Expert's Opinion

Tushaar Shah of the International Water Management Institute (IWMI)

Integrated Water Resources Management in Informal Water Economies: Fitting Reforms to Context

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Integrated Water Resources Management in Informal Water Economies: Fitting Reforms to Context

Tushaar Shah

In response to growing water scarcity, global discussions on water policy and institutions has increasingly emphasized the need to shift from supply-side interventions to demand-side management. Although the phrase IWRM is used in various ways, its central focus often is on improving the management of demand for water through *direct regulatory and economic interventions*. Water sector reforms instituted in many countries of Asia (Thailand, Indonesia, Vietnam, Sri Lanka) and Africa (Ghana, South Africa, Ethiopia, Tanzania) since mid-1990's have involved: [a] declaring water as State property through a new law; [b] establishment of a system of 'water withdrawal permits'; [c] introduction of a water price or 'tax'; [d] water management at river basin level by reorganizing territorial agencies into river basin organizations; and [e] people's participation in water resources management in a gender-sensitive fashion.

A workshop organized by IWMI earlier this year discussed the experiences of several of these countries with their water sector reforms. The overwhelming sense was that these reforms are achieving little by way of improving the working of water economies of these countries. In some cases, negative impacts were noted because reforms undermined-or even emasculated — traditional institutions that were serving important purposes of the people. In Sri Lanka, efforts to institute reforms were frustrated twice by civil society and media, and had to be dropped. In South Africa, the Mecca of water reforms, new water law and policy established order in the 'formal' water economy — commercial farms, industry, mines, commercial establishments — that account for 95% of national water use but 0.5% of South Africans. Rural, black South Africa has remained largely untouched by the reforms. Ghana, which led the reform movement in Africa, we were told, is already going back to the drawing board.

IWMI's explorations in the efficacy of *demand-side* reforms has led us to following seven propositions(Shah 2005):

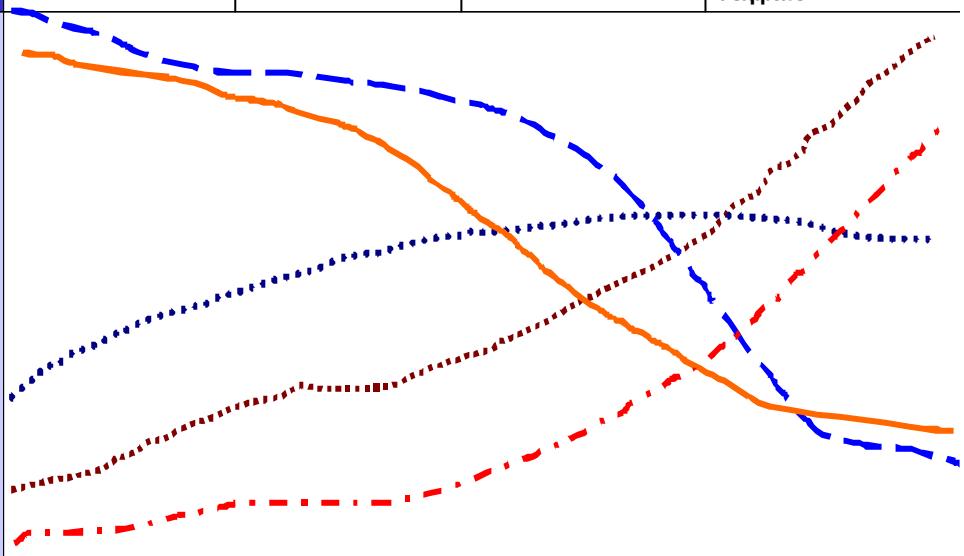
First, water institutions obtaining in a nation at any given point in time depend critically upon the level of *formalization* of its water economy; by formalization, we mean the proportion of the economy that comes under the ambit of direct regulatory influence of water law, policy and administration of the country.

Second, water sectors are highly informal in poorly developed economies, and become more formalized only as national economies grow; poor countries rarely have a highly formal water economy; and rich countries seldom have an informal water economy.

Third, the *pace* of water sector formalization depends centrally on the 'accumulation and deepening of hydraulic capital' through sustainable investment in infrastructure which in turn, occurs as a response to over all economic growth. Other factors—such as the nature of the State (China or Oman) or peculiar institutions (such as Mgambo in Tanzania or military in Pakistan) may have some influence; however, it

is clear that India or Tanzania can not have Switzerlands's level of formalization of its water sector at their present state of economic evolution.

Fourth, in a predominantly informal water economy, by far the majority of water users divert water directly from nature. In India, over 80% of domestic water users and over 70% of irrigators have no point of direct contact with any formal mediating agency because they get their water directly from aquifers, ponds, streams. These do not depend on a public or even a community-managed water source. In contrast, in a highly formalized water economy, most users and uses of water depend upon formal water service providers. Here, water sector policy makers can easily influence the behavior of millions of end-users by modifying the behavior of a handful of service providers.

	Stage I: Completely Informal	Stage II: Largely Informal	Stage III: Formalizing	Stage IV: Highly Formal Water Industry
% of water users in the formal sector	<5%	5-35%	35-75%	75-95%
Examples	Sub-Saharan Africa	India, Pakistan, Bangladesh	Mexico, Thailand, Turkey, Eastern China	USA, Canada, Western Europe, Australia
Dominant mode of water service provision	Self-supply and informal mutual-help community institutions	Partial Public Provisioning but self-supply dominates	Private public provisioning; attempts to improve service and manage the resource	Rise of modern water industry; High Intermediation; self-supply disappears
Human, technical, financial resources used by water sector % of total water use self-supplied Rural population as % of total Cost of domestic water as % of per caput income Cost of water service provision				
Concerns of the Governments	Infrastructure creation in Welfare Mode	Infrastructure and Water services, especially in Urban areas	Infrastructure and service in towns and villages; Cost recovery; Resource protection	Integrated mgt. of water infrastructure, service and resource; Resource protection
Institutional Arrangements	Self-help; mutual help and feudal institutions dominate	Informal Markets; Mutual help and community management institutions	Organized service providers; self-supply declines; informal institutions decline in significance	Self-supply disappears; all users get served by modern water industry.

Fifth, informal water economies are teeming with informal water institutions. India, for example, has vibrant—but local and fragmented—markets in pump irrigation service as well as for urban water supply, mass-based movements for rainwater harvesting and groundwater recharge, tank management institutions, in-land fisheries institutions and so on. These emerge, exist and survive as long as they serve purposes important to their patrons.

Sixth, the *transaction costs* of regulating the working of these informal institutions are exceedingly high. Thus, India has been contemplating a law to regulate groundwater draft for 30 years; but doubts are raised about the State's capacity to enforce such a law. Mexico, faced with groundwater depletion, has tried hard to make such regulation work through their Law of the Nation's Water; but they have found it very difficult to enforce pumping quotas on their 96000 irrigation tube-well owners. If India were to try this route, it will have to enforce the law on over 20 million owners of irrigation wells. It is bound to fail.

Seventh, while informal water institutions are not subject to easy regulation by the State, it is often possible to devise *indirect* instruments to influence their working, provided we understand their working fully—warts and all. In India, thus, the government can not regulate groundwater directly, but, as IWMI has shown (Shah et al 2005) it can achieve much the same impact by redesigning electricity supply and pricing policies for agriculture. Likewise, the water policy makers can not directly do much to bring greater equity in access to benefits from local water bodies but can make powerful impact by working with fisheries authorities who write and administer policies for leasing of ponds for culture fishery. A major water sector challenge in India is to reduce water use in agriculture. 60 percent of India's agricultural water use is in flood irrigation of rice. A new bunch of rice cultivation practices, popular as System of Rice Intensification (or SRI) has the potential to drastically reduce India's agricultural water use. However, water sector policy makers seldom talk to power sector managers or fisheries decision makers or agriculture extension agencies for forging such indirect levers of managing the water economy.

The upshot of IWMI research is that improving water resources management in informal water economies requires IWRM of a different kind in which water policy makers eschew their hydro-centric propensity, and cast their net wide in search of *indirect levers* of water policy that would work through informal institutions. It requires an integral approach to managing numerous informal economies where water is a central input. Since the nature of these economies would differ from country to country, there is no 'one-size-fit-all' formula.

In summary, then: [a] normal IWRM — using prices, permits and regulation to manage water demand — would work in formalized segments of national water economies but not in informal segments; [b] for a long time to come, making meaningful and wise investments in water infrastructure and services — and their sustainable management — will be a key priority for developing countries; [c] the only way to improve management of *water resources* in developing countries is through an integrated approach but of a different kind, in which water policy makers build working coalitions with policy makers in water-using informal economies; and [d] to make such a strategy work, it is critical for water policy makers to extend their understanding beyond the technicalities of the water sector and envelope the full working of key water-using informal economies.

References:

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SHAH, TUSHAAR, Christopher Scott, Avinash Kishore, Abhishek Sharma. 2005. "Energy-Irrigation Nexus in South Asia: Conserving Groundwater and Improving the Viability of Electricity Industry", IWMI Research Report 70.

Annex 1

Characteristics of *Swayambhoo* (self-creating) Water Institutions

	Fishing contractors using co-operatives as fronts	Reverse Osmosis plants in North Gujarat's cottage industry	Tubewell companies of North Gujarat and Gujarat's Public Tubewell transfer program	Urban tanker water markets	Irrigation institutions unfolding in the Narmada command	Decentralized groundwater recharge movement of Saurashtra
Scale of the institution	Tens of thousands of small and large tank fishery in India	Around 300 plants in Gujarat	Some 8-10 thousand companies in North Gujarat	Most Indian cities	Several thousand new pumps installed/year	300,000 wells modified for recharge; 50,000 check dams
Economic contribution	Contributed to achieving 7-10 fold increase in inland fishery productivity during 1960-2000	Add and operate water treatment capacity to serve demand for clean water	Create irrigation potential where individual farmers would be unable to do.	Fill the gap between demand and supply	Private investment in water distribution infrastructure; expansion of Narmada irrigation	Improved greatly security of kharif crops, and chance of a rabi crop
Raison de tre	Can protect fish better and therefore can invest in intensive culture fishery which co-ops can not	To profit from serving emerging demand for fluoride-free water by investing in and maintaining RO plant	To pool capital and share risks of tubewell failure in creating and operating an irrigation source in an over-exploited aquifer	To profit from supply of water in cities where public institutions can not cope with the economic demand	To profit by distributing Narmada water by lifting water from canals and transporting it by rubber pipe to user fields	Improve water availability in wells for life-saving irrigation when monsoon makes early withdrawal
Mode of emergence	*swayambhoo*	*swayambhoo*	*swayambhoo*	*Swayambhoo*	*Swayambhoo*	*Swayambhoo; catalyzed by religious organizations.*
Strategy of reducing transaction and transformation cost	Instilling fear amongst poachers	Cultivating annual customers	Vesting management roles into members with largest share in command area	Meet the demand as it occurs in flexible manner	Avoid making of sub-minors and field channels, reduce seepage, overcome topography	Swadhyaya Parivar and Swaminarayan Sampradaya reduced transaction costs of co-operative action
Incentive structure	Pay-off concentration	Pay-off concentration	Pay-off concentration	Pay-off concentration	Pay-off concentration	Self-interest was skillfully blended with missionary zeal
Outlook of the 'establishment'	Negative; but changing in states like Gujarat	negative	Negative	Neutral/ negative	Negative/neutral	Initially skeptical; but then, it piggy-backed and lessened its *swayambhoo* character
Preferred alternative in institutional environment	Registered Fishermen's co-operatives	Community RO plants	Idealized Water User Associations	Municipal water supply improved	Idealized Water User Associations	Narmada project; scientific recharge works

Water Management in Informal Economies: Experiences from India

Tushaar Shah of the International Water Management Institute, interviewed by Chris Morger and Annette Kolff for InfoResources, November 2005

InfoResources: *You say that the Integrated Water Resource Management (IWRM) approach is not working as intended because often the water sector is informal, and it is unlikely that a society can reach a formal stage within a few years. It this correct?*

Tushaar Shah: There is one mistake that needs to be corrected. My impression is that the IWRM approach follows models that work in high-income countries with formalized water economies. It is basically assumed that these models – slightly modified for poor countries – produce the same impacts that they do in their home countries.

No matter how we look at IWRM, it essentially focuses on affecting demand. But for the past one hundred years, all the developing countries have concentrated their efforts on improving the supply of water. Farmers need water to build irrigation systems. In towns, people do not have drinking water of good quality and are building more supply systems.

In the last ten years the awareness that supply-side thinking alone cannot lead to sustainable water management has grown. Managing demand has become a key factor in sustainability in water management, and the IWRM approach moves in this direction. This must be taken into account when designing both interventions in the water sector and water policies in developing countries.

Creative solutions are needed to manage water demand in a society where the entire sector is basically informal. What would they look like?

What would work is far less clear than what is not working. For example, there is this normal, very valid assumption that you cannot have a commodity that is both scarce and free. If you have a scarce commodity that is free, then it is wasted. Thus if you have a commodity that can become scarce, sometimes a price must be attached to it.

Manage water demand

IWRM is thus about controlling demand via the formal sector. But demand is constantly increasing, because population is increasing at an alarming rate. Between 1960 and 2000, we had a doubling of the population, which means that access to natural resources per capita was halved. Growing demand has negative impacts on the environment. How can we control demand effectively and at the same time reduce its impacts on the environment in an informal system?

I doubt if the answer is fully known. First we have to look carefully at the policies that were formulated in the past and are today producing pervasive impacts. In many countries, especially in Asia, for example, there is a history of policies that were once correct and relevant but have today become counterproductive. For example, India was facing a national food security crisis in 1960. People in Haryana and Punjab were encouraged to grow rice and wheat, which had never been native crops in that area. Rice was introduced in Haryana and Punjab as the result of government policy. Conse-

quently, India did achieve national food security in the 1970s, but at the cost of the environment. How can you grow rice in a desert? Punjab used to be a desert before the British canal system was built. Now there are huge areas under rice in the Indo-Gangetic Plain. That happened because of a wrong set of policies not adapted to environmental conditions. Today we need to gradually undo these policies.

Dropping incentives once given to farmers is not easy. How can people who now depend on water for their livelihood be persuaded to use less water?

The Water Resource Minister of Punjab has organized farmers' rallies. He keeps asking farmers, "Why do you oppose the Indian government's attempts to reduce this subsidy?" And farmers say: "We never grew rice. You made us grow rice and now you want us to grow something else." Then he asked them: "Are you interested in subsidies or are you interested in income? If you are interested in income, then I know better ways to make more money and we are willing to support you in changing your cropping pattern."

In the first one-and-a-half years, he was able to trigger the conversion of 150,000 acres of land under rice into orchard crops. He did this by providing integrated technical advice and marketing support to farmers and by subsidizing drip irrigation.

So you say that integration has to go beyond a hydro-centred approach, beyond irrigation as such. What then are the keys to making the best use of water?

Especially in highly populated regions in the world I would expect pressure on water, as well as on other natural resources, to ease only when agriculture ceases to be the parking lot of the poor. Today a large number of people in South Asia depend on agriculture for their livelihood, because there are no options for off-farm income. Current discussions – and I do not exclude my own institution from this – focus on enhancing irrigation for food security. A lot of people have to earn their income from a one-acre plot of land. Irrigation helps them to produce on one acre what three acres would produce without irrigation. Most often this development is not driven by government investment but by private investment, because a large number of poor people try to make a living in conditions where in fact no livelihood is possible.

I don't expect this situation to continue forever. In Bangladesh, for example, the garment industry has taken much pressure off agriculture. Similar trends are seen in water-stressed regions similar to Tamil Nadu in India. Farmers who no longer find water in aquifers are now shifting from farming to off-farm livelihoods. This is a painful shift, but it eases the pressure on agriculture. So in 15-20 years' time, I expect that at least in South Asia there will be much less people depending directly on agriculture and natural resources.

Would this mean that greater efforts have to be made to develop off-farm income? This would result not only in more crops per drop but also in more jobs per drop. Will these off-farm opportunities be linked to agriculture?

They are very tightly linked. In South Asian countries, pockets of off-farm livelihoods are generated much faster in areas where agriculture is prospering and food processing facilities are available. So curiously, it is in irrigation pockets that off-farm livelihoods are growing much faster than in areas with stagnant agriculture. The challenge will be to generate off-farm livelihoods where water is scarce and where agriculture is not prospering.

Foster balance of water withdrawal and recharge

We would like to come back to the problems of the water sector – in the narrow sense. How can the overuse of many aquifers, for example in India, be stopped?

I think there is a way to counteract overuse. In many parts of India groundwater irrigation has become unsustainable. The only reason it continues is because of subsidies. In Gujarat if you cut down on subsidies in the evening today, agriculture will come to a grinding halt in many places tomorrow morning. These farmers cannot afford to pump groundwater if electricity costs 2.5-3 Rupies. This happened years ago in the Western US in many pockets where pumping of groundwater for irrigation came to a halt because energy cost of pumping from great depths were prohibitive. Groundwater pumping without subsidies is self-regulating.

Are there possibilities to recharge groundwater in order to reach a balance between abstraction and recharge of these aquifers?

That is the direction many countries are moving. I don't think it is possible to bring complete balance between abstraction and recharge, but you can at least reverse the trend. Efforts to recharge groundwater are increasing, for example through management of watersheds, by building check dams, etc. In South India, in many areas where flow irrigation was dominant, percolation tanks have been introduced and local institutions have established norms for percolation to recharge the groundwater.

Can small-scale recharge schemes like percolation tanks or water harvesting systems counterbalance withdrawal from aquifers? Isn't there a need for more large-scale recharge schemes?

The ironic fact about India's water policy is that in India everybody knows that 60% of irrigated areas are supplied by groundwater but 80-90% of our public financial resources on water are spent on surface water management. As the world's largest user of groundwater, India should be the place where high-tech programmes for recharging take place. But they only take place in the western US and Australia. India should be in the lead, experimenting with innovative large-scale schemes, but there is no scientific community to address the challenge of groundwater recharge.

Save water in agriculture

Where do you see the best potential to reduce the amount of water used for agriculture?

One major opportunity is in making cropping patterns more consistent with the water endowments of the river basins. In India, for example, we have rice being grown in large areas where there is no basis for rice production.

You have a lot of sugar cane cultivation in Maharastra just because there are very successful marketing cooperatives for sugar. Although sugar cane could easily be produced with the abundant water available in eastern India, there is hardly any sugar cane cultivation in that area just because there are no marketing facilities for sugar.

In Gujarat and Rajasthan, the dairy industry is highly developed and a huge amount of water is being used to produce dairy products. The production of one litre of milk consumes 3000 litres of water.

Government policies in the past have obviously provided the wrong incentives. But what can the farmer do to make the best use of water at the field level?

I think there is a need for what the Mexicans call "technification". In arid and semiarid areas, there are real losses due to high evaporation by flood irrigation. I think the assumption that whether to irrigate by flooding or by drip technology doesn't affect water use at the basin level is wrong. Micro-irrigation technology is an important means of real water savings in semiarid arid tropical areas, because it reduces direct evaporation losses from wet soil and open water surfaces.
Changing cropping patterns seems to me one of the most important ways of making agriculture more water-productive – primarily because such changes will be accepted by farmers, since they will also benefit from greater production. In North Gujarat we have an action research project in which we are trying to motivate farmers to switch from field crops to orchard crops. In extension work, we don't tell them that we want to save water. Basically, we tell them that world-wide, farmers are switching to drip irrigation. This is not because farmers want to save water, but because they want to earn more money. That is something that farmers understand very well. Growing wheat one season, followed by rice, gives you an income of 600 Rs per hectare. But if you grow one hectare of pomegranate you will make 15,000 Rs per hectare.

There are other new technologies that aim to improve farmers' income and at the same time preserve natural resources as an essential outcome. An example promoted by centres such as CIAT in the Indo Ganga Basin is the System of Rice Intensification (SRI). The proponents of this system say that for a thousand years it was assumed that rice requires flooding. That is not the case. The fact that rice tolerates being flooded does not mean that it requires flooding. Traditionally, it was grown in areas that were naturally flooded, but it can also tolerate non-flooded periods, which saves water.
In the SRI, farmers build a small pit at the lower end of the field – covering about 5% of the area – to harvest rainwater. This stores enough water for supplemental irrigation of the rice when needed.
In India, some NGOs experimented with this system; our research showed that yields can be increased by 20-25 % over those in permanently flooded areas, while using less water.

Building institutional and social capacities

Improving water management also challenges institutional set-ups and requires social capacity at different levels. How could development cooperation help to build this social capital to improve water use and water management?

Earlier I mentioned work in Eastern Rajasthan by a group of local organisations – some of which have been supported by the Swiss Agency for Development and Cooperation (SDC) – on water conservation and recharge, and building local institutions to sustain this capacity. In particular, they developed a "river parliament". I think this is a good example of institutional development with external support.
In the south of India there are also watershed projects with institutional development of very good quality. There are NGOs which have worked on tank rehabilitation and management. South India has a lot of these tanks, which have been there for centuries. The main challenge is to restore them and bring them back to their original shape. Some very good institutional development, as well as physical reconditioning of these tank systems, has been going on.

But will these tank systems be sufficient to serve the much greater population of today compared to the population at the time they were built?

These tanks were built to irrigate about 300 hectares, and the rehabilitation restored the original parameters. But people are complaining that they do not serve their needs. This worked in the earlier context, but today the context is very different and this must be reflected in the rehabilitation scheme.

At the time when the tank systems were built, the society was hierarchically structured and equity was not a concern. How can the dimensions of equity and poverty be incorporated today in rehabilitation of the tank schemes?

We were involved in developing a concept for a rehabilitation programme of 30-40 tanks in Rajasthan in 1994. We spent a lot of time talking to people. One of the key issues was that these tanks were built by the Rajas 100-150 years ago only for irrigation. But today many different groups of stakeholders are making different demands on these tanks: there are people who want to cultivate crops in the tanks during the dry period, while some want to wash there and others want to fish, etc. So the rehabilitation of these tanks is very complex, and the different stakeholders, who often have directly conflicting interests, have to be brought together.

Our main recommendation was to develop an association of farmers as a multi-stakeholder organisation. This association should control the agenda of the rehabilitation and finally agree on the rehabilitation plan.

Although these tanks were in a terrible state and irrigating only 500 ha instead of the original 1200 ha, they were still serving some general purposes. Rehabilitating the tanks in a technical fashion and restoring the irrigation capacity alone would have actually reduced overall welfare and excluded many of the actual users. If multipurpose functioning is the main objective, the tank schemes should only be improved when multifunctionality can be optimized. Otherwise it would be best to leave them as they are.

Some conclusions

As a researcher and as a representative of IWMI, what are the main lessons you have learnt in the context of sustainable water management?

There are two lessons: First, intelligent learning is essential. The experiences of programmes in different contexts, for example in developed countries like Australia and the western US, need to be analytically studied and the findings translated into problem-solving approaches adapted to other contexts. If developing countries do not learn from countries that solved these problems 40-50 years ago, then there will be a great loss.

Second, an understanding of how the water economy really works is very important in order to intervene in a promising, workable way. In India, interventions are sometimes done with no understanding of how India's water economy actually functions. In these cases the interventions will either not achieve their objectives or they will be even counterproductive. International, global principles can be used as guidelines when planning interventions in the water sector, but an understanding of the reality of the national water sector is essential, especially when designing water policies.

InfoResources: *Thank you very much for this thought-provoking interview.*