



Environment

Water & Environmental Sanitation Network (WES-Net India)



Solution Exchange for WES-Net India Consolidated Reply

Query: Water Budgeting by Communities, from UNV, Jharkhand (Experiences).

Compiled by Pankaj Kumar S., Resource Person; additional research provided by Ramya Gopalan, Research Associate
7 November 2006

**Original Query: Ravi Niwash, United Nations Volunteers, Jharkhand
Posted: 7 September 2006**

I am a United Nations Volunteer (UNV), coordinating a project in Karra Block, Ranchi district, Jharkhand on social mobilization of women's groups for natural resources management, with support from UNDP and Ministry of Rural Development, GOI. The project is taking up construction of 10 water harvesting structures (ponds) and other land development work in the project area through water user groups and about 300 SHGs.

In order to enhance the way in which communities manage their water resources, I am interested in initiating a process to facilitate village communities to undertake water budgeting in selected (micro) watersheds in Karra block. Using this, communities should be able to analyze the demand and the supply of water resources in their (micro) watershed and analyze the ways in which they will adapt their demand to supply.

In this context, I request members to kindly respond on the following:

1. Experiences from other projects/ states on the methodology/ process of empowering communities to conduct water budgeting exercises. Members may also suggest possible topics for capacity building in this regard.
 2. Details of follow-up interventions needed after the budgeting has been done and examples from other projects/states where operationalisation of such water budgeting exercises have led to successful management of surface and groundwater resources by local communities.
 3. Advice on precautions to be taken while scaling up water budgeting programmes with communities, local governance institutions and government line departments.
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Responses received with thanks from:

1. [Arunabha Majumder](#), AIH&PH and Jadavpur University, Kolkata
2. [Ajit Sheshadri](#), Vigyan Vijay Foundation, Churu, Rajasthan
3. [Pankaj Kumar S.](#), UNDP, New Delhi

4. [K. A. S. Mani](#), APFAMGS Project, Hyderabad
5. [Mihir Maitra](#), ICEF, New Delhi
6. [Jyotsna Bapat](#), Consultant, New Delhi
7. [S. Ramesh Sakhivel](#), WES-Net India c/o Plan International, New Delhi
8. [Depinder S. Kapur](#), WaterAid India, New Delhi
9. [Pran Ranjan](#), Society for Promotion of Wasteland Development (SPWD), Ranchi
10. [D. Umrikar Satish](#), Government of Maharashtra, Mumbai
11. [S. C. Jain](#), AFPRO, New Delhi
12. [Viren Lobo](#), SPWD, Udaipur
13. [Rahul Banerjee](#), Aarohini Trust, Indore

Further contributions are welcome!

Summary of Responses

The query attempted to seek members' advice on the process that could prepare communities to take up water budgeting for better management of water resources. Responses by members covered a wide range of issues, suggestions and experiences from various parts of India. The discussions underlined the importance of using water budgeting as a tool for community water resource planning. Examples quoted by members showed that when empowered to document and monitor water inflows and outflows, communities have been motivated to make sure that water utilization takes place along with its conservation.

Respondents explained that **community water budgeting** (CWB) is a process of keeping track of water inputs (mainly rainfall) and outputs (water spent in irrigation, drinking, industrial use, etc.) in a hydrological unit. Members provided practical guidelines to calculate demand and supply of water, stressing that the water budgeting process empowers communities to conserve and rationally use water resources.

Members shared **methodologies for implementing CWB** from other states in India. As an example of a project that had covered all aspects of the CWB process, members mentioned the [APFAMGS project](#) in **Andhra Pradesh**. The project builds capacities of farmers' groups for regular data collection of rainfall and groundwater levels, data dissemination, awareness building, calculation of the water budget and estimating water deficits. Public dissemination of the collected meteorological, groundwater and other data and its analysis on display boards is done in villages. This enables farmers to estimate if they are overdrawing groundwater resources, thereby motivating the community to change their crop water demand to suit the supply of water. Additionally, data collected by the communities is "value-added" by the project and sold to other users for scientific research. This generates revenue, making water budgeting self-sustainable. Similarly, the aquifer management project [Jalswarajya](#) in **Maharashtra** helps communities to calculate projected demand and supply timelines for preparing water resources management plans. The efforts of [SOPPECOM](#) from **Maharashtra** in designing an alternative to the Narmada dam was another example members cited for scaling up the concept of water budgeting, while the [West Bengal](#) experience showed how youth clubs took up water budgeting to enhance crop water security.

In addition to the above methodologies, members identified **major challenges in water budgeting**. They pointed out that due to the interplay of surface and ground water, the dynamics of water budgeting in watersheds is more complex than for water storage systems or aquifers. Wide fluctuations in rainfall and underlying geological conditions are other factors making water budgeting difficult. Members also described the situation in the [Neemkheda](#)

[watershed](#) in **Madhya Pradesh**, where in spite of an intensive water budgeting exercise, the designed water-harvesting plan could not be implemented due to skewed land ownership in the watershed as farmers owning larger farms refused to participate in land treatment. Similarly, the upper ridges in most watersheds are owned by government departments (like the Forest Department), which sometimes do not allow communities to regenerate and protect these resources.

Another crucial issue stressed during the discussion was the inclusion of “**social**” **water budgeting** to ascertain equitable access to water for the most vulnerable sections of the community. In this context, respondents mentioned the former [Wastelands Integrated Research Project](#) in **Maharashtra**, which had tried to set up a system to ensure water distribution for guaranteeing minimum food and biomass security for all households in a watershed. They emphasized the need to allot an assured share of water to small and marginal farmers to prevent the “elite” from capturing water resources. In general, members stressed that good water budgeting models have tried to ensure social equity by enforcing water saving methods, defining water rights for all sections and banning of deep bore wells and water intensive crops. Participants cited [several projects](#) that had effectively incorporated equity concerns for the poorest in their planning, such as Ralegan Siddhi, Pani Panchayat and Hivare Bazar projects in Maharashtra in this regard.

Among **other learnings** in water budgeting, members mentioned the need for CWB exercises to take into account the varied demands of upstream and downstream settlements. They also felt that institutional complexity increases with the scale of the hydrological unit. Thus, self-regulation by communities could be more effective only when they are given legal support and when aquifer level institutions contain representatives of district and block officials. Respondents also welcomed the inclusion of drinking water core issues in water budgeting debate, which have conventionally focused only on crop and livelihood issues.

The responses underlined CWB’s potential to serve as a tool for empowering communities to estimate and manage water resources. However, members underlined the need for such experiments to be implemented with sensitivity towards equity concerns and institutionalization to make CWB exercise truly relevant for marginal communities and large hydrological units.

Comparative Experiences

Maharashtra

Social Water Budgeting Models (from [S. Ramesh Sakthivel](#), *WES-Net India c/o Plan International, New Delhi*)

Models adopted in Pani Panchayat, Ralegaon Siddhi and Hivare Bazar stress equitable benefits to all in a watershed. These projects have also introduced water saving methods through intensive social controls to prevent over exploitation, ensuring water rights to all, banning deep bore wells and banning water intensive crops, etc.

Jalswarajya Project (from [S C Jain](#), *AFPRO, New Delhi* and [D. Umrikar Satish](#), *Govt. of Maharashtra, Mumbai*)

This participatory project undertaken by Government of Maharashtra, works in 26 of the 33 Districts in the State. The Government facilitates the community to carry out water budgeting to understand demand & supply. Capacity building is done in using management tools and providing technical services. Under the project, AFPRO has conducted CWB in 28 villages of Jalgaon District and is working towards forming an aquifer level institution with self-regulatory community norms.

Wastelands Integrated Research Project (WIRP) (from [Depinder S. Kapur](#), *WaterAid India, New Delhi*)

This project supported by SPWD and conducted by SOPPECOM attempted to estimate the minimum water required to meet food and non-food biomass requirements of a unit family in the State's dry zones. The results obtained serve as the norm for estimating equity in water distribution for ensuring equitable food, biomass and livelihood promotion.

West Bengal

Engaging Youth Clubs to Address Problems of Drought (from [Pran Ranjan](#), (*Society for Promotion of Wasteland Development (SPWD), Ranchi*)

Since 1987, SPWD is working with an organization named Jamgoria Sevabrata on water in Purulia district. Here, village people with the help of youth clubs have done work on their private and common lands to address drought situations firstly for a single critical crop and later on ensuring water for a second crop.

Madhya Pradesh

Neemkheda Watershed Project (from [Rahul Banerjee](#), *Aarohini Trust, Indore*)

Samaj Pragati Sahayog undertook the project, in which the forest department controlled the top and bottom portion of a watershed, and did not allow conservation work, depriving the watershed of a water-harvesting source. Similarly, three big landowners owning the middle of the watershed would not allow for water retention structures. The NGO finally built them in an area with low retention capacity. These conflicts, were resolved through mass and legal action.

Andhra Pradesh

APFAMGS Project (from [K. A. S. Mani](#), *APFAMGS Project, Hyderabad*)

A culmination of field-level data collection by the community wherein the community collects and discusses the data and disseminates the results on display boards in the village centre. Using this, water budgeting is carried out by farmers within the same drainage basin. While NGOs facilitate this exercise, farmer facilitators are trained to compute the budget, discuss the water balance, and work out an appropriate cropping plan matching the resource

Related Resources

Recommended Organization

SOPPECOM, Maharashtra (from [Depinder S. Kapur](#), *WaterAid India, New Delhi* and [Viren Lobo](#), *SPWD, Udaipur*)

16 Kale Park, Someshwarwadi Road, Pashan, Pune 411 008; Tel: 020-25880786/6542; soppecom@vsnl.com

Recommended for experience in water budgeting and resource mapping and for designing an alternative to the Narmada dam by scaling up the water budgeting concept

Andhra Pradesh Farmer Managed Groundwater Systems Project (APFAMGS) (from [K. A. S. Mani](#), *APFAMGS Project, Hyderabad* and [Pankaj Kumar S.](#), *UNDP, New Delhi*)

<http://www.apfamgs.org/Default.aspx>

Recommended for promoting Crop Water Budgeting (CWB) as a tool to empower farmers for deciding appropriate crop system matching the available groundwater

Recommended Website

Rainwaterharvesting.Org (from [S. Ramesh Sakthivel](#), WES-Net India c/o Plan International, New Delhi)

<http://www.rainwaterharvesting.org/jalswaraj2.htm>

For information on some water harvesting initiatives with the aim of promoting its revival of as a practical solution for drought proofing the affected areas

Recommended Documentation

Jalswarajya Project (from [S C Jain](#), AFPRO, New Delhi and [D. Umrikar Satish](#), Govt. of Maharashtra, Mumbai)

<http://www.afpro.org/programs.htm>

Details this project, which seeks to bring reforms in Rural Water Supply and Sanitation Sector in Maharashtra, adopting a participatory approach aimed at capacity building

Rain Water Harvesting at Rajasthan (from [Ajit Sheshadri](#), Vigyan Vijay Foundation, Churu, Rajasthan)

Project 76; The Vigyan Vijay Foundation; April 2006

<http://www.solutionexchange-un.net.in/environment/cr/res20090601.doc> (Size: 96 KB)

Provides a compilation of the project audit comprising pre-project data & inferences from field work based on Vigyan Vijay Foundation's experience in Churu district, Rajasthan

Main Report - Development Strategy for Rainfed Areas in Sabarmati Basin (from [Viren Lobo](#), SPWD, Udaipur)

Click [here](#) to view PDF (Size: 1.52 MB)

Details strategy, aimed at overcoming limitations of small water harvesting structures arising from variability of rainfall, limited run off and inadequate surface storage capacity.

India's Drylands: Tribal Societies and Development through Environmental Regeneration (Social Policy and Human Development in India) (from [Rahul Banerjee](#), Aarohini Trust, Indore)

Mihir Shah; D. Banerji; P.S. Vijayshankar; Oxford University Press, New York; 1998 (paid publication)

Click [here](#) to view link

Illustrates example of Neemkheda watershed in Madhya Pradesh where in spite of a water budgeting exercise, implementation of an ideal water-harvesting plan was difficult

From [Pankaj Kumar S.](#), UNDP, New Delhi

Understanding Water Budgets and Balances

Current Theme: Learning and Service, Boulder Area Sustainability Information Network (BASIN)

<http://bcn.boulder.co.us/basin/learning/waterbudget.html>

Explains the concept of water budget and the relevant inputs

The Water Balance

The Physical Environment

http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/hydrosphere/water_balance_1.html

For a clarification of the concept of water balance

From [Ramya Gopalan](#), Research Associate

Spatial Water Budget Model (SWBM)

J. C. Luijten, J. W. Jones and E. B. Knapp; Natural Resources Defence Council, Washington D.C.

http://eco.wiz.uni-kassel.de/model_db/mdb/swbm.html

Explains SWBM model, which simulates water supply and demand over space and time on a daily basis using GIS data structures

Software to the Rescue of Parched Indian Villagers

Stories of Change, Archives

http://www.infochangeindia.org/ItanddIstory.jsp?recordno=194§ion_idv=9

Article on Jal-Chitra software to help villagers take advantage of information and communication technologies to exercise their right to manage their own water sources

Regulating Water Resources

CMC Limited

http://www.cmcltd.com/case_studies/e-Governance/water_resource_management/bas.htm

Explains BAS: Basin-wide Water Accounting and Budgeting System, application software for accounting and budgeting of water resources in an entire river basin

Field Water Budgeting and Soil Moisture Profiles

<http://www.tifac.org.in/itsap/water.htm>

Brief on a TIFAC ongoing project, implemented by Punjab Agricultural University, water balance components are assessed by a locally developed and tested model

W.A.T.E.R. Model

<http://www.agwaterbudget.com/index.htm>

Spreadsheet model, developed to help agriculturalists adapt to irrigation water allocations by budgeting water and developing strategies to maximize profitability

Water Budgeting for High Water Table Soils

Forrest T. Izuno; University of Florida, IFAS Extension

<http://edis.ifas.ufl.edu/AE374>

Discusses farm and field level water budgeting, illustrating variables and factors- how a budget is kept and used in water management decision making

Water Budgeting

Click [here](#) to view PDF (Size: 41 KB)

Describes basic practice guidelines and two approaches with examples to calculate water budgets

Sprinkler Irrigation Scheduling Using a Water Budget Method

Water Conservation Factsheet; Ministry of Agriculture, Food and Fisheries, British Columbia; May 2004

Click [here](#) to view PDF (Size: 775.4 KB)

Explains this method, works well with a computer spreadsheet that allows daily reference ET (ET_o), precipitation and irrigation amounts to be accounted for in irrigation scheduling

Recommended Contact

R.K. Midha, Advisor, IT-SAP, TIFAC (from [Ramya Gopalan](#), Research Associate)

D-6 Apartment, Outab Hotel, New Mehrauli Road, 110016 New Delhi; Tel: 91-11-26533224

Fax: 91-11-26522587; midhark2001@yahoo.co.in

Recommended for information regarding TIFAC's ongoing project on Field Water Budgeting and Soil Moisture Profiles

Responses in Full

Arunabha Majumder, AIH&PH and Jadavpur University, Kolkata

My comments to your query are as follows:

1. Assuming 1000mm rainfall per year the surface runoff may be available as 2000 cub. metre from one hectare catchment area. The runoff should lead to the pond for storage.
2. A 50m x 50m pond with 3m average depth may store 7500 cub metre of rain water. It would require 3.75 ha of catchment area.
3. Catchment area development may be necessary.
4. The pond must be free from organic and chemical pollutants.
5. Bathing and washing are to be prohibited.
6. Consider 1/3rd percolation and 1/3rd volume of water evaporation loss from the pond.
7. Available water for use would be 2500 cubic metre. This can be used in 250 days (Non rainy period).
8. Per day 10,000 litres can be used from the pond.
9. 250 persons can use the water per day @ 40 litres per capita per day (lpcd). Otherwise 1000 people can use water @ 10 lpcd for drinking and cooking.
10. The pond water will need treatment. It can be treated by the application of HRF-SSF technology. The filtered water will require disinfection.
11. Fish should be in the pond but fish-feed must not be added.
12. The program must run through community-based management system.

Ajit Sheshadri, Vigyan Vijay Foundation, Churu, Rajasthan

This is in response to the request from Mr. Ravi Niwash.

Based on the experience of our NGO in Churu district, Rajasthan we link herewith some notes on the pre-project data compilation, and inferences from the field work.

<http://www.solutionexchange-un.net.in/environment/cr/res20090601.doc>

Please feel free to ask us for any more details.

Pankaj Kumar S., UNDP, New Delhi

I wish to add in a few definitions on water budgeting, especially for those of our members who may need a clarification on the concepts:

"A water budget reflects the relationship between input and output of water through a region. The water balance graph shows precipitation and potential evapotranspiration both as line graphs. Thus we have a direct comparison of supply of water and the natural demand for water. It is [therefore] possible to identify the periods when there is plenty of precipitation and when there is not enough."

Source: <http://bcn.boulder.co.us/basin/learning/waterbudget.html>

Practically speaking, water budgeting helps the community (or anyone) to keep track of the inputs (water that came in mainly through rainfall) and outputs (water that is spent in irrigation,

drinking, industrial and other uses) of water in a watershed. Various projects (such as AP Farmer Managed Groundwater Systems Project, Hyderabad) have used water budgeting to get farmers estimate the amount of water they get, and to see if they are taking up an overdraft of groundwater resources. Farmers have also been able to change their cropping pattern to suit the availability of water. For details, see: <http://www.apfamgs.org/>

For a clarification of the concept of water balance, see:

http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/hydrosphere/water_balance_1.html

K. A. S. Mani, APFAMGS Project, Hyderabad

I would like to share the experiences of Andhra Pradesh Farmers Managed Groundwater System (APFAMGS) in facilitating water budgeting by communities. Water budgeting, referred as Crop Water Budgeting (CWB) by the project, is the culmination of number of field-level data collection by the community (rainfall, groundwater levels, discharge, etc). The community collects and discusses these data and disseminates the results on display boards in the village centre. Using the monitoring data, the water budgeting is carried out by bringing together farmers who fall within the same drainage basin. While NGOs facilitate the CWB exercise, farmer facilitators are trained to compute the budget, discuss the water balance, and work out an appropriate cropping plan matching the resource. The salient details of the approach are detailed below.

The APFAMGS project, in partnership with 9 NGOs, has organised farmers from 650 villages forming part of 70 Hydrological Units (micro basins) in 7 drought prone districts of Andhra Pradesh into Groundwater Management Committees (GMC). Membership of GMC comprises of men and women farmers who are provided with knowledge and skills to carry out various data collection, which ultimately helps them to estimate available groundwater resources adopting the Crop Water Budgeting Exercise. Participatory Hydrological Monitoring (PHM) activity is an exercise where farmers maintain and record rainfall from number of rain gauge stations in the Hydrological Unit and regularly monitor groundwater levels and discharge. Based on data collected over a period of one hydrological cycle the farmers estimate the groundwater balance in the form of Crop Water Budget (CWB). Based on the CWB results, the farmers decide on the appropriate cropping plans matching the resource availability. As a follow-up to CWB, those aquifers that show heavy overdraft are identified for improved groundwater recharge.

Thus, the main objective of APFAMGS is to improve farmers understanding of the local groundwater system. Enhanced understanding on rainfall pattern, groundwater draft and recharge, etc. has encouraged the farmers to not only monitor the various critical parameters related to groundwater availability but also interpret the data and use it for effective management of the local groundwater system. Significant achievements have been:

- GMC are currently involved in technical data collection in 638 habitations and reaching out to 5, 00,000 farmers
- 3584 farmer volunteers (men and women) are involved in collecting technical data
- Daily rainfall measurement is collected from 194 rain gauge stations
- Daily groundwater levels are monitored from 90 monitoring wells
- Fortnightly groundwater levels are monitored from 2032 monitoring wells
- Fortnightly discharge measurement are carried out from 1114 monitoring wells
- Seasonal groundwater quality measurements are carried out from 300 drinking water wells
- Annual Crop water budget exercise (Sept, Oct 2005) have been carried out in 38 Hydrological Units attended by 8442 farmers from 505 habitations.

Thus, in our opinion, water budgeting needs to be quite comprehensive beginning with the involvement of the community in data collection, data dissemination, awareness building, computing the water budget and most importantly, making the correct inferences for appropriate follow up.

To sustain the data collection process and to cover the operational cost of data collection, GMCs are collecting a moderate charge for any data request by various governmental agencies, researchers, consultants. A data catalogue has been published and put up on the web site www.apfamgs.org giving details of site location, parameters measured, units, frequency, accuracy etc.

Value addition to the field data is done and processed data such as Maps, Hydrographs, Bound Reports or data in digital format is also made available.

Three years of data collection by the community has removed the mask of secrecy on data and has made available real time data in a transparent manner to the entire community. Data collection by farmers also provides immediate feedback, thus ensuring data authenticity, quality and overall reliability. Data awareness by farmers has increased knowledge on data collection procedures, thus making the entire village to emerge as a pressure group in monitoring data collection and recording. We have also seen that well-informed and knowledgeable farmers with access to technical data have initiated small but appropriate interventions to restrict over-exploitation of aquifers. Participatory aquifer management has also bestowed on the farmers the responsibility of the upkeep of the aquifers and sustainability of the groundwater resource.

Mihir Maitra, ICEF, New Delhi

It is clear from the discussions so far that water budgeting has to be addressed in the context of the system under question. Thus, we can work out the water budgeting for a well by computing/measuring the abstraction vs. recuperation, a tank by computing/ measuring the inflow vs. outflow plus evaporation, groundwater by computing total abstraction and recharge from an identified aquifer system and climatic water balance of a geographical area by comparing rainfall and evaporation. Communities can be involved extensively in the collection of field data for these tasks after necessary orientation. This also helps in inculcating the much needed scientific temperament amongst communities, particularly local youth.

Water budgeting of a medium to large watershed, however, is a much more complicated task, one reason being the likelihood of interflow between the surface water and the groundwater. Besides, in addition to evaporation data from water bodies and land surface, one would also require evapo-transpiration data from the cropped area. This requires land use pattern and crop co-efficient data for various crops being grown. While the rainfall, discharge and evaporation can be measured directly, the evapo-transpiration and recharge are to be computed. The most practical time frame for such water budgeting is annual.

Jyotsna Bapat, Consultant, New Delhi

The query looks at water as a common property natural resource. From this perspective I have some experience to share about other similar experience in CPR management and its learning should be equally valid for water sector. In budgeting and distribution of benefits in Joint Forest Management between the forest department and the dependent community, what has worked is really a partnership where the marginal, dependent community is able to derive its subsistence through minor forest produce while protecting the state forests from poaching. The state in

return allows them to use these produce by legalizing access. Thus, protecting the rights and sustenance of the small and marginal people is the key to a sustained partnership in the sector.

The same strategy would work in case of water. A guaranteed subsistence share with the small and marginal farmers by irrigation department (or the relevant mediating government agency) would ensure that the water budgeting does not get 'captured' by any small group and is monitored on the ground. I am not aware of any example except the Pani Panchayat actually doing this that is making the right to water as a tradable right with its implications of choice for the right holder.

Hope this helps

S. Ramesh Sakthivel, WES-Net India c/o Plan International, New Delhi

This is a very important topic of discussion given the complex issues around water that we see across the country. I agree with Mihir Maitra that it is a very complex exercise if all the scientific aspects were to be carried out for a comprehensive water budgeting exercise.

However, given the imbalances in the socio-economic set-up of our villages, it would be essential to ensure that the interests of poor and vulnerable communities are not neglected. Therefore, even if all the aspects of scientific approach of water budgeting can't be taken up, social water budgeting models adopted at Pani Panchayat, Anna Hazare's Ralegaon Siddhi and the recent works by Popat Pawar in Hivare Bazar village (all in Maharashtra) can be introduced to bring equitable benefits to all. These projects have attempted to maximise the available water by introducing water saving methods through intensive social controls such as curb on over exploitation of water, water rights to all, saying no to deep bore wells, ban on water intensive crops, etc., to bring equitable distribution of benefits to all across a watershed.

I think water budgeting initiatives that aims to introduce such social budgeting methods would be highly successful even if there were difficulties in introducing some complex scientific methods of water budgeting.

For more information on some water harvesting initiatives, visit:

<http://www.rainwaterharvesting.org/People/RuralJY.htm>

Depinder S. Kapur, WaterAid India, New Delhi

Water budgeting needs to be seen as part of resource literacy and empowerment discourse. That it will help in IWRM – needs a certain scale of conceptualization. The APFMGS experiment has that potential. But there have been other small and large experiments in the past.

The earliest NGO experiments that I am aware is of the SOPPECOM's work in the mid 1980s in a Maharashtra based project (Wastelands Integrated Research Project), then with the Society for Promotion of Wastelands Development. Before this, the Peoples' Science Movement in Kerala also did some work on this.

In WIRP, the research question was the minimum water requirement needed to meet food and non-food agriculture requirements of a unit family in the dry zone of Maharashtra – the results to serve as resource literacy and advocacy for what is possible and what is not. Thereby, the project attempted to estimate what agriculture could and whether a unit of 5 member family in the dry

zone of Maharashtra can make a subsistence living from agriculture or not – with a mix of endogenous and exogenous water to meet the minimum water requirement. WIRP had a very good and active network of NGO partners back in the days when networks were not in fashion, since this network worked well as it involved leading scientists, agriculturists and farmers. SA Dabholkar and his grape farmers' network also emerged around the same time and place. In my discussions with SOPPECOM over the years, they have taken water budgeting to higher and more complex levels. Their work on the peoples alternative to Narmada dam – was another good example of scaling up water budgeting. Resource mapping exercises by SOPPECOM in villages and recent resource mapping exercises in urban slums by Shelter Associates of Pune – offer more recent examples of social and technological interventions.

The example given by APFMGS is a good one. That drinking water now forms a focus of water budgeting highlights that core drinking water issues are becoming critical in the otherwise crop and livelihoods focused water budgeting discourse.

Pran Ranjan, SPWD, Ranchi

I have never visited the area that Ravi talks about, but my experience of Chhotanagpur makes me suggest that Ravi Niwash looks into the work done by Society for Promotion of Wastelands Development (SPWD) on the issue of water in Purulia. Since 1987, SPWD is working with an organization named Jamgori Sevabrata in Purulia district of West Bengal. Here the village people with the help of youth clubs have done work on their private as well as common land, especially to address drought situation for a single critical crop. Later on they started working fully on water for second crop. Will send in the rest of the details in my next mail.

D. Umrikar Satish, Government of Maharashtra, Mumbai

I found Ramesh Saktivel's noting special in two ways: It is down to earth and there is no alternative to what he suggests. We all know that the only supplier to the surface water as well as ground water is none other than rainfall. It is now the right time to understand this fact and act upon it.

We are doing similar things in our World Bank assisted "Jalswarajya" Project with a participatory approach. It encompasses 26 (of the 33) Districts of the state where the Govt. acts as facilitator whereas community does the works. The capacity building is done through trainings, workshops, exposure visits, meetings taking all management tools into account. Hope to read more from you.

S C Jain, AFPRO, New Delhi

The Water Budgeting exercise is complex if we only see from the study point of view with scientific approach. But the point raised by Mr Ravi Niwash is how best this exercise can be simplified and facilitated at micro level by involving community so that it leads towards empowerment. Some of the experiences from Maharashtra have already been mentioned by Ramesh & Depinder Kapur. Beside these examples, there are other success stories on water budgeting from the Jalswarajya project on drinking water supply and sanitation under implementation in Maharashtra. Under the project, water budgeting is an essential step, which needs to be carried out as part of planning.

The support organization and technical service providers facilitate community to carry out water budgeting to understand demand and supply in the local context. Based on this, the plan for water supply is developed by deciding appropriate measures for source sustainability. During the exercise, a timeline on water availability, utilization trend, and increasing demand for various purposes are discussed to understand the trends of water demand and supply in the village. In our experience, whenever there is a deficit faced by the community, the community takes up planning to ensure better utilization practices, water conservation and for deciding the norms for self regulation. The water budgeting exercise is found to be a good tool to sensitize the community on the issue of IWRM.

AFPRO is working as part of a consortium for capacity building under the Jalswarajya and has conducted training cum demonstration in eight villages as a Support organization and Technical Service provider to implementing organisations. These organizations are further facilitating the exercise in other villages. A technical manual that has been prepared in local languages (Marathi) includes water budgeting a step for planning.

AFPRO has also carried out the water budgeting exercise in twenty-eight villages of Yawal Taluka of Jalgaon District under the Aquifer Water Management project by the community. Our experience shows that there are challenges in scaling up of the concept as the institutional arrangement becomes more complex. The focus of intervention in this project was to create awareness among the community on demand and supply in Yawal basin. The aquifer level institution is constituted as an outcome of this exercise and the community has evolved self-regulatory norms.

The experiences suggest that self-regulation will not be effective until these are given a legal support and the aquifer level institution also contains representatives by district/block level official/ non-officials.

Viren Lobo, SPWD, Udaipur

SOPPECOM has also conducted a study for SPWD on small water harvesting structures in Jaisamand catchment of Udaipur district. They found that during the last 12 years, the catchment has received 6 years of shortfall years and 3 years average and 3 years surplus years. In terms of water availability, they identified 3 years as shortfall years, 6 years as average and 3 years as surplus years.

During the shortfall years, the irrigation engineers of Jaisamand Lake complained that upstream structures were preventing filling of the lake. In low rainfall years, the upstream storage structures also did not fill up, though in pockets there was local recharge. The observation of the engineers was not based entirely on fact. However, during the surplus years this constraint was not noticed particularly due to the high intensity of the rainfall.

The experience of the last 12 years shows that the nature of rainfall and geology determine where the run off and storages will be. A larger unit is necessary, to properly understand the water flows and storage dynamics.

Rahul Banerjee, Aarohini Trust, Indore

Apart from the rainfall fluctuations and the underlying geology of the catchment that have been pointed out as destabilizing factors which are difficult to account for in water budgeting in a small

watershed, there is also the major factor of ownership of land and control of water courses that has to be taken into account.

One of the most famous examples in Madhya Pradesh is that of the Neemkheda watershed where the NGO Samaj Pragati Sahayog has done watershed development work (Shah, M, Banerji, D, Vijayshankar, P S & Ambasta, P (1998): *India's Drylands: Tribal Societies and Development through Environmental Regeneration*, Oxford University Press, Delhi.). Here the top of the watershed around the ridgeline where considerable amount of conservation work can be undertaken and also the portion of the watershed further down where an earthen dam can be built is under the control of the Forest Department which refuses to allow this work to be done, thus depriving the whole watershed of a good source of water harvesting. After this comes the middle of the watershed which has deep clayey soils with good water retention possibilities but where the land is owned by just three big landowning families, who will not allow water retention structures to be built. So ultimately the water retention structures had to be built on the pebbly and gravelly murrum soils much lower down whose water retention capacity was very low.

Thus even after a proper water budgeting exercise an ideal water harvesting plan could not be implemented. What little water flow enhancement was achieved was sought to be utilised by the powerful landowner families because they controlled the water course also. This led to conflicts which had to be resolved through mass action and later legal action in the courts. Thus unless the reality of the skewed control of land and water sources is not factored in to the water budgeting exercise, it may prove to be a sterile one as in the case mentioned above.

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for WES-Net at se-wes@solutionexchange-un.net.in with the subject heading "Re: [se-wes] Query: Water Budgeting by Communities, from UNV, Jharkhand (Experiences). Additional Response."

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