు ప్రాధాన్యతనివ్వాలి





గ్రామ నీటి నిల్వ బడ్జెట్ - 2013-14



గ్రామ నీటి ఖర్చుల (వ్యయాల) అంచనా

తాగు, పారిశుధ్య నీటి అవసరాల అంచనా

క్రమ సంఖ్య	తాగు, పారిశుధ్య అవసరం	పరిమాణం	నీటి అవసరం (ఎకరా మీటరు/1000)	మొత్తం నీటి అవసరం (ఎకరా మీటరు)
1.	జనాభా		4	
2.	పెద్ద పశువుల సంఖ్య		6	
3.	చిన్న పశువుల సంఖ్య		1	
4.	పెంపుడు కోళ్ళ సంఖ్య		0.5	
5.	ఇతరములు			
	మొత్తం			

పంట నీటి అవసరాల అంచనా

క్ర. సం.	పంట	ఎకరా నీటి అవసరం మీటర్లు	ఖరీఫ్ కాలం ప్రస్తుత పంటలు			రబీ కాలం ప్రతిపాదిత పంటలు		
			నీటి ఆధారం (ఎకరాలు)	నీరిచ్చే పద్ధతి	మొత్తం నీటి అవసరం(ఎ.మీ.)	నీటి ఆధారం (ఎకరాలు)	నీరిచ్చే పద్ధతి	మొత్తం నీటి అవసరం(ఎ.మీ.)
1	2	3	4	5	7	8	9	10
1.	వరి	1.250						
2.	వరి (శ్రీపద్ధతి)	1.250						
3.	పత్తి/పసుపు	0.750						
4.	మొక్కజొన్న/జొన్న	0.525						
5.	పొద్దు తిరుగుడు	0.425						
6.	పూలతోట	0.600						
7.	ఉల్లి/ఆముదం	0.500						
8.	మిరప/ బెండ	0.600						
9.	అరటి	1.100						
10.	చెరకు	2.350						
11.	పెసర	0.325						
12.	కంది/శనగ	0.400						
13.	గోధుమ	0.500						
14.	బత్తాయి	1.050						
15.	వేరుశనగ/టమాట	0.425						
	మొత్తం							

మొత్తం నీటి వ్యయం = తాగునీటి అవసరాలు + పంటనీటి అవసరాలు + వచ్చే సంవత్సరం తాగునీటి అవసరాలు (20 శాతం)

మొత్తం నీటి వ్యయం =

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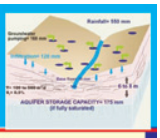
గ్రామ నీటి నిల్వ బడ్జెట్ - 2013-14



గ్రామం _____ **మండలం** _____

గ్రామ సమాచారం

మొత్తం భూమి విస్తీర్ణం _____ ఎకరాలు **వర్షపాతం మొత్తం** _____ మీటర్లు

గ్రామ నీటి లభ్యత అంచనా

గ్రామ భూమి విస్తీర్ణం (ఎకరాలు) × వర్ష పాతం (మీటర్లు)

మొత్తం గ్రామం నీటి లభ్యత _____ ఎకరా మీటర్లు

వివిధ రూపాలలో నీటి లభ్యత

నేల తేమ, ఆవిరి, భాష్పీభవనం రూపంలో	70%	ఎకరా మీటర్లు
వరద రూపంలో	20%	ఎకరా మీటర్లు
భూగర్భ జల రూపంలో	10%	ఎకరా మీటర్లు
మొత్తం నీటి లభ్యత	100%	ఎకరా మీటర్లు

వరద నీటి నిలువల అంచనా

క్రమ	నిర్మాణం	సంఖ్య	విస్తీర్ణం (ఎకరాలు)	నీటిలోతు ×0.60(మీ)	ఎన్నిసార్లు నిండింది	ఆవిరి నష్టాలు	మొత్తం నీటి నిలువ (ఎకరా మీటరు)
1.	చెరువు						
2.	ఊటకుంట						
3.	చెక్‌డ్యాం						
4.	ఫారం పాండు						
5.	కందకాలు						
6.	నీటి మడుగులు						
	మొత్తం						

నికర నీటి లభ్యత = భూగర్భ జలం + వరదనీటి నిలువ _____ ఎకరా మీటర్లు

గ్రామ నీటి బడ్జెట్ = నికర నీటి లభ్యత – మొత్తం నీటి ఖర్చు = (+) మిగులు/ (–) లోటు

గ్రామ నీటి బడ్జెట్ = _____ ఎకరా మీటర్లు

నీటి సమతూక సూత్రాలు

1. నీటి లభ్యత నిల్వలు లోటుగా ఉంటే దానికి అనుగుణంగా రబీ పంటల విస్తీర్ణాన్ని తగ్గించుకొని తక్కువ నీటితో పండే పంటలకు మారాలి.
2. నీటి పాదుపు పద్ధతులను పాటించాలి. వచ్చే సంవత్సరానికి కావలసిన తాగునీటి అవసరాలకు నీటిని కేటాయించిన తరువాత మిగులు నీటిని మాత్రమే రబీ పంటల సాగును చేపట్టాలి.
3. నీటి లభ్యత నిల్వలు మిగులు ఉంటే వచ్చే సంవత్సరానికి నిలువ చేసుకోవచ్చు లేదా వినియోగించుకునే పంటల ప్రణాళికలు తయారు చేయాలి.
4. చెరువు మట్టి, సేంద్రియ ఎరువులు వేయడం ద్వారా నేల తేమ నిల్వ సామర్థ్యం పెరిగి నీటి అవసరం తగ్గుతుంది.
5. వరదనీటి పరిమాణంలో 50% వరకు నీటి నిలువ నిర్మాణాల ప్రణాళిక చేయాలి.
6. భూగర్భ జలాలు ఎక్కువగా ఇంకే ప్రదేశాలు గుర్తించి ఆ ప్రాంతంలో తగు నిర్మాణాలు చేపట్టాలి.
7. ఉన్నది. వ్యర్థిగత భూములలో చెట్లను/ పచ్చదనాన్ని పెంచడం ద్వారా నీటి ఆవిరిలను తగ్గించాలి.

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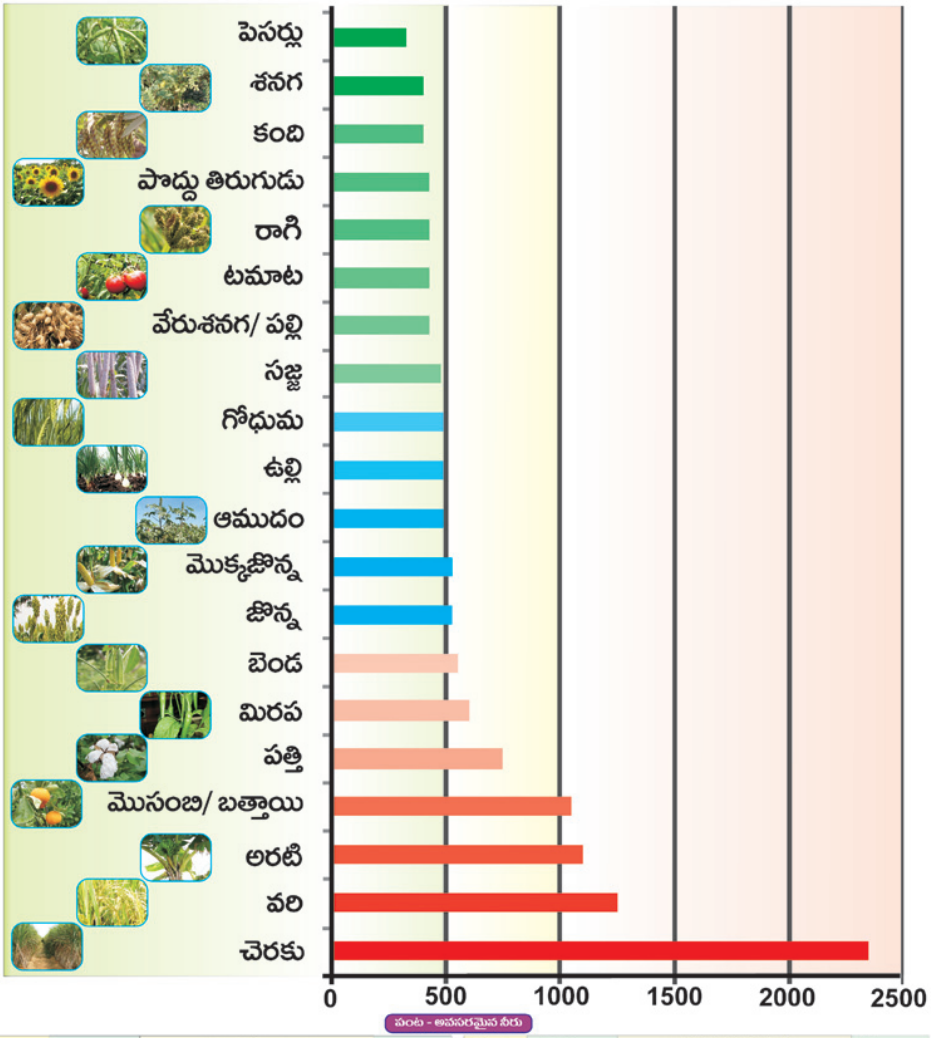
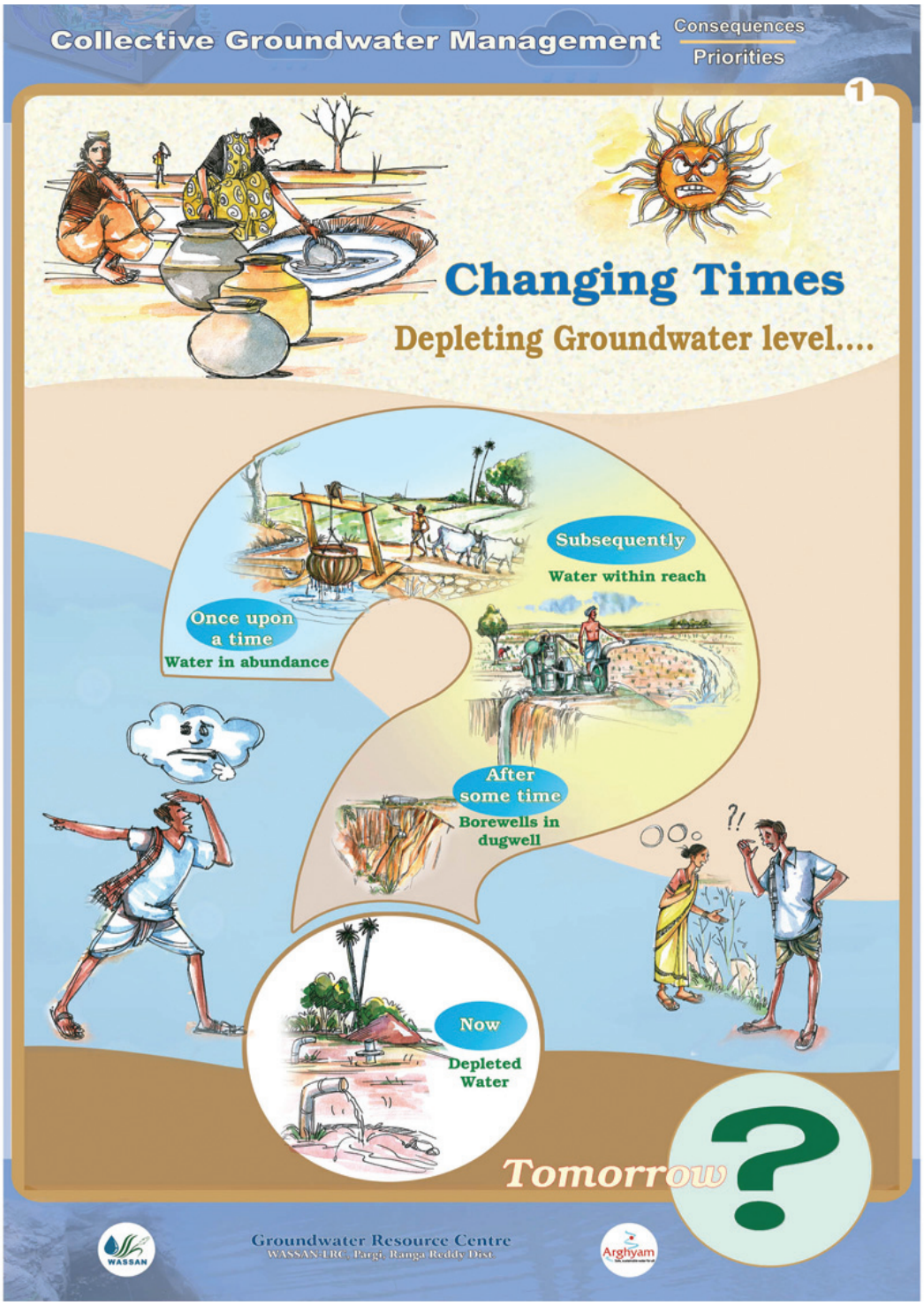
మీకు తెలుసా? ఏ పంటకు ఎంత నీరు కావాలో...

పంట తడి – నీటి అవసరం (ఎకరాకు మి.మీ.లు)



క్రమ సంఖ్య	పంట రకం	అవసరమైన నీరు (ఎకరానికి)			పంట కాలం
		మి.మీ. లలో	క్యూ.మీ లలో	లీటర్లలో	
1.	వరి	1250	5000	5000000	110
2.	వేరుశనగ	425	1700	1700000	100
3.	కంది	400	1600	1600000	150
4.	మొసంబి బత్తాయి	1050	4200	4200000	360
5.	ఆముదం	500	2000	2000000	110
6.	జొన్న	525	2100	2100000	120
7.	మిరప	600	2400	2400000	180
8.	టమాట	425	1700	1700000	90
9.	ఉల్లి	500	2000	2000000	90
10.	చెరకు	2350	9400	9400000	360

క్రమ సంఖ్య	పంట రకం	అవసరమైన నీరు (ఎకరానికి)			పంట కాలం
		మి.మీ. లలో	క్యూ.మీ లలో	లీటర్లలో	
11.	బెండ	550	2200	2200000	60
12.	అరటి	1100	4400	4400000	360
13.	శనగ	400	1600	1600000	110
14.	పెసర్లు	325	1300	1300000	80
15.	సజ్జ	475	1900	1900000	120
16.	రాగి	425	1700	1700000	70
17.	గోధుమ	500	2000	2000000	120
18.	మొక్కజొన్న	525	2100	2100000	120
19.	పొద్దు తిరుగుడు	425	1700	1700000	110
20.	పత్తి	750	3000	3000000	200


Collective Groundwater Management
Consequences
Priorities
1
Changing Times
Depleting Groundwater level....
Once upon a time
Water in abundance
Subsequently
Water within reach
After some time
Borewells in dugwell
Now
Depleted Water
Tomorrow ?
Groundwater Resource Centre
WASSAN-LRC, Pargi, Ranga Reddy Dist.
WASSAN
Arghyam

Changing Times...

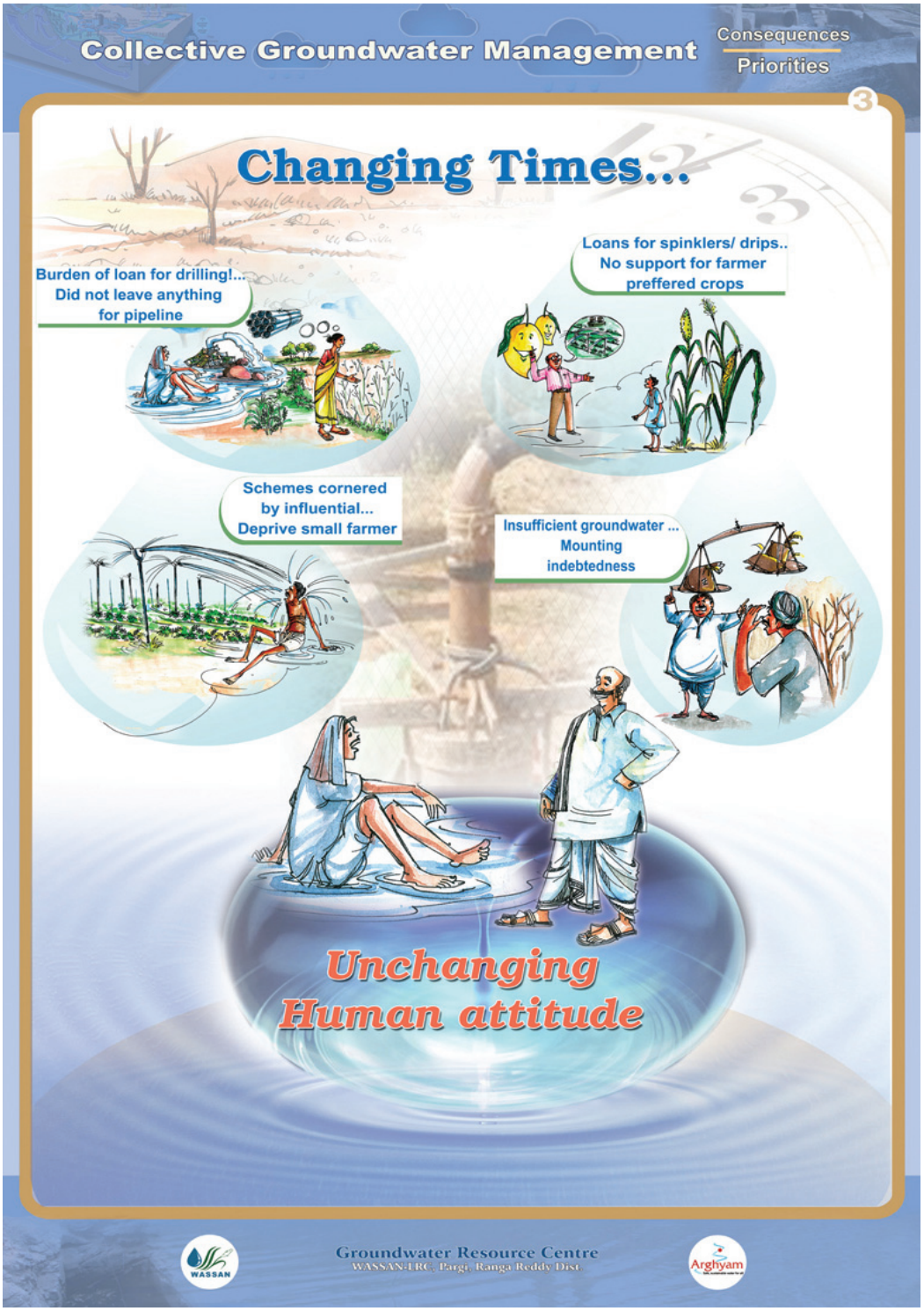
Hoping against hope

Chasing groundwater... Low success rate

Competitive drilling.. Uncertain future (water)

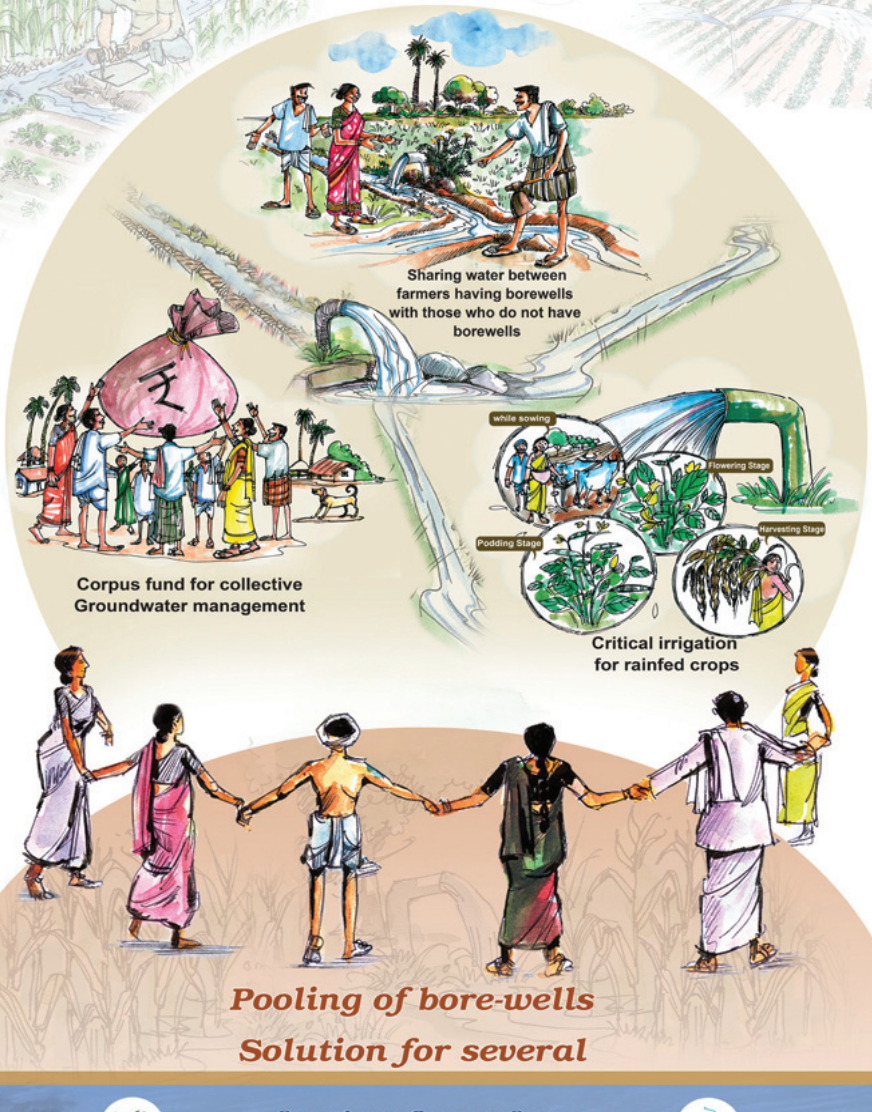
Rainfed agriculture... Turning into a mirage

Unchanging Human attitude


Collective Groundwater Management
Consequences
Priorities
3
Changing Times...
Burden of loan for drilling!... Did not leave anything for pipeline
Loans for spinklers/ drips.. No support for farmer preffered crops
Schemes cornered by influential... Deprive small farmer
Insufficient groundwater ... Mounting indebtedness
Unchanging Human attitude
WASSAN
Groundwater Resource Centre
WASSAN-LRC, Pargi, Ranga Reddy Dist.
Arghyam

Collective Conspiracy ... Never ending water Scarcity

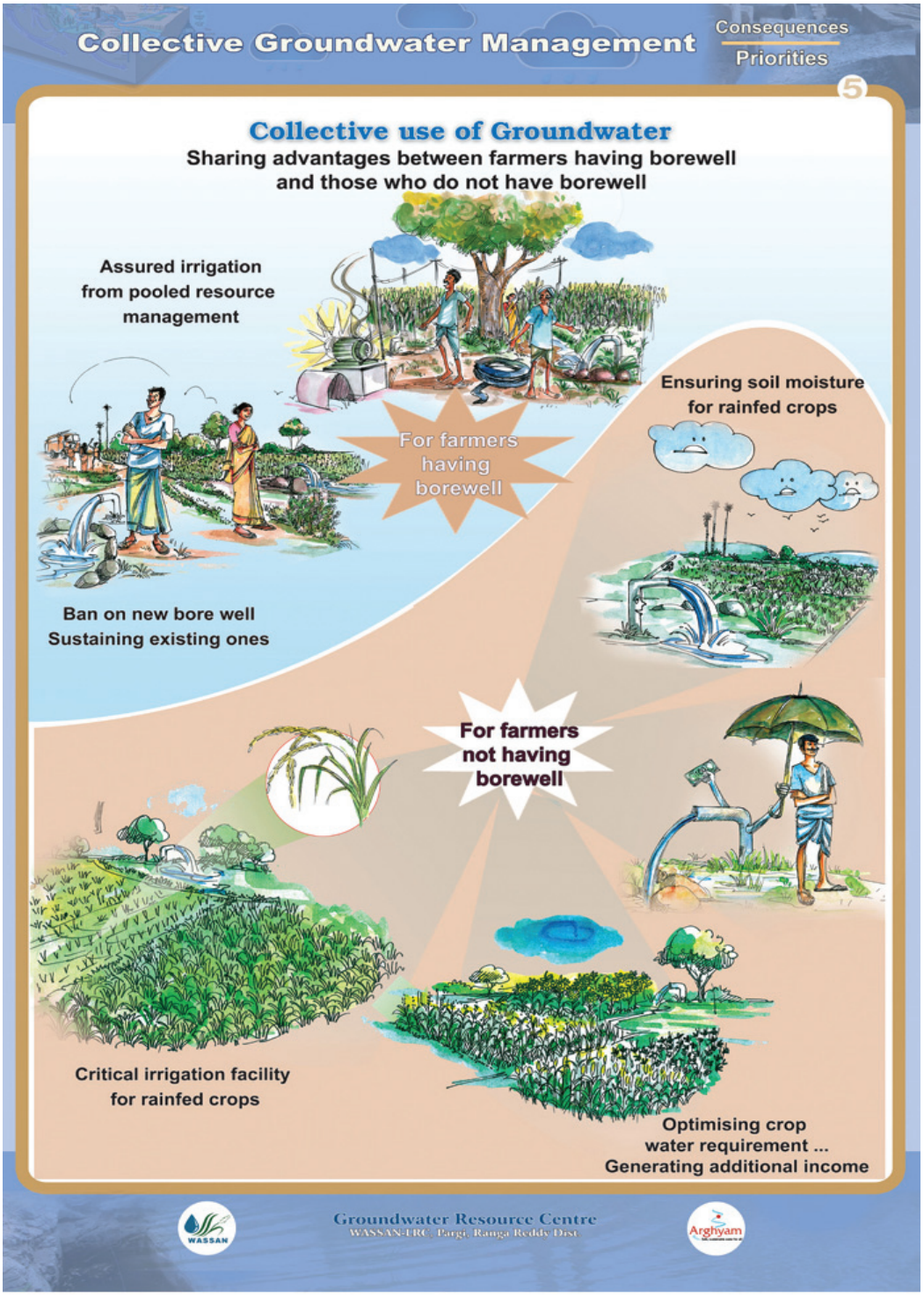
What is the Solution



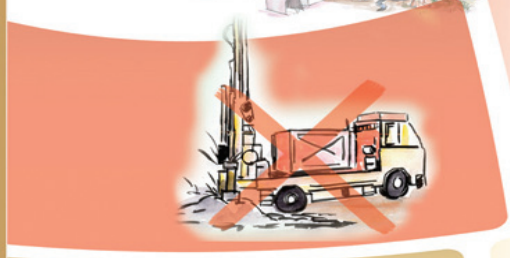
Pooling of bore-wells

Solution for several

Groundwater Resource Centre
WASSAN-LRC, Pargi, Ranga Reddy Dist.


Collective Groundwater Management
Consequences
Priorities
5
Collective use of Groundwater
Sharing advantages between farmers having borewell and those who do not have borewell
Assured irrigation from pooled resource management
For farmers having borewell
Ban on new bore well
Sustaining existing ones
Ensuring soil moisture for rainfed crops
For farmers not having borewell
Critical irrigation facility for rainfed crops
Optimising crop water requirement ...
Generating additional income
Groundwater Resource Centre
WASSAN-ERC, Pargi, Ranga Reddy Dist.
WASSAN
Arghyam

Non negotiable Principles



Pledge not to drill bore-well for next 10 Years

Groundwater potential based crop water planning during Khariff

Reduce area by 50% under water intensive crops and switch to rainfed crops

Develop common pool fund for maintainance

Plan for O & M every year and collect funds accordingly


Bore well owners share groundwater with farmers who do not have bore wells...
No of Districts: 3
Mehabubnagar, RR District, Anantapur
Facilitating Agencies
Mandal Mahila Samakhya (MMS),
Watershed Support Services and Activities Network (WASSAN)
Human and Natural Resource Development Society (HANDS),
Rural and Education Development Society (REDS),
Rural Integrated Development Society (RIDS),
Action Fraterna Ecology Center (AF),
Government Projects Accessed:
APDAI; RKVY; NAIP; MGNREGS; APMIP; CLDP
As part of "Collectivization of Groundwater" initiative, WASSAN and other partners are able to promote institutional arrangements for sharing groundwater.
Group discussion
Survey of proposed land
Draft proposed plan
Agreement between farmers having borewells and who do not have borewells
Monitoring, repair and maintenance by farmers
Micro Irrigation System
Training to farmers on soil, crop and water management
Trench work
Laying of Pipeline
Networking of Pipelines
Connecting Borewell
No of Villages 13
No of Groups of Farmers 22
No of Wells in Pipeline Network 113
No of Farmers having wells 134
No of Farmers not having wells 267
Total No of Farmers sharing water 401
Intense Irrigated Area brought into critical irrigation during Kharif (Acres) 268
Rain fed Area brought into critical irrigation during Kharif (Acres) 754
Total Area brought into critical irrigation (Acres) 1021
Farmer's Contribution Rs 881450
Project Contribution Rs 9742566
Total Expenditure Rs 10624016
Rs/ Acre 10405
Rs/ Farmer 26494
WASSAN

Annexure No 7

Water Balance Template

	Water Availability estimation	Quantity	Unit
A	Watershed / Village Area in Acre		Acre
B	Rain fall during monsoon of current year (as per nearest Rain gauge station)		m
C	Total rain water availability (A*B)	0	Acre meter
D	Water availability in different form		Acre meter
1	Soil moisture and evaporation form (70% of C)	0	Acre meter
2	Ground water form (Highly weathered hard rock's) based on the geology (10% of C in highly weathered igneous rocks)	0	Acre meter
3	Run off from catchment area (20% of C)	0	Acre meter
4	Surface storage water estimation		

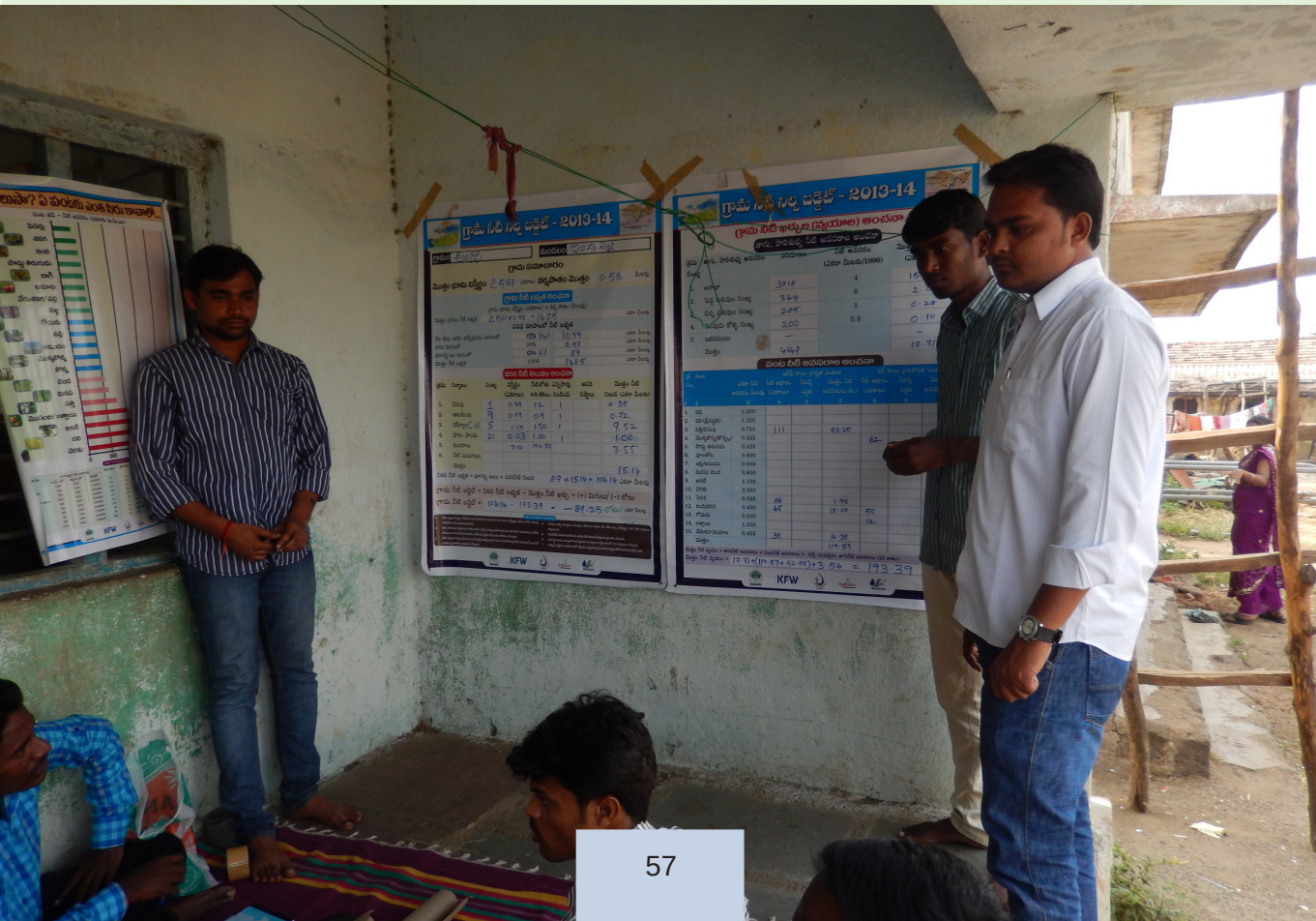
Sl.No.	Name of the pond / Tanks	Water storage measurements (Average in meter)			No of fillings	Total storage	Units
		Length	Width	Depth			
1						0	Acre meter
2						0	Acre meter
3						0	Acre meter
4						0	Acre meter
	Subtotal of surface storage					0	Acre meter

5	Artificial Ground water recharge							
Sl.No.	**Name of the structure**	**No of such structures**	**Water storage measurements (Average in meter)**			**No of fillings**	**Total storage**	**Units**
			Length	**Width**	**Depth**			
1	Percolation tank						0	Acre meter
2	Mini percolation tank						0	Acre meter
3	Earthen gully plugs						0	Acre meter
4	Dug out ponds in gullys						0	Acre meter
5	Farm ponds						0	Acre meter
6	Sunken farm ponds						0	Acre meter
7	Check dams						0	Acre meter
8	Check walls / masonry gabions						0	Acre meter
9	Water absorption trenches without contour						0	Acre meter
10	Water absorption trenches on contour						0	Acre meter
11	Staggered trenches without contour						0	Acre meter
12	Staggered trenches on contour						0	Acre meter
13	Continuous contour trenches						0	Acre meter
14	Any other please specify						0	Acre meter
	Subtotal of artificial Ground water recharge						**0**	Acre meter
	Net water available = Groundwater storage + Surface Storage + Arfificial ground water recharge							

Water extraction estimation

A. Drinking water demand

Sl.No.	Drinking water purpose	Total population	Unit water require-ment in acre meters	Unit qty	Total water demand per year	Units
1	Human beings		4	1000	0	Acre meter
2	Large ruminant		6	1000	0	Acre meter
3	Small ruminants (Sheep & goat)		3	1000	0	Acre meter
4	Poultry		0.5	1000	0	Acre meter
5	Other specify			1000	0	Acre meter
	Subtotal drinking water demand				0	Acre meter
B	**Industrial demand if any**					
Sl.No.	**Name of the industry**					
1						Acre meter
2						Acre meter
	Sub total				0	Acre meter



Sl. No	Crop Name	irrigation water depth in mm	Kharif crops (Sowing before or on monsoon)			Rabi crops (Winter crops sowing in October to December)			Summer crops (Sowing in January end in April/ may)		
			Area in acre	Per acre	Total (4*5)	Area in acre	Per acre	Total (7*8)	Area in acre	Per acre	Total (10*1)
1	2	3	4	5	6	7	8	9	10	11	12
1	Paddy	1250		1	0		1.25	0		1.375	0
2	Ground nut	425		0.34	0		0.425	0		0.4675	0
3	Red gram	400		0.32	0		0.4	0		0.44	0
4	Sweet Orange	1050		0.84	0		1.05	0		1.155	0
5	Caster	500		0.4	0		0.5	0		0.55	0
6	Zowar	525		0.42	0		0.525	0		0.5775	0
7	Chillies	600		0.48	0		0.6	0		0.66	0
8	Tomato	425		0.34	0		0.425	0		0.4675	0
9	Onion	500		0.4	0		0.5	0		0.55	0
10	Sugarcane	2350		1.88	0		2.35	0		2.585	0
11	Bendi	550		0.44	0		0.55	0		0.605	0
12	Banana	1100		0.88	0		1.1	0		1.21	0
13	Bengal gram	400		0.32	0		0.4	0		0.44	0
14	Green gram	325		0.26	0		0.325	0		0.3575	0
15	Bazra	475		0.38	0		0.475	0		0.5225	0
16	Finger millet	425		0.34	0		0.425	0		0.4675	0
17	Wheet	500		0.4	0		0.5	0		0.55	0
18	Maize	525		0.42	0		0.525	0		0.5775	0
19	Sun flower	425		0.34	0		0.425	0		0.4675	0
20	Cotton	750		0.6	0		0.75	0		0.825	0
21	Other crops specify			0	0		0	0		0	0
	Sub total of irrigation water				0			0		0	0
	Grand total										

extraction of ground water = 120% Drinking water Demand + Industrial Water Demand + Irrigation Water Demande

Net Water Balance = Net water availability – Demand = xx (+ or – acre mtrs)

Annexure No 8

Summary Statement of Water Balance in 32 Watersheds

IGWDP Watershed wise water balance Statement Year 2014-15

S.No	Districtwise Watershed Name	Water Demand in acre meter				Water Availability estimation								Water balance in acre meter	% of development	status of GR water
		Human& livestock	Standing Crops kharif	Proposed Crop rabi as per survey before awareness program	Total	Geographical area	Rainfall (mm)	Total Rain water in acre meter	SMC& Evaporation in acre meter	Runoff acre meter	Ground water acre meter	Surface storage / Infiltration in acre meter	Net water available in acre meter			
	Karim nagar															
1	Bayyaram	36.84	655	263.3	955.14	2875	625	1797	1258	359	180	77	257	-698	-271.48	OE
2	Devarampally	15.39	655	258.3	928.69	3600	625	2250	1575	450	225	45	270	-658	-243.46	OE
3	Laxmipur	10.83	206.95	144	361.78	1912	500	956	669	191	96	11	107	-255	-238.82	OE
4	Namiligundupalli	10.36	219.23	175.05	404.64	2375	640	1520	1064	304	152	3	155	-249	-160.76	OE
5	Nizamabad	16.02	379	331.43	726.45	3127	309	966	676	193	97	10	106	-620	-584.40	OE
6	Danwada	24.9	200	543.75	768.65	3045	620	1888	1322	378	189	157	346	-423	-122.11	OE
7	Mettubanda	5	108.81	190.49	304.3	1480	710	1051	736	210	105	12	117	-187	-160.51	OE
8	Bathulapalli	4.62	105.07	186.62	296.31	1802	710	1279	896	256	128	51	179	-117	-65.66	OE
9	Surampeta	11.54	759	450.45	1220.54	2270	556	1262	883	252	126	575	701	-520	-74.13	OE
	Warangal															
10	Erragollapahad	16.2	610	0	639.7	2600	600	1560	1092	312	156	31	187	-440	-235.76	OE
11	Bharath	12.43	346.55	208	558.69	3450	600	2070	1449	414	207	44	251	-316	-125.98	OE
12	Ramachandragudem	14.97	434.75	304.75	754	2622	600	1573	1101	315	157	13	171	-584	-342.04	OE
13	Sri Venkateswara	25.26	187.5	229.45	442.21	1087	550	598	418	120	60	28	88	-355	-404.89	OE
14	Veeraram	22.02	147.55	98.5	268.07	2555	550	1405	984	281	141	10	151	-117	-77.74	OE
15	Abbayipalem	32.17	139.5	133	304.67	2930	550	1612	1128	322	161	13	175	-130	-74.50	OE
16	Gollacherla	30.63	278.17	97.25	406.05	2755	500	1378	964	276	138	16	153	-253	-164.80	OE
17	Chinthapalli	49.03	216	116.75	381.78	3590	550	1975	1382	395	197	7	204	-177	-86.75	OE
18	Gopirajpalli	16.08	805	0	818.4	2390	600	1434	1004	287	143	1	145	-676	-466.81	OE
19	Cheekatayapalem	32.17	170.5	99.5	302.17	2125	500	1063	744	213	106	3	109	-193	-176.56	OE
20	Ayyagaripalle	63.7	211.75	122.62	398.07	2747	550	1511	1058	302	151	10	161	-237	-147.47	OE
	Adilabad															
21	Harkapur	14.51	166.5	54	235.17	2263	580	1313	972	263	79	1	80	-155	-193.69	OE
22	Indravelly	21.25	119.59	52.55	193.39	2561	580	1485	1099	297	89	15	104	-89	-85.48	OE
23	Yemaikunta	40.88	159.9	48.5	249.28	3437	620	2131	1577	426	128	30	158	-92	-58.14	OE
24	Sakeda	19.11	343.05	88.3	450.46	2417	1280	3094	2290	619	186	33	218	-232	-106.38	OE
25	Shettihadpanur	18.27	213	126.25	357.52	2500	1350	3376	2498	675	203	90	292	-65	-22.23	OE
26	Kohinur (B)	20.86	246.25	155.75	422.86	2470	1350	3335	2468	667	200	126	326	-97	-29.87	OE
27	Dharmasagar	12.68	412.5	93.27	518.54	1050	580	609	451	122	37	18	55	-464	-851.11	OE
28	Dhurvaguda	2	138.75	28.5	169.25	1065	580	618	457	124	37	1	38	-131	-345.61	OE
29	Rampurguda	12.85	99.97	77.24	190.06	828	580	480	355	96	29	10	39	-151	-387.65	OE
	Medak															
30	Theegulanarsapur	14.73	249.79	108.72	373.24	1436	550	790	553	158	79	4	83	-290	-348.61	OE
31	Shivarvenkatapur	15.61	272.97	130.07	418.65	2383	500	1192	834	238	119	3	123	-296	-241.39	OE
32	Kasireddypally	13.14	196.22	159.47	368.83	1436	550	790	553	158	79	1	80	-289	-360.92	OE

Annexure No 9

Crop - Water - Profits

Crop	No of Watersheds in which this crop is grown	No.of pumping hours/ Acre/ Season			Net Income Rs/Acre			Profit Rs/ 1 hour pumping water		
		Min	Max	Ave.	Min	Max	Ave	Min	Max	Ave
Redgram	5	4	20	12	10000	12500	11400	600	3125	1417
Greengram	8	6	20	11	6500	25000	14344	1000	1725	1340
Bengalgram	5	9	30	18	4800	10800	8920	300	667	523
Chillies	11	100	225	140	45500	110000	65260	312	688	468
Groundnut	8	20	72	38	11000	18500	14475	242	700	438
Haldi	1	120	120	120	50000	50000	50000	417	417	417
Tomato	6	16	70	39	4000	44000	17910	133	639	406
Cotton	28	25	100	45	6500	31000	15842	200	840	380
Onion	1	96	96	96	35000	35000	35000	365	365	365
Sorghum	8	15	70	34	4000	16000	8250	121	464	269
Maize	24	20	120	61	7200	23000	13421	100	547	258
Brinjal	1	140	140	140	35000	35000	35000	250	250	250
Wheat	8	28	90	52	3500	10000	5675	69	188	124
Blackgram	1	20	20	20	2000	2000	2000	100	100	100
Paddy	25	190	840	437	8800	20000	13826	12	86	37

How to facilitate "Crop Water Budgeting" by Watershed Communities?

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