Water, Households & Rural Livelihoods

Collaborative workshop on Water Supply & Sanitation and Watershed Development: positive and negative interactions

Andhra Pradesh, India, 5-14 May 2001

Workshop summary

Research promoting access of the poor to sustainable water supplies for domestic and productive uses in areas of water scarcity

WHiRL

This project is supported by the UK Department for International Development (DFID) through the Infrastructure and Urban Development Division's Knowledge and Research programme. Project R7804 'Integrating drinking water needs in watershed projects'

Summary

Watershed development programmes in India typically don't address water resources management or rural water supply needs. However, they can have significant impacts upon the availability of water resources available for rural water supply. Watershed development projects can increase the availability of groundwater at a local scale, and this may benefit village water supplies. However, they can also lead to increased irrigation water use through improved incomes, and access to credit for new borewells and pumps. Currently the separation of watershed development and rural water supply (and irrigation) results in several missed opportunities. Watershed development projects could perhaps provide some of the elements required for successful local water management to address competition of scarce resources between irrigation water users and domestic water needs, such as effective local institutions and natural resource management rules. Without improvements in rural water supply, where access to water is one of the crucial factors in the livelihoods of poor people (affecting health and productive activities dependent upon a water source from livestock keeping to tea stalls), watershed development projects cannot expect to significantly improve the livelihoods of poor people.

The collaborative workshop on 'Water Supply & Sanitation and Watershed Development: positive and negative interactions' explored these issues as part of the on-going Water, Households and Rural Livelihoods Project (WHIRL) project. This project is focused on the middle ground between watershed management and rural water supply, and brings together a number of South African and Indian organisations with interests in water services, land and water management and rural development. Through reviews, and action research at village level and with organisations at national, state/ province and district level, this project will make available research findings to promote appropriate integartion of rural water supply within watershed development projects.

The workshop brought together over 50 specialists through a series of field visits, meetings and seminars. Using a novel decision-support methodology, Bayesian networks, an initial attempt was made to synthesize the many important factors that must be addressed in order to improve the availability of safe water for drinking, other domestic and livelihood-supporting activities at household level. This workshop report summarises presentations made during the workshop, the findings of field visits and groupwork, and discussion sessions.

Additional information can be accessed from the WHIRL project website at:
http://www.nri.org/WSS-IWRM/

Contents of this report

1 Background

In many Indian villages, drinking water supplies drawn from traditional wells and boreholes have been severely affected over recent decades by widespread over-abstraction of aquifers for irrigation. Irrigated areas and the amount of groundwater abstracted have increased dramatically, associated with policies to increase food production, subsidies and increased access to loans for farmers to sink wells and purchase pumps, and incentives such as free or cheap electricity. Under effectively open-access regimes, such policies have led to widespread declines in groundwater levels in alluvial areas and more rapid use during the year of the limited groundwater available in hard rock areas. The shift from traditional large-diameter dug wells for drinking water supply to deeper borewells has still failed to provide sustainable sources. Many village water supplies now fail routinely during the dry season, and they are increasingly vulnerable to periods of drought. Tankering of supplies is a costly emergency solution and unpopular with communities.

In specific areas, high levels of toxic elements such as arsenic and flouride are a major problem with severe impacts on the health of communities. Increasing levels of pollution of surface- and ground- waters are also a major concern.

Increasingly unable to develop local groundwater resources for drinking water supplies, district government and state development agencies have often sought large-scale engineering solutions to harness surface water resources. Large dams, water treatment works and extensive pipeline networks have been given priority – often each serving hundreds of villages. However many disadvantages associated of this approach have emerged, and often schemes cannot be sustained at desired levels of service. Regional piped water supply schemes have suffered from poor and unreliable infrastructure, and as responsibilities are decentralised, high operation and maintenance costs are a major constraint. Local solutions are now increasingly being sought to manage water resources better, address water quality issues and secure sustainable resources for consumptive (drinking, washing etc) and productive use (backyard irrigation, watering livestock etc.) at lower cost.

Watershed development projects can improve local water resources through increased groundwater recharge. However, the emerging evidence suggests that potential to augment water resources through forest, field and drainage line treatments is very limited compared to the gap between supply and demand. For their positive impacts to endure, watershed development projects in the future will have to address difficult water management issues especially the allocation of finite water resources between competing users. Already there is evidence that watershed development projects may worsen drinking water provision in some situations by stimulating water use through increased irrigation. The impact on water supply for domestic use, vital for the poor, is rarely directly considered or addressed. Impacts on downstream water users have also been neglected.

Against this background, the workshop aimed to explore how water supply and sanitation issues in Andhra Pradesh can be more effectively and sustainable addressed through improved watershed development projects, and how watershed development programmes in coordination with action at national, state and local levels can help to achieve a fairer and more efficient balance between all water users.

2 The WHIRL project

WHIRL is a collaborative Indo-South Africa-UK research project[1]. It aims to promote better institutional and operational solutions for water resources management to improve the access of poor people to safe water supplies for consumptive and productive use. Based upon action research in South Africa and India, the project will by 2004 develop, validate and disseminate demand-led guidelines to promote appropriate integration of water supply and sanitation within watershed development programmes. The workshop aimed to contribute to development of this project, and opportunities for further links and collaboration were developed during the workshop.

Further details about the project can be found on the project web-site at http://www.nri.org/WSS-IWRM/

3 The workshop

3.1 Objectives and scope

The objectives of the workshop were:

1. To explore from a multi-disciplinary and holistic perspective the problems and solutions to water resources issues in Andhra Pradesh, especially drawing upon water resource audits and participatory assessments undertaken by the Andhra Pradesh Rural Livelihoods Project (APRLP).
2. To reach a preliminary understanding of water resources issues in Andhra Pradesh that integrates the multiple objectives of numerous actors, and the many influencing factors and opportunities for intervention. This understanding will be used to target future research and interventions.
3. To explore the different approaches taken to tackle water management problems in South Africa and India, to share lessons learned, and to develop linkages between the research team and actors involved in water management in Andhra Pradesh.

The workshop explored water resources issues faced by people in southern Andhra Pradesh, particularly how these impact on drinking water supplies for the rural and urban poor, and the potential for watershed development programmes to address or compound these problems. It addressed the negative consequences of current water use patterns and approaches to tackle these problems, as well as the positive impacts of watershed development. Issues discussed included:

- impacts of overexploitation of groundwater (for irrigation) on drinking water supplies,
- measures to augment water resources and protect domestic supplies,
- possible negative impacts of watershed development projects to stimulate water use and increase overexploitation,
- potential for legislative, institutional and practical solutions to improve the allocation, management (especially demand management) and regulation of water resources.

[1] WHIRL is a collaborative research project co-ordinated by the Natural Resources Institute with partners in India (Accion Fraterna, BAIF and Dr AJ James), South Africa (AWARD and DWAF) and the UK (NRI, University of Leeds and Water Resources Management Ltd). Activities are carried out in partnership with development projects and programmes including the Andhra Pradesh Rural Livelihoods Project, and Water and Sanitation Programme-South Asia in India and the Save-the-Sand project in South Africa. The project is supported by the UK Department for International Development (DFID) through the Infrastructure and Urban Development Division's Knowledge and Research programme. Project R7804 'Integrating drinking water needs in watershed projects'.

3.2 Participants

The workshop participants included representatives from a wide-range of organisations in Andhra Pradesh including NGOs, District and State Government, and participants from the government and NGO sector in South Africa. A list of participants and contact details is included in Annex 1.

3.3 Approach

The *approach* taken by the workshop combined a series of site visits, workshop sessions and seminars to identify and explore issues and problems faced by poor communities. The workshop involved travel between Bangalore and Hyderabad over a period of 10 days, with a series of one-day seminars in Bellary, Kurnool and Hyderabad providing an opportunity for a wider range of stakeholders to be involved at district and state levels. Field visits in small groups included watershed development projects, rural and urban water supply and sanitation schemes, and villages and towns with severe drinking water shortages. Workshop sessions used **Bayesian networks**, a novel decision-support methodology[2] that is well suited to the issues faced in promoting sustainable water resource development. This provided a mechanism to integrate multi-disciplinary thinking and allow the views of a wide range of stakeholder to be represented.

A further aspect of the approach of the workshop was to draw upon water management experiences from **South Africa**. There are a number of interesting complementarities between the experiences and approaches being followed to address the water resource problems in India and South Africa. In South Africa, new legal and regulatory frameworks and long experience of effective management of water resources at the macro-level, provide good examples of how to potentially address similar issues elsewhere. In India, strengths in local-level rural development, long experience of watershed development as an approach, and experiences in scaling-up and replicating success offer rich lessons for poverty alleviation programmes elsewhere.

The workshop agenda is included in Annex 2.

3.4 Outputs

This workshop report is the main output of the workshop. It incorporates the dynamic 'map' developed using Bayesian Networks that attempts to represent the views of the participants at the Kurnool Seminar, and a preliminary analysis of this network that was presented and discussed at the Hyderabad seminar.

Other outputs include a working paper prepared for the workshop 'Water and Sustainable Rural Livelihoods in Andhra Pradesh: Background paper' by Viju James and Liz Robinson (WHIRL Project Working Paper 3).

Copies of this report, the background paper and all presentations made at the workshop are available at the WHIRL project website (http://www.nri.org/WSS-IWRM/reports.htm)

[2] The use of Bayesian networks was facilitated at the workshop by Jeremy Cain (Centre for Ecology and Hydrology) and Patrick Moriarty (IRC International Water and Sanitation Center). The use of Bayesian networks for natural resource management has been developed under DFID KaR project R7137, Integrated planning and management of water resources.

4 Summary of presentations and discussions

4.1 Welcome dinner in Bangalore (Day 1)

After an introduction to the WHIRL project by John Butterworth, a welcoming speech was given by Kaushik Mukherjee, Executive Director of the Karnataka Watershed Development Society. In this address Mr Mukherjee encouraged the participants to look critically at water supply and water resources management issues in relation to watershed development. The KAWAD project has produced two recent reports which address these issues (Batchelor CH, Rama Mohan Rao and James, 2000; KAWAD, 2001).

4.2 Field visits to watersheds supported by the KAWAD project, Karnataka (Day 2)

On the second day four groups visited KAWAD watersheds in Upparahalla Watershed, Bellary District, Karanataka facilitated by the NGOs MYRADA, LORDS and DPG.

4.3 Bellary seminar (Day 3)

The opening session of the seminar included two presentations:

- the activities of the **Central Soil and Water Conservation Research and Training Institute** (CSWCRTI) and links to watershed development in India were introduced by Dr MS Rama Mohan Rao, head of the institute.
- a **background to the WHIRL Project** by John Butterworth (a revised version of this presentation as presented at the Hyderabad seminar is available on the WHIRL project website).

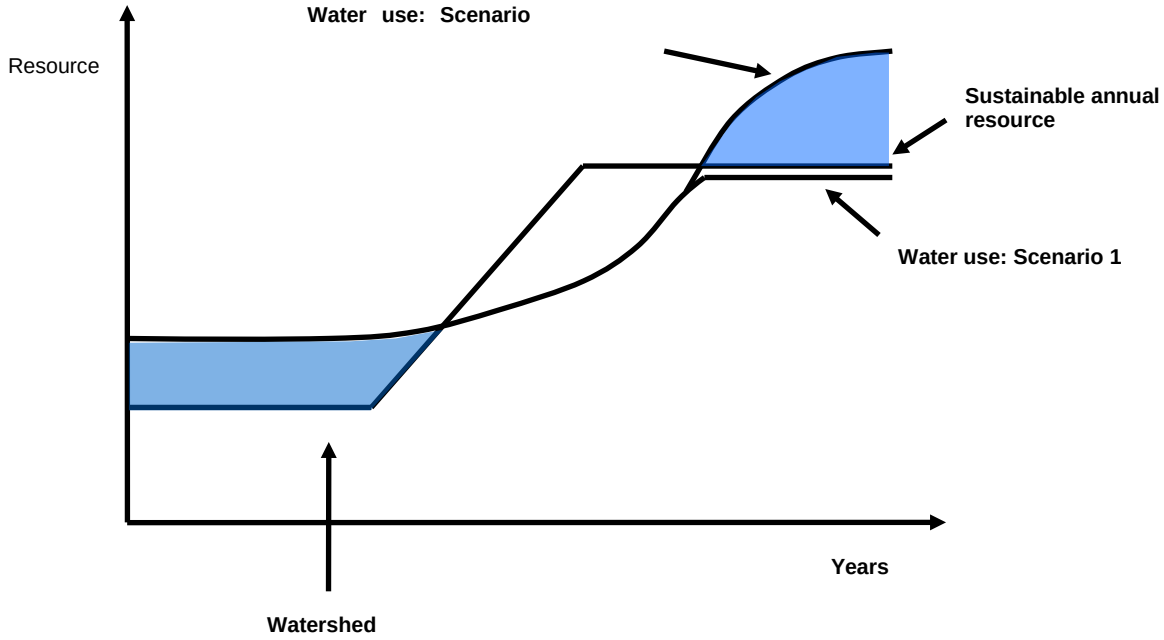
Some of the main points from the latter presentation were:

- explanation of the **project focus** on rural water supply and particularly, how water resources issues are increasingly impacting upon services for the poor
- description of the **research areas** that have been proritised in India to date:
  - ⇒ increasing risk of failure of water supply systems due to overexploitation of groundwater
  - ⇒ the role of watershed development…or management in relation to rural water supply
  - ⇒ costs and benefits of different approaches to overcome water shortages i.e. regional piped water supply schemes versus improved local water management
  - ⇒ the need for effective policy, legislation, institutions and incentives to manage water efficiently
- elements of the **research approach**. This is poverty focused, multi-disciplinary, involves multiple partnerships, aims to support and add to existing initiatives, is focused on making information widely accessible, promotes south-south collaboration (with South Africa), takes a river basin or macro-watershed view, and involves research across multiple scales from household to state.
- explanation of the WHIRL project **phasing**. An inception phase has been recently completed (report available on website), a review phase is currently underway (three draft papers available on website) and the partners are now embarking upon the action research phase. Research will lead into the development of tools and guidelines, but there will be continuous dissemination of papers, reports and findings during the 4-year project (to March 2004).

Finally a schematic diagram was presented to prompt discussion (Figure 1). The diagram represents a hypothetical watershed where a watershed development project is implemented

leading to increased local water resources e.g. due to enhanced groundwater recharge as a result of bunds and check-dams (so there is a step in the line depicting the sustainable annual resource). However, the issue that tends to be neglected is what happens to water demand and use when watershed development projects are implemented. In the figure, water use is initially greater than sustainable use of the resource permits, and in this case, groundwater levels may be falling. After implementation of watershed development the available resource is greater than use, and groundwater levels may recover or flows out of the watershed may increase. Two scenarios are then proposed. In Scenario 1, water use rises perhaps due to increased irrigation and greater water use by rainfed crops and trees, but plateaus off at level close to the sustainable limit. In Scenario 2, water use continues to increase until resources are again being overexploited e.g. for irrigation. A major failing of watershed development programmes is that they provide incentives to irrigate (through increased water availability, improved incomes and access to credit to drill borewells or buy pumps), but don't take measures to promote sustainable water use (scenario 1) and trends depicted in scenario 2 can be expected.

Figure 1. Schematic diagram illustrating potential impacts of watershed development on water resources availability



Liz Robinson and Viju James then presented the main conclusions from a **background paper** prepared for the workshop. This paper includes sections on Andhra Pradesh, the rural economy and people, poverty, water, livelihoods, convergence, sustainable rural livelihoods projects and integrated water management for sustainable rural livelihoods. A series of annexes are also included. This paper was also presented at the Hyderabad seminar, and some key points are discussed in this latter section of the report.

Eustathia Bofilatos, Deputy Director, Catchment Management Directorate, Department of Water Affairs and Forestry then gave a presentation on **Catchment Management: Experiences and challenges in South Africa.**

At the end of the morning session, a final presentation was given by Dr J Venkateswarlu (Andhra Pradesh Academy of Rural Development, APARD, consultant) on case-studies of successful **water-harvesting interventions**.

4.3.1 Discussion

Some of the key points arising from discussion of the various presentations were:

- watershed development in India has been historically biased towards **soil conservation and agricultural production**, but water resources depletion is one of the most worrying issues in dry areas.
- increased **irrigation efficiency** could in theory make a lot of additional water available for other uses. And irrigation efficiency may increase if **power supplies** become more reliable (not clear what would happen to total water use though)
- **drinking water** represents a small proportion of all groundwater extraction. Say only 5%? But need to consider the scale of calculation. At certain times and in certain areas, drinking water represents a much larger share of the available resource. In a village or urban area it may represent 100%. Where competition takes place is crucial.
- a key issue is the **priority** in practice given to the domestic demand. It often gets squeezed out by increasing demand for other uses. Have to ensure that needs are protected. Water markets don't do this as poor are vulnerable. Also rising demands from **micro-enterprises** in rural areas.
- there are divergent views on the current status of water resources. Some believe there are no real signs of **competition**, whereas others believe competition is evident and increasing.
- farmers perceive differences in charges, or possible charges, for surface and groundwater for **irrigation** as being unfair.
- there are a plethora of **organisations** involved in water management in India. But no common guidelines or structure. Acts and institutions interact, conflict and cannot be applied. Some believe government can't be trusted to handle water management and need to hand everything over to communities since traditional water management systems were very good.
- local **panchayats** do have rights but there is confusion about this at top and bottom. Local people don't know what to do with this authority. Decision-making is lacking at a basin level. In AP, Panchayat system is weak and weakening.
- there is a history of good **surface water management**. Problem is groundwater. Community decision making has not been able to shift to groundwater.
- the **change** in water use from surface water to groundwater is a fairly recent in India. Changes are dramatic and dynamic. 15 years ago water utilisation patterns in RSA and India would have been similar, but now they are very different. Groundwater is not yet used on a big scale in southern Africa (only monitored in large-scale commercial farming areas). In India, usage (generally on a small-scale basis) is phenomenal.
- concepts such as a **reserve** to protect supplies for human needs in South Africa are interesting for India. But how to identify and define a reserve? The Madras water supply is taken from 1000 km, so a reserve would have to be local or distant. It also has to be dynamic e.g. due to population change.
- within communities **equity** is a big issue. Sticking to traditional systems means sticking with inequity.
- regulatory and legislative approaches are vulnerable to **corrupt** practices.
- there is a forthcoming policy shift to promote **industrial water needs** ahead of irrigation (but after domestic water needs).
- impacts of irrigation on **large towns** are increasing partly due to increasing footprint of urban areas. Village/ town water supplies will need to double in next 15-20 years. In Mysore 18 months ago this led to conflict and farmers fed up with 'irrigation' supplies being diverted to Mysore blocked the supply and were moved on by police.

4.4 Field visits in Kurnool and Anantapur Districts, Andhra Pradesh (Days 4 & 5)

On 8 May (day 4), in Kurnool District one group visited **S. Rangapurum Watershed** while in Anantapur District one group visited **Vyasapuram** and **Singhampalli** villages near Uravakonda, and a second group visited **Kalyandurg town** and then **Maram Pally** and **Kadiridevarapalle.** On 9 May (day 5), one group visited **Laxmipalli** and **Kacheru** Villages in Kurnool District, while another group met the Anantapur District Collector, visited sites related to the **Anantapur** urban water supply and visited **Rekulakunta** village in Dhone Mandal, Kurnool District.

The summary findings of these field visits and meetings are included in Annex 3.

4.5 Kurnool seminar - Development of Bayesian networks (Days 6 &7)

In Kurnool, activities focused on the use of **Bayesian networks** to capture the ideas of the group.

Jeremy Cain (Centre for Ecology and Hydrology) gave the presentation '**an introduction to Bayesian networks**: a tool to support the planning and management of development programmes in the water sector and beyond' (available on website). Participants were then encouraged and assisted in groups to develop Bayesian networks using Netica software.

Bayesian networks are a simple and easy to use graphical tool that can be used for building decision support systems to help make decisions under uncertain conditions. They can be used to:

- analyse the logic and consequences of different courses of action
- help deal with explicitly with complexity
- show clearly the effects of uncertainty
- synthesise the ideas of multiple “experts”
- communicate ideas and promote debate
- involve stakeholders
- develop a clear reference point (marker) within a process

Bayesian networks were developed, and subsequently combined, focused on the objective of providing an equitable share of water to meet domestic needs. For the purpose of the workshop this was considered to be 40 lpcd in rural areas - sufficient for drinking and other domestic needs and some productive activities. The Bayesian networks developed were presented at the final Hyderabad seminar and are discussed in this section.

In addition, Kgopotso Mogkope (AWARD) gave a presentation on the work of **AWARD in South Africa**, in particular the Save-the-Sand pilot integrated catchment management project and the established of a new catchment management agency (for the Incomati).

4.5.1 Discussion

Some of the points made in the discussions were that:

- it is important to recognise that **watershed committees** currently have no role in water management. They are mainly focused around disbursement of funds for land-based activities and infrastructure development e.g. check-dams.
- it is also important to recognise the important contributions that **irrigated agriculture** makes to rural livelihoods. After all, this has provided a route out of food insecurity and poverty for many people over recent decades.

- the **connectivity** of local aquifers is a vital factor in relation to groundwater management.
- there has been a strong emphasis on **surface water resources** in RSA.
- does **productive use** of water compromise drinking water availability (for the poor in particular) or improve it through improved cost recovery?

4.6 Hyderabad seminar (Day 10)

4.6.1 Purpose

The aims of the Hyderabad seminar were:

- To explain the purpose and activities of the WHIRL project to a wider group of stakeholders
- To present the findings of a series of field visits and seminars, focusing on:
  - ⇒ impacts of groundwater development for irrigation on rural water supplies
  - ⇒ impacts of watershed development on rural water supplies
  - ⇒ sharing experiences between South Africa and India
- To develop partnerships and linkages

4.6.2 Presentations in morning session

Opening Remarks by SP Tucker, Project Director, APRLP, focused on three important and relevant efforts: watershed development, promoting people's empowerment and the one-year old water mission. In this context, the development of linkages between government, NGOs, donors and external organisations is very important. In particular, Andhra Pradesh can learn from South African experiences where good legislation has been developed. The state is largely a dry area (300-1200 mm rainfall) and per capita water availability is declining. Inequity and conflicts over water are major problems. There are both quantity and quality problems. These issues are of great importance to government and are recognised by the Chief Minister and are backed by financial resources. Focusing on the role of the seminar, the potential to improve water management and rural water supply through watershed development projects was emphasised.

Mr Malla Reddy from Accion Fraterna, the lead NGO partner involved in the WHIRL project in India then made some **introductory remarks** on behalf of the project.

An **Introduction to WHIRL** was then given by John Butterworth (NRI).

Workshop presentations were then given by participants on behalf of the group who were able to attend the whole workshop. These were:

- **Water and Livelihoods in Andhra Pradesh: Some Key Issues** by Liz Robinson (NRI) and AJ James
- **Understanding a complex problem** by Patrick Moriarty, IRC International Water & Sanitation Center
- **Finding a way forward: challenges and opportunities** by AJ James

All the above presentations are available on the project website.

The Bayesian networks that were developed during the Kurnool seminar were presented and discussed. A simplified version is illustrated in Figure 2. This illustrates how access to an equitable share or 40 lpcd of water at household level was considered to be dependent on three factors: 'total domestic' meaning the resources available for domestic use (e.g. an aquifer or tank), 'water supply infrastructure' such as a well, handpump or storage tanks and 'local rules' that will determine whether all people will have access to the supply. Each of these

factors is in turn dependent upon many other factors. Watershed development (WSD) is shown to influence 'recharge' which affects the availability of 'local water resources', but also the 'incentives to irrigate'. This means that watershed development has both positive and negative impacts on local water resource availability. According to the tables that underlie the relationships, and were based upon very preliminary beliefs at this stage, the overall effect was that watershed development was felt to be relatively neutral i.e. it did not improve or reduce access to domestic water resources as the positive and negative impacts cancelled each other out. During the course of the WHIRL projects these networks will be improved and necessary data that underlies the network will be collected and validated.

In the third presentation, an interesting diagram was presented illustrating how over the course of the year domestic water needs can get squeezed out by irrigation water use (Figure 3). The diagram, based upon data from Karnataka, illustrates how cumulative recharge increases during the period July to January for a localised aquifer. Cumulative irrigation water use utilising groundwater from the aquifer lags behind recharge. Domestic water use is relatively constant. In this example, in March cumulative water use for irrigation and domestic use exceeds the cumulative recharge. At this stage, the use of water for domestic purposes has to be reduced, or the demand fulfilled by water from elsewhere e.g. from another source or aquifer.

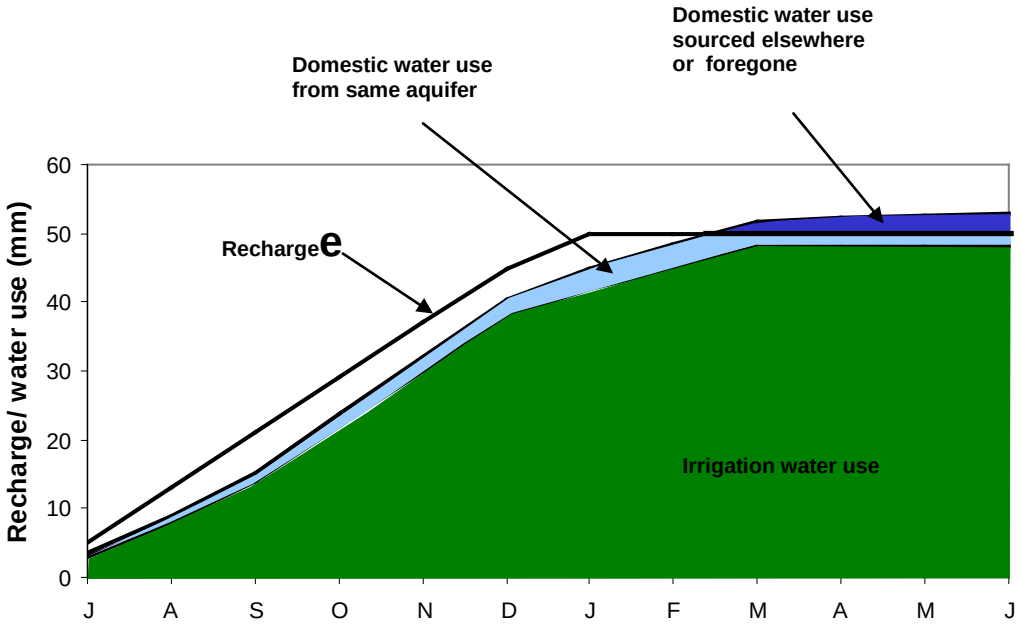


Figure 3. Diagram illustrating impacts of competition for groundwater on domestic water availability and use.

4.6.3 Discussion

Key points raised in the discussion were:

- we must recognise that dryland agriculture is risk prone and **irrigation** is one of the key risk mitigation strategies and a basis for improved livelihoods. Agricultural policies are of vital importance. Current disincentives include low prices and high fertiliser costs.
- we may have more **water harvesting** structures than is appropriate given the recharge potential
- **Bayesian networks** have weaknesses as well as strengths. Two dangers are that numbers can be just made up and then considered to represent reality and it is very difficult to

collect data evenly across a network to minimise errors. A more useful question to ask though than whether decisions based on a Bayesian network are correct, is whether the decisions are better than decisions made using existing approaches.

- Bayesian networks can be **integrated** with other models e.g. physical or hydrological models.
- It is not possible to reduce irrigated areas, but can improve **water use efficiency**. There may be win-win solutions in some cases
- **water quality**, flouride and bacterial contamination, issues are of vital importance.
- recent changes can be seen as effective **privatisation** of a common pool resource through borewell irrigation. To change this situation has technical and constitutional aspects and is a very long-term issue. In the mean time, we have to address very real water shortages. A **twin-track approach** is therefore needed to deal both with immediate problems and to promote log-term solutions. In this context people can be scared by IWRM which is seen as disempowering.
- the role of **markets** in promoting efficient water use should be investigated.

4.6.4 Presentations in afternoon session

Three further presentations included experiences from South Africa and other water sector projects in Andhra Pradesh:

- **Experiences from South Africa** by Washington Tunha (DWAF) & Kgopotso Mokgope, (AWARD) (available on website)
- **Experiences from Netherlands-Assisted Projects** by RK Daw
- **Experiences from APWELL** by Govardhan Das (available on website)

4.6.5 Discussion

Key points raised were:

- In South Africa the new act focuses on **institutional change**. In this context, India may find the experiences very useful.
- In Nalgonda no way was found of protecting low **fluoride** content water for drinking rather than use for paddy irrigation. The authorities were not willing to use powers.

4.6.6 Groupwork

Breakout sessions then focused on the following themes:

1) Interactions between watershed development and rural water supply
2) Demand Management: Where is the potential?
3) Regulatory approaches: The South African case
4) Water and Livelihoods: Productive use
5) Case study: Singhampalli Village, Anantapur

The main findings of the groups are summarised in Annex 4.

4.6.7 Discussion

In the subsequent plenary discussion, some key points and questions included:

- will there be any fieldwork and **action research**? Yes, this will start following this workshop working closely with APRLP
- how can we get involved (APARD)? The initial point of contact in Andhra Pradesh is Mr Malla Reddy at Accion Fraterna. John Butterworth at NRI can also be contacted.

- the focus of the project is very much on institutional issues around watershed development and rural water supply

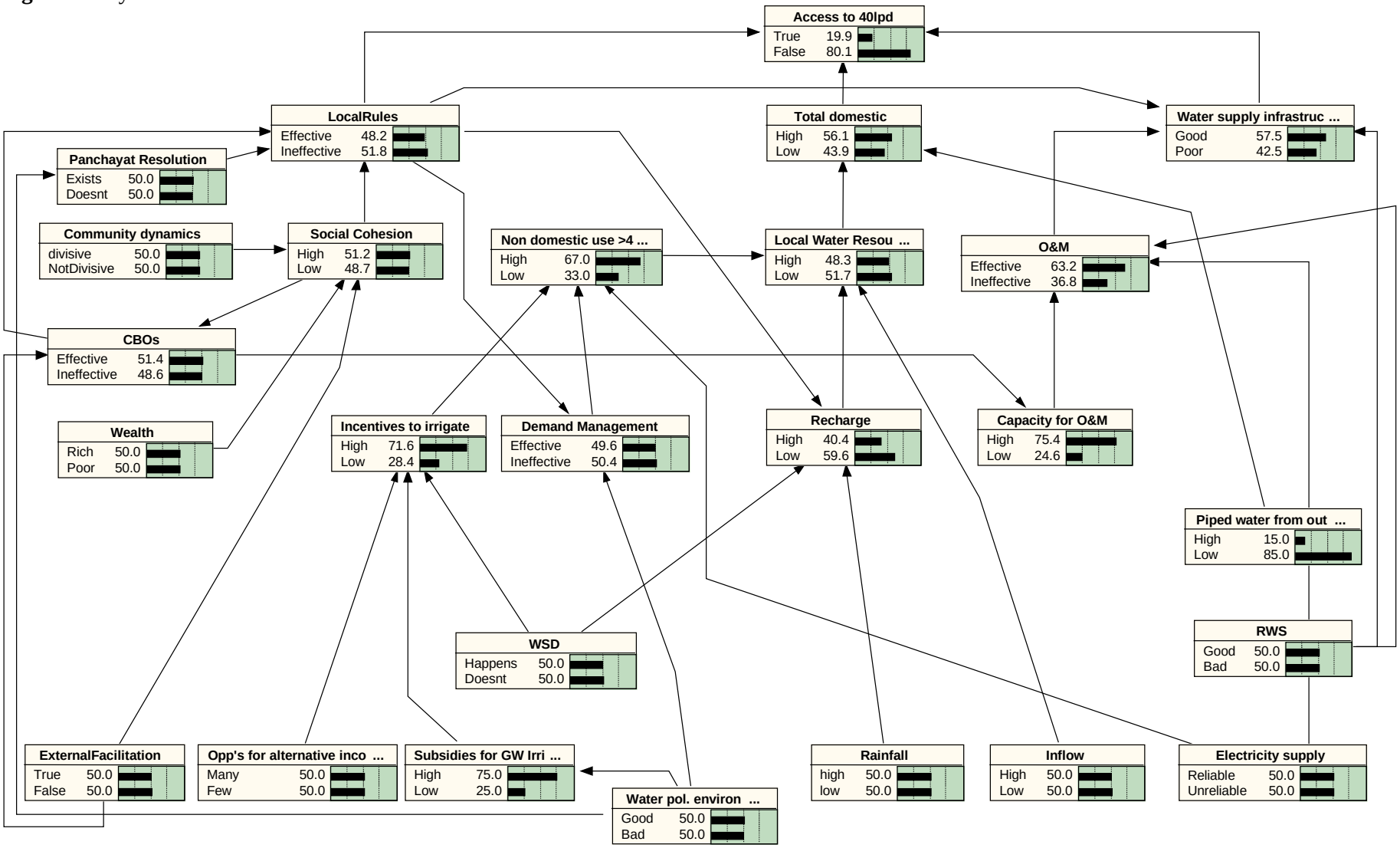
4.6.8 Closing remarks

Mr Tucker (APRLP) made some important concluding remarks on behalf of government. These focused on how the APRLP is trying to address poverty in drought-prone areas, and the importance of water resources. The trend from tank to groundwater irrigation is a major shift that has many implications. It was noted project includes innovation or breakthrough projects and in this context, WHIRL can play an important role.

Malla Reddy on behalf of Accion Fraterna and the WHIRL project responded. It was pointed out that there are no easy solutions to a difficult problem. The WHIRL project is seeking ideas and collaboration, and are trying to build convergence through the research in the areas of water and rural livelihoods.

Finally, all participants interested in the middle ground between watershed development and rural water supply were encouraged to keep in touch.

Figure 2. Bayesian network.



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Annex 2: Workshop programme

5 May	Participants met and registered in Bangalore. Introductions and welcome dinner with speech by Kaushik Mukherjee, Executive Director, KAWAD.
6 May	Visits to villages in Upparahalla where KAWAD and associated NGOs are supporting watershed development.
7 May	**Bellary Seminar** at *Central Soil Water Training and Research Institute*, Bellary.
8 May	Visits to watershed development projects in Kurnool and Anantapur Districts.
9 May	Visits to watersheds and urban/ rural water supply schemes in Kurnool and Anantapur Districts.
10 May	**Kurnool Seminar** at DPAP offices, Kurnool. Development of Bayesian networks.
11 May	Development of Bayesian networks (continued).
12 May	Preparation of presentations for Hyderabad seminar.
13 May	Rest day.
14 May	**Hyderabad Seminar** at Viceroy Hotel, Hyderabad.

Annex 3: Summaries of field visits

The villages and locations visited were:

- On the 6 May four groups visited KAWAD watersheds in **Upparahalla** Watershed, Bellary District, Karanataka (not reported)
- On 8 May, in Kurnool District one group visited **S. Rangapurum Watershed**. In Anantapur District one group visited **Vyasapuram** and **Singhampalli** villages near Uravakonda, and a second group visited **Kalyandurg town** and then **Maram Pally** and **Kadiridevarapalle.**
- On 9 May, one group visited **Laxmipalli** and **Kacheru** Villages in Kurnool District, while another group met the Anantapur District Collector, visited sites related to the **Anantapur** urban water supply and visited **Rekulakunta** village in Dhone Mandal, Kurnool District.

S. Rangapurum, Kurnool District
(8 May 2001)
Present: Batchelor, Tunha, Robinson

Key points from a meeting with Father Joseph (WCUSS, Peapully):
- Doing work with DPAP (finished), now doing UNDP social mobilisation project
- Under DPAP only 5% of funding goes to the NGO
- 4000 rupees per hectare for the DPAP of which they get 5%
- Working in 100 villages

Key issues discussed before reaching the village:
- Children diving into very clean dugwell used for irrigation
- Another close by but not used by the farmer as he is a money lender and so not interested in growing crops in dry season
- Check dams appear to have been successful
- Ridge to valley approach to watersheds, looked good
- Saw horticulture, silkworm cultivation with mulberry, papaya, citrus – high value crops
- Both the farmer's dugwells were dried up, each had a borewell adjacent to it
- The farmer had tried an in-well borewell but did not appear to be working
- Farmer was probably not competing for water with others, over time was chasing the water down using borewell
- Even with soil conservation was needing to go deeper for water by using borewell
- Saw a check dam two years old. Fifty metres from this a new dugwell with a pump installed. Example of checkdam followed by installation of well

At the village, the situation was:
- Watershed looks like a watershed with ridges and valley
- Showcase watershed
- Often quoted and often visited by politicians and WB officials
- Project initiated in 1996, completed in 2000
- 70 families, most ST/SC
- Only six landless, working as day labourers on fields

and issues included:
- Concrete road an entry point activity
- Sanitation poor
- 3 wells before project, 11 total after the project – all dugwells

- Perceived that the project had increased water
- Tried 3 borewells at total cost 45,000 rupees but had all failed
- Villagers did not object to other villagers putting in borewells if they wanted but so far there are none in the village
- Watershed committee meets once a year butdoes not discuss water, more seeds and fertiliser
- One woman complained that after the check dam was built her land was flooded (2 ½ acres) which caused her problems
- No committee for water and sanitation but if a breakdown had a gram sabbah to which they all contributed some cash and labour
- Appeared cohesive village
- Why so few wells – money, and farmers think children will move out for town jobs (many opportunities for STs?)
- Not growing high water need plants such as paddy and jowar. Instead work on farms in other areas outside watershed and get paid in grain (strongly encouraged/pushed by the NGO)
- Overall positive
- Felt that rainfall had decreased and one farmer thought that borewells in another watershed was affecting their water, but the water levels in the wells was good (especially as May)
- Situation where watershed development should work
- Cohesive community, small, soils, slope
- What if borewells introduced? Would that start process of chasing water down
- Said had not experienced water shortage but had had famine when they were eating leaves

Laxmipalli Village, Kurnool District
(9 May 2001)
Present: Batchelor, Tunha, Robinson

- Did not have an NGO member who had participated in the water audit in the village so difficult to do much
- Much water-related infrastructure in the village not working
- Failed water tank scheme
- Taps missing from water tanks
- Six wells, two had salinity problems, one was not working
- Very backward village, recently started watershed development (entry point road), enthusiastic about water initiatives, participating etc.

Kacheru Village, Kurnool District
(9 May 2001)
Present: Batchelor, Tunha, Robinson

- Tank with large catchment area, excellent condition (over-specified British-built bund?)
- Tank never used for irrigation, though sluice and canal channel but goes nowhere
- Beautiful 200-600 year well
- Caste system still functioning – social constraints on access to water – STs and SCs cannot go down to well and so have to wait for water from the upper castes
- No groundwater problem
- Tank is excellent source of recharge
- Problems are social and current/electricity, and reticulation system a problem (taps missing)
- Tank had overflowed twice in last ten years

- Sluice/spillway to get rid of the excess
- Well constructed and well maintained houses
- Water shortage nothing to do with competition
- Irrigated area small
- Shortages due to other reasons
- Not a cohesive village, the road separates the ST/SCs from the other caste villagers
- Continuous contour trenching outside of village very expensive and not very effective

Vyasapuram village, Uravakonda, Anantapur District
(8 May 2001)
Present: Ganguly, Butterworth, Bofilatos, Cain, James

There are three main sources for drinking (sweet) water in the village:

- The open well outside the village, near the old step well (but the water does not boil dal properly – unless it is boiled for a long time)
- The public tap from the Satya Sai Water Supply overhead tank built in a neighbouring village, where water is available for 1 – 1.5 hours every alternate day.
- Irrigation borewells 1.5 km outside the village, which is only used when extra water is needed (for festivals, weddings, etc.)

The borewells with handpumps in the main village, which has salty water, are used for cattle.

Borewells provide irrigation for one season (rabi). But there was not too much water to begin with and the situation is more or less the same now. Farmers feel that some borewells on the upper reaches have less water now than before. Water is found 180-200 feet normally.

Time line : Drinking Water supply

1800: 200 years ago, there was only one drinking water well (near the temple), but it was not very good quality.
1850: Then, about 150 years ago, a man called Bheemaiyya Shetty came to the village and made a well for the village. (He and his wife were childless and had been told that they would have to dig a well in a village to get a child.) This is the step well outside the village, with a shelter attached. (Bheemaiyya Shetty's family still comes once a year to offer prayers at the well.)
1920: About 80 years ago, the two open wells on either side of the step well were constructed. One was for the caste Hindus and the other for the Dalits (Scheduled Castes). It appears that this was when the open step well began to fall into disuse.
1960: Work started on the High Level Canal (HLC) and was completed by 1975 (during Chief Minister Vengal Rao's time).
1975?: The Rural Water Supply (RWS) Department of the Government of Andhra Pradesh built a piped water system for Uravakonda town and 6 other villages, of which one was Vyasapuram. This system took water from the HLC (which flows from July to December?) to a summer storage tank, from which it was pumped to different villages after simple filtration. In Vyasapuram this water came to an overhead tank built in the village with 1 outlet at its base holding 3 public taps. But for different reasons (being in the tail-end of the distribution system, problems with the pipes, etc.) it does not work any more and the village gets no water from that source.
1986: The RWS Department drilled a borewell near the open step well, which produced water that began to smell soon after pumping commenced, and the water turned salty. The RWS paid for the borewell and the pump. The pump is not in a working condition now.
1990?: Sathya Sai Trust drilled a borewell and an overhead tank in a nearby village. The residual water from that tank (after satisfying the demand of that village) was provided to Vyasapuram. But of the four public taps provided from this source, only one (in the SC

colony) is now working. Also, water only comes for 1-1.5 hours every alternate day. The upper caste households also collect water from this tap, making the SC wait their turn. As there is no tap attached to the hole at the bottom of the water tank, water just keeps flowing out when water is not being collected by the people. Even while the pots are being filled almost all 50% of the water is wasted.

2001: The RWS drilled a new borewell near the open well used by the upper caste. The borewell is 150 feet deep although water was available at 45 feet. Also, the water level fell by 6 feet in the open well when the water was pumped out initially. Through the Gram Panchayat, the villagers had asked the RWS to drill the borewell. They hoped that money to put in a pump and pipelines to the village could be raised through the local MLA or the some other source.

Suggestions

Bring water from new borewell near HLC canal

Villagers feel that this is a perennial source of sweet water and there are many private borewells and orchards in nearby land. The land around the canal belong to the HLC, and so they wouldn't have to get permission from any private farmer. But when they asked the RWS to organise this for them, they were told that the RWS does not have enough money to do it.

Separate overhead tank from Satya Sai water supply system

By adding a new overhead tank to the existing pump and pipeline, villagers feel they will be able to pump additional water solely for their village. This is something they have yet to enquire about.

Rejuvenate old well

De-silting and cleaning the well may rejuvenate it.

Singhampalli, Uravakonda, Anantapur District
(8 May 2001)
Present: Ganguly, Butterworth, Bofilatos, Cain, James

A man named Singhappa and his family founded the village and gave it its name. Long ago (probably last century?) while transporting cotton to Bellary, a large stone (incarnation of a goddess) was found ('came and sat') on one of the bullock carts. Because of the weight, it was removed. But another stone was found on the bullock cart. The villagers then decided this was auspicious and built a temple and named the four corners of the village after deities: Anjenaya (South), Bakumariamma (East), Akkamma (North) and Puleramma (West). The fortunes of the village changed for the better since then – and no epidemics have visited the village.

Time Line Analysis : Irrigation

- **1900**: Perhaps around 100 years ago an old broken tank (*cherwu*) was re-built (claimed to be the father of one of the old men in the village). The wall between two hillocks was re-built with stone and cement, in place of the brick and lime mortar of the original construction. The spillway was also made on rock, and the bund was designed to be standing 'even when other dams broke and fell away'.
  Apart from this *pedda chervu* or big tank, there were two others : a medium (*madyama*) tank and a small (*chinna*) tank. These provided for irrigated agriculture in the village.
- **1940**: Pre-independence, there were about 100 small wells providing irrigation water. Water was available at 10-15 feet and there was water in the tanks. There were 3 drinking water wells in the village.

- **1950-1970**: Drinking water wells ran dry, and were deepened. Water was lifted out either using bulls (and a leather bucket) or by people walking on a plank, that dipped a leather bucket into the well and drew water out.
- **1970 – 1974**: Diesel pump sets were fitted to 40-50 wells for irrigation. There were lots of animals (cattle, goats, sheep) with an average of 20-30 animals per household. There were about 100-120 households at the time.
- **1974**: Electricity came to the village, and farmers shifted to electric pumpsets.
- **1975 – 1979**: Water was pumped day and night. Irrigated area increased manifold: where 1 bull could irrigated 1 acre, pumps could irrigate 7-8 acres. Irrigation wells began to dry up.
- **1980 – 2001**: Everyone tried in-well bores (4 inches), to depths from 40 – 100 feet. Worked for a while, then even those dried up. Then people began to go in for surface bores (6 inches), 150- 200 feet deep with submersible pumps.
- **2001**: Currently there are about 40 irrigation borewells, which provide for 1 irrigated rabi crop, apart from the kharif crop. The main crops grown are ragi, groundnut and paddy.

Time Line Analysis: Drinking Water

- **1975 –1979**: Enormous increase in pumping after electric pumpsets put on 40 irrigation wells and the 3 drinking water wells ran dry.
- **1979**: The government (RWS?Panchayat?) drilled 4 borewells near the wells and put handpumps on them. This lasted for about 10 years, by the end of which it was getting more and more difficult to work the hand pumps.
- **1990**: Another borewell was dug (by the RWS?), 232 feet deep and with a handpump attached. This source served the entire village.
- **1996**: Satya Saibaba Trust came to put in new pipelines to connect them to an outside source. Villagers said they don't want pipeline from an outside source, just a pump and 4 tanks. This was built and currently serves the population. The SST also bored a well in the SC colony, but it was a failure.
- **2001**: The upper caste sections of the village have water, provided there is electricity (they get electricity 12 hours a day). Water is pumped whenever there is electricity (the pump has an automatic on-off switch). But (most?) often taps are not closed properly and water is allowed to run waste. Also the pump continues to work whether or not the tank is full. The tank in the SC colony is located slightly uphill and therefore fills only if the other taps are closed (and that is not often?). So they have to come and fill water from one of the 3 overhead tanks/taps in the upper caste section of the village. There is also a *lambada* settlement in the village, but they have their own borewell and handpump system.

Effects of watershed development

- When the check dam gets filled, the water in the wells increases. But the last few seasons there have been no rains.
- Now, in the height of summer, there is still enough drinking water if there is electricity (though water in the wells *has* reduced).
- Cattle numbers have decreased. Only farmers own cattle now, and that too only an average of 2 per household (a pair of bullocks – or a cow and a buffalo?).
- In answer to question as to whether they would like to cultivate less during years of good rainfall (to build up a reserve for a bad rainfall year in the future), the villagers said that they could not afford any reduction – they still had to pay off loans.

Rekulakunta Village, Dhone Mandal, Kurnool
(9 May 2001)
Present: Bofilatos, Butterworth, Cain, James, Renuka and APRLP staff

The main water sources in current use in this small village (250 people) are an irrigation borewell used for drinking (1 km from the village near the main road), a traditional step-well used for watering livestock, and a borewell fitted with handpump with 'salty' water that is used for other domestic purposes (washing etc).

Timeline:

c. 1940 Water was collected from a traditional open well with steps providing access. It was always hard to get sufficient water in the summer season when a cup had to be used to scoop up water. Another traditional well (about 2km away across the main road) was also used.

c.1940 In a neighbouring hamlet everyone died of cholera.

1985 After an outbreak of guinea worm, associated with use of the step well, a borewell was drilled nearby (to 200ft) and fitted with a handpump. The water from this borewell has always been 'salty' and not suitable for drinking.

The step well fell into disuse and the water spoilt. It partially collapsed, and became a main source for watering livestoock.

1995 Another borewell was drilled to 460ft near the village. This borewell along the road into the village has water during the monsoon, but not during the summer.

1996 A diesel pump was fitted to the step-well and the farmer now takes a kharif and rabi crop (aboput 1 acre)

1998 A farmer drilled a new borewell for irrigation on his land near the main road (1 km from the village). The villagers collect drinking water (1-2 pots per person per day) from this borewell when the electricity is on and the well pumping.

2001 Two more borewells for irrigation purposes have been developed nearby. However, there is still plenty of water whenever the power is on.

Summary

The recent solution to 'water problems' has been provided by a farmer from the village who provides access to a new irrigation borewell, although this is 1 km from the village. However, this 'discovered' aquifer is being rapidly developed and it is quite likely that future overexploitation may compromise access to a reliable source of drinking water in the summer and during droughts.

Meeting of the team with Somesh Kumar, Anantapur, 9 May 2001

- Traditionally, in Anantapur district, there were 13-14 surface water tanks (or water bodies) per habitation, with an ayacut of between 1 – 100 acres. Some of these were large enough to look like seas (e.g., Singhanmala, Anantapur tanks, etc.). Also several villages are named after tank and water bodies.
- Under the Khudi Marammat Act (during the British period) villagers were paid by the government to repair and desilt their own surface water tanks.
- Also, certain families were asked to protect and take care of the tanks and, in exchange, were given charge of a tamarind grove *thope* in the village as payment.

- There was also a traditional leader called the *pinna peddar* (elder among the youth), who could motivate the youth (and others in the village) to do community well, including tank rehabilitation.
- Watershed development in the current period has probably done more harm than good. It has been equated with check dam building which is indiscriminate because there is money to do it.
- However, given the two possible options of (1) trying to speak and influence and (2) do and show, the second is probably more useful. This was done in the case of the Japanese encephalitis outbreak in Anantapur in 2000 (it was more linked to malnutrition and mosquito breeding grounds than pig rearing by the poor).
- This is also the purpose of the Chitravati Nala Revival Project, which is trying to revitalise the river and revive the traditional tank recharge systems along the river. It will cost Rs. 40 lakhs and should be done by end June.
- This approach is different from watershed development in that:
  - There is a focus on reviving traditional systems
  - There is a separation of watershed development and poverty alleviation
  - There is a clear exit policy for government and handover to local communities
- There is still a large amount of indigenous technical knowledge that can be useful (e.g., 10 different indigenous designs for converting water harvesting structure to percolation tanks in Mehboobnagar, reported by Dr. Sanghi of Manage).
- The project would be glad to document these processes in the Nala Revival Project.
- Somesh would be happy if the project was prepared to pay for 1-2 people (who he could put on the job) for about 15 person-days a month.

Kalyandurg town, Anantapur District
(8 May 2001)
Present: Morairty, Desai, Mogkope, Renuka, Malla Reddy and Mr A Vijayabashar Naidu (Panchayat CEO)

Major Panchayat – 1991 pop 27,000 now maybe 40.,000. Panchayat staff of 60, of which 12 paid by government and the rest from Panchayat funds.

- Deal with water supply public health and sanitation (fixing pumps, chlorinating water, starting water at specific times). Also public health – cleaning roads, and maintaining some 5km of drains (17%) to which approximately 6,000 people have access. The drains serve wash rooms etc – not toilets. People use pit latrines.
- Water dept has 1 electrician, 12 night watchmen (part time) , 1 full time night watchmen. Only do small stuff, RWS does major work, but only on design and estimates – then contracted out.
- Water supply system based on 2 Ground Level Security Reservoirs (GLSR) and 1 overhead reserve, each has a capacity of 40,000m^3 and filled twice per day. In addition 2 borewells. One GRLS gets water from 14km away from Hagari river system, the second from a 150km pipe from Tungabhadra dam via a series of small reservoirs – serves lots of other communities on the way. Take from a balancing tank 30km away. The overhead tank (a Sai Baba system) is attached to a borewell. All three have water chlorinated before being pumped out but no other form of treatment. In addition to the storage tanks there are 2 additional borewells. The water from which is not chlorinated. One of the systems goes to the well of the bus depot – runs for 24hrs (or as long as there's power) and has a problem of dropping water level, the other is run twice a day as for the other supplies. They supply approximately 1300 households? And were Dug about three years ago.

- Water is provided from 6-8am and 5-7pm depending on availability of electricity. The system has about 308 taps and 1,400 private connections (300 rupees each as a connection fee). No storage tanks allowed in private houses.
- People do have private borewells – about 25% of people have them – though saline so used for non drinking. Have been drilling for about 5 years.
- Panchayat estimates they need two additional 40,000 tanks (160,000), and want to drill another borewell in the Hagari system.

Panchayat system:

- The town is divided into 20 wards – each of which elects a representative. A Sarpanch is elected directly by the Gram Sabbah. The CEO works for government.
- The Panchayat passes resolutions, makes annual plans, which are then checked by CEO who has right to refer them to higher bodies. The Panchayat board has to meet every 30-90 days.
- The Panchayat spends 42% (CEO's estimate) on staff – about 20 lakh. However total budget is only 31lakh. 28 lakhs from house and water tax (house is 1-2% of house, water is 20% of this). Get eight rupees per person from the "rupee" tax (about 40,000 per annum) and another 100,000 from the Jawaharlal Gram Swarojgar Yojana (JGSY) scheme – together about 140,000 per year. Of the resources for staff the government pays for about 12 people – the other 48 come from Panchayat own funds. All money received is based on 1964 census – in terms of population.
- The Panchayat requested credit of 1,890,000 for 98/99 for shopping complex, upgrading roads etc from the NABARD scheme (government). They have still heard nothing.

Borewell visit – a borewell in an 'unofficial' settlement on the edge of town

- Community borehole, on the out-skirts of the town – applied to be in Panchayat but refused. Single borehole that tastes bad and has some "particles" in the water – makes them feel like vomiting. All the community suffer from joint pains (flourosis?). Spend about 400 rupees a month on health if they visit private doctors. Handpump is hard to use and about 500m away. Everyone uses it – truckers etc. "People like you are always coming to talk to us but give us nothing".
- "If the woman earns the home runs, if the man earns the man runs – Malla Reddy.
- Women carrying water. One woman from a household of fifteen carries 25 sixteen-litre pots of water. Another woman from a household of four and had eight buffaloes and she carries 20 sixteen-litre pots of water a day.

Maram Pally, Anantapur District
(May 2001)
Present: Morairty, Desai, Mogkope, Renuka, Malla Reddy and RDT staff

- Maram Pally is one of the villages where RDT doing both poverty and watershed work (about 1500 villages doing poverty, about 100 doing watershed – they keep the projects strictly separate). Within watershed projects they have CDCs and separate watershed development communities. In CDCs only have poor, in watershed committees have everyone.
- First stop was at a hand-pump in front of a school for scheduled casts. About 3 years old, provided by RDT as part of their poverty work
- The pump is run by the community. Regulations include not pumping too hard etc. If it breaks the community fix it and share the cost. So far it has broken down once and they paid for it to be fixed. Women carrying 40 pots per day.
- Second stop was a new check-dam. "Check dams will influence recharge one to two kilometres downstream". In this village boreholes used to be at 60ft now at 200ft. There are currently 68 borewells. There used to have wells but these no longer work.

- 20 years ago the village used to irrigate 40 acres now 105 acres.
- Why do they think water decreased?
  - family lands were divided between sons and each son has to irrigate
  - also less rains and deforestation.
- Some think vegetation think is more important, some think absorption (extraction?) occurs– one woman also said crops had changed. Nobody talked about less use as being a way to resolve the problem of falling water table, everyone had high hopes for the check dam.
- One lady says water should belong to everyone – but that it currently doesn't.
- "RDT has for been shouting for ten years – and now we listen" – this is why the community is keen to be involved in watershed development projects
- When asked if they couldn't reduce abstraction? Extraction? We were told that they already use less water because of electricity problems.

Kadiridevarapalle, Anantapur District
(8 May 2001)
Present: Morairty, Desai, Mogkope, Renuka, Malla Reddy and RDT staff

- Village has 1600 people. RDT put in 42 lakhs and 15 check dams as well as renovating 3 tanks. They have developed 28 mango gardens with 7,500 trees.
- RDT will only carry out a project where there is full consensus at a Gram Sabbah. If only a single person benefits they contribute 15% if lots of people then 10%. RDT carries out NO monitoring of any of its work – for either effectiveness of efficiency
- Visited one old check dam (7 years old) that had a mango garden attached for which water was being pumped from the bed of the tank. Followed this by a visit to Mr Reddy's house (a prominent farmer) to meet men and women's farmer groups.
- Talked to the farmer at the check dam. His mango garden had 10 acres – contribution was 10% - altogether paid 30,000 in the four years – which he has already made back. Paid five thousand for the check dam next to his land and then dug a borewell in the bed of the check dam. For the first two years he did pot irrigation, then did the borewell and has since moved to drip (70,000 subsidy and 10,000 own contribution) preferred to use drip because assured of enough water and no weed problems. If government didn't give subsidy he wouldn't have done it. He is the only person in the village to have it - the scheme ended and was supposed to come back but hasn't. Cultivating mango is easy as only first three year need pay attention.
- Following this talked to a farmer below the check dam who had a traditional open well that was empty but now had water again. He cultivates paddy, groundnut and some tomatoes. When his well dried up he wasn't able to irrigate and had to buy rice from the 'fair price shop' – i.e. became very poor, now able to do 14 acres. Now making a lakh per year. The well has water throughout year.

- Renuka – talked to lady organiser about gender and was told about a group of women only watershed organisers
- women's watershed development committee - Village elders had heard about watershed activities – and made a proposal to RDT – 20-25 members went. After this RDT staff came and called a Gram Sabbah. Village elders supported women to be committee members. When asked why this had happened they said that the women were already in self help groups and have some knowledge of banks etc. Women made their committee – 1 from SC, 1 from ST, 3 from BC, farmer families 2 from big farmers and 2 from small farmers, 2 from dokra group (SHG)1 from temple trust, one from advisory committee, one from GP. After the formation of the committee and in the presence of the people they called a Gram Sabbah to take the oath to work for better watershed etc. After that given many trainings on leadership, plan making, obligations, and now go for regular meetings

2 times per month. They also take part in regular PRA was exercises – and have developed an action plan. The action plan was prepared for a whole project area for four years. Now divided into a yearly plan, and monthly plans.

Interview with women's group:

- All rich women – all landed – of 11 committee members 4 are women – however they were added to group only 2 years before pull out (as this was an early RDT watershed any participatory work was relatively recent – they'd originally had a largely technical focus).
- The main benefits to women were
  - biogas: they don't have to clean pots, and don't have to get fuel and firewood.
  - hybrid grasses - one woman used to go far and get grass for fodder and now they've introduced hybrid grasses – women have to get grass – so this has helped.
  - Wages: women get wages from labour opportunities – get SR rates for 1.5 cubic metres dugout they get 23.5 rupees.
  - Water: sufficient water for cattle and changes towards horticulture crops and have started kitchen gardens. Water availability is also better for both drinking and irrigation.
  - Soil moisture: now they have water in their farms too because of increased moisture in the soil and they get better crops and higher incomes.
- What happens if you keep developing? "Now we have water, we need it, we'll use it – we don't think about the future." Before the watershed project they thought water shortage was due to lack of rainfall – now they think it is runoff problems and de-vegetation.
- Had problems understanding conceptual issues – such as 'how do women become empowered' – only saw physical things – checkdams etc.

Meeting with men's group –as for the women – a group of 'resource rich' farmers:

- The men thought that the watershed project had
  - Increased irrigated area
  - Increased agricultural wages
  - Increased water availability
  - Increased soil moisture and crop yields
- Asked what they thought about water going away again:
  - In future to reduce the problem they should plant more trees (fruit) and maybe do more check dams
  - "How can we say no to someone who wants to sink a well - Everyone has to live to the extent that is possible"
  - They could try to tell someone to restrict use – but would need some external backup in the form of laws, regulations, etc.
  - They think that it would be difficult (unacceptable) to do metering but suggested control through electricity permits. For the last three years there have been no new permits (applications refused).
  - Asked what they'd think of an equitable share based on a calculation of availability – they thought it would be unworkable - BUT currently only 50 families have water/ are irrigating.

Anantapur town

- Norm for towns is 70l/day. Houses are getting 1.3 hours per day depending on pressure. Treatment is by flocculation using alum, filtering and chlorination. They only supply 40l per day. They supply water every alternate day usually and once in 3 days in summer?
- What's the problems? Lack of sources.
- 15,000 legal connections, 1,000 public taps. Household connections cost 60rupees per month. No idea as to how many 'illegal' – think 'not many'. Think that leaks are 1-3%. However NO metering. 1991 population was 2.7 lakh now 3.5 lakh. Using tankers to provide water in slum areas. In 44 identified slums they've put some taps, in 15 unidentified and the rest of the 44 use tankers that they pay for.
- 850 municipal borewells for non-drinking water – an unknown number of private ones ("could be from 1000 to 10000).
- Visit to reservoir and treatment centre – 10-% of any large dam is reserved for drinking water. The supply to the reservoir outside Anantapur comes from 200km away at ? via a balancing tank at 40km. From August to December they tap from regular irrigation flows. For the rest of the year have to put in requests for water as and when needed. The reservoir has 45 days storage capacity.

Annex 4: Summaries of group discussions at Hyderabad seminar

Group 1: Watershed development - Positive and negative interactions

This group presented a table summarising their discussions.

Positive impacts of WD	Negative impacts of WD	How to build on positive impacts? How to avoid or mitigate negative impacts?
• Increased groundwater recharge (short term) • Can raise awareness in relation to water use and management • Entry-point activities e.g. hand pump • Possibility to leverage funds and action by government RWS departments	• Successful WD projects tend to encourage borewell irrigation either directly or indirectly due to incentives to irrigate e.g. increased water availability, investment of subsidies and higher returns from dryland farming in wells and pumps. Can result in failure of drinking water sources e.g. hadpumps.	• Should address WRM in WD guidelines • Use GW legislation to aquire wells and land and encourage measures to restrict borewell construction, cropping practices • Remove subsidies from irrigation • Raise awareness and make lower water consumption attractive e.g. subsidies should encourage efficient water use • Accept that RWS is unsustainable in long-term! • Household rainwater harvesting • Ensure some of the recharge is protected for drinking water

Some of the comments made included:

- we are not sure if the RWS sector-reform projects are doing their own watershed development (as source protection) or linking with DPAP?
- many felt that RWS can be better linked or integrated with watershed development, but not the other way round. Also dangers of integration.
- an interesting strategy to cope with high flouride contents in drinking water in Nalgonda was that dairy farmers were bringing back water from Hyderabad in milk churns.
- the practise is to have multiple sources in villages (for different purposes or groups) and multiple use of individual sources. It is complex. It has been a mistake to try and implement universal RWS schemes with single source aiming to provide water for all needs. These have usually failed.
- the relative cost comparison between options (including appropriate water management) is important.

Group 2: Demand management

1. The group agreed that demand management was necessary and that demand management strategies should be devised in relation to rural livelihoods.
2. The group defined two broad categories of demand management strategies:
    - measures to encourage more efficient water use
    - measures specifically aimed at reducing water use
3. The group agreed that measures to encourage more efficient water use were needed. However, the group was split over the need for and/or the feasibility of implementing measures specifically aimed at reducing use.

4. Some of the group felt that access to drinking water was not generally a problem. If it was a problem, it was in less than 25% of the villages and only during the summer period. Some members of the group felt that this situation was unlikely to change in the future. During the discussion that followed, it was suggested that it might be more accurate to say that *safe* drinking water was a problem.
5. It was suggested that the WHIRL project may have a role in collating and disseminating evidence as to the scale and nature of drinking water problems.

Measures to encourage more efficient water use include:

- Regular timely power supply to avoid wastage.
- Protective irrigation (this is the use of minimal irrigation- it cannot be practised with paddy cultivation).
- More efficient irrigation systems (i.e. drip and sprinkler as opposed to flood).
- Community irrigation systems (a well shared between 4 or 5 families with only on family having access on each day. Due to limited access to water, this encourages farmers to grow more drought tolerant crops which leads to improved water use efficiency).
- Training of farmers in water use efficiency strategies. Attitudinal changes would be needed.
- Combination of poor quality surface water with good quality groundwater for both domestic and agricultural use.

Notes on measures specifically aimed at reducing water use are summarised below. Some members of the group felt that none of these measures were necessary. Some also felt that none of them were implementable.

- Water uses should be prioritised as follows: Drinking, sanitation, rural livelihoods, local industry.
- Need to provide disincentives to irrigate (e.g. reduce crop values, provide alternative income sources).
- Disincentives (or reduction of incentives) needed to reduce groundwater exploitation.
- Limit area which can be irrigated (it was noted that irrigating less than 3 ha. was uneconomic).
- Define and protect a reserve of 40 l/head/day (this concept was not clearly understood by many of the group).
- All of these measures raised ideological issues of individual rights vs. the common good. These would need to be addressed if any of these measures were to be implemented.
- A reserve may be appropriate in "grey" areas, where more than 65% of available resources is being used.

Comments

When there are water supply shortages, who are excluded?, is a vital question to ask.

Group 3: South African Regulatory Approaches

This group compared South African and Indian experiences in water resources management and water supply. The National Water Act in South Africa and National Water Policy in India were compared.

In India, the provision of drinking water is enshrined in the constitution of the country. Water for domestic uses is prioritised in the provision of water. Second priority is given to agricultural irrigation, then industry and power generation. In the event of water shortages and other circumstances, water for non-domestic use can be withdrawn from these sectors and used for domestic uses. However there is a need for compensation in this regard, for those who relinquish their access to water.

There is no Act equivalent to the South African National Water Act in India. However there is a National Water Policy. There are schemes existing that are aimed at integrating management of all rivers, however there is no integrated approach to water resources. The overall problem in India is not the lack of legislation, but the enforcement of the existing wide range of legislation. Existing legislation on groundwater extraction include the Groundwater Acts, but as with other pieces of legislation, this is not enforced. The Land, Water and Trees Bill, 2001, is also aimed at regulating the exploitation of groundwater.

The principles of equity within the South African National Water Act meant that there was a need to abolish rights to water based on riparian principles. Access to water is primarily based on riparian rights in India. Although it is desirable to "abolish" riparian rights, it is very unlikely to be possible to abolish these rights or to change the status quo. However, riparian rights are being lost as a result of poor catchment management. There is a need to consider the provision of alternative water for those who comply with legislation, as an incentive, particularly when considering the abolishment of riparian based access to water.

The participants from India in this group felt that the word abolishment, on the issue of riparian rights was too negative, particularly given the situation in India, where these rights are deeply entrenched and well established, and thus more likely to be met with resistance.

Comments

Food security is an important issue in this context. It is different from food self-sufficiency. Food security can still be attained while importing water in food from less dry areas.

Group 4: Livelihoods (non-irrigation) group

Questions and issues considered by this group were:

- Water in rural areas is often divided between supplies for 'domestic' and 'irrigation' use. However, it has many other 'productive' uses, many of which are crucial for the livelihoods of women and the poor. These include watering livestock, laundry, construction etc.
- How can these other uses be included in water resource allocation decisions?
- Can the definition of 'domestic' water supply be extended to include them?
- How can statutory 'minimum' rights to access be expanded to include them ?
- What information is there about the 'non-irrigation' uses of water in rural India: what are their relative values and importance and to who? Is it possible to come up with estimates of quantity and value?

Group 5: Case study of Singhampalli Village, Anantapur

This group considered the case of Singhampalli Village in Anantapur, one of the villages visited earlier during the workshop and how to ensure 'equitable' access to water for all villagers. Discussions are summarised in the table below.

Critical issues	Solutions	Who is responsible and how
▪ Very low rainfall area ▪ "Survival" – people chase water down ▪ Erosion of supplemental income from livestock ▪ Challenge: "How to	▪ Protect one aquifer from extraction ▪ Piped water from outside the village – but from where ▪ Roof water harvesting	▪ Panchayat Raj institutions ▪ Rules and regulations for informed local choices ▪ Fight for changes in groundwater act ▪ Strengthen local village

drought-proof the village” ▪ Insufficient resources for panchayat	▪ Revival of tanls	institutions ▪ (relate to all)
▪ Lack of understanding between different groups ▪ Insensitivity ▪ Caste discrimination	▪ Proper representation of all groups within village for planning	
▪ Food production appears priority, so irrigation water priority over drinking water ▪ High water-used crops chosen	▪ Allocate water as a function of need and availability	▪ Monitoring system for water use
▪ Wasting water	▪ Automatic switch off when tank is full ▪ Closing taps when not in use	
▪ Unreliable electricity supply ▪ Automatic switch so that water always comes on when current is on	▪ Predictable electricity supply	