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HIGHLIGHT

Canal Irrigation Conundrum

Applying Contingency Theory to Irrigation System Management in India

Tushaar Shah
With contributions from
Arif Anawar, Upali Amarasinghe, Chu Thai Hoahn, Junna Mohan, Francois Molle, Aditi Mukherji, S Prathapar, Diana Suhardiman, Asad Qureshi and Kai Wegerich

We report on a discussion among IWMI's Asian researchers on our strategy for policy research on canal irrigation in India. Poor service delivery, persistence of head-tail inequity, growing gap between irrigation potential created and utilized, shrinking of command area despite growing investments in construction and rehabilitation, sustained build up of deferred maintenance of infrastructure, patchy performance of Farmer-Participatory Irrigation Management, poor service fee recovery - these are part of the litany of problems that concern irrigation managers and policy makers in India and elsewhere in Asia. This paper argues that state, society, technology and agrarian institutions - all had a better 'fit' with the canal irrigation technology during the colonial and earlier times in ways that does not obtain today. A contingency hypothesis is proposed to explore why, as socio-technical systems, canal irrigation systems would behave differently under different 'contingency clusters'. A research program around irrigation *management* performance benchmarking - with four meta questions - was proposed but received little support from the IWMI research group. The paper concludes the discussion with the lead author's dissenting note which argues that, though difficult, benchmarking of *managerial* performance - as routinely done in businesses, educational institutions, governments, even research institutions - may be the way to go if IWMI aims to contribute to effective reform in canal irrigation management.

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CANAL IRRIGATION CONUNDRUM
APPLYING CONTINGENCY THEORY TO IRRIGATION SYSTEM MANAGEMENT IN INDIA[1]

Research highlight based on a paper with the same title[2]

INTRODUCTION

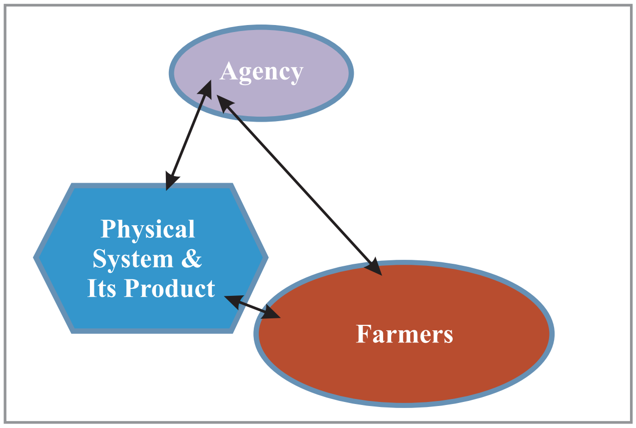
With massive public investments still going to them, improving the performance of major and medium irrigation systems remains an area of active focus in India. Dissatisfaction with the performance of canal irrigation is understood in several ways. Despite government and donor investments of the order of US $ 60-70 billion in constructing new and rehabilitating old irrigation systems during the past two decades, the area actually irrigated by canal irrigation has declined by 3-4 million ha compared to 1991. The government of India is worried that the gap between irrigation potential created (IPC) and irrigation potential utilized (IPU) is steadily growing (Planning Commission 2011a). A persistent problem is also the neglect of system upkeep and massive build up of deferred maintenance. International lenders have made large loans for rehabilitation of old systems. However, canal irrigation schemes manifest a build-neglect-rebuild syndrome; as a result, rehabilitation is not sustainable. If sustained build up of deferred maintenance is one indicator of the need for corrective action, the persistence of head-tail inequity is another (Shah 2003). Poor recovery of irrigation service fees (ISF) is yet another (Planning Commission 2011b). The boom in tube wells in canal commands is also a sign that farmers expect irrigation managers to provide higher level of irrigation service than offered now (Shah 2009).

Arguably, these indicators are but the symptoms of a deeper malaise. The 'problem-shed' of canal irrigation is located in the interplay between three components of canal irrigation systems: (1) management agency, (2) farmers, and (3) physical system, as outlined in Figure 1. Much available evidence suggests that this interaction worked better right through the history - medieval as well as colonial - than it is working now. Over the recent decades, decline in this interaction has been explained in the main, with the help of four broad, almost paradigmatic propositions each of which held sway over irrigation reform thinking for a length of time and drove a significant program of intervention.

Organize Farmers: The first proposition put the blame largely on farmers for creating anarchy below the outlet. Vandalizing infrastructure, failure to cooperate with water distribution management, poor recovery of ISF - are all the problems blamed on India's small farmers. The answer offered was organizing the farmers below the outlet into a Water User Association (WUA) and federate these WUAs at higher levels for participatory irrigation management (PIM) in which the irrigation agency would be responsible for the operation and maintenance (O&M) of the main system (head works, main and branch canals), while WUAs and their federations take the responsibility for local management of distribution below the outlet. This latter would include, *inter alia,* maintaining local distribution system, orderly distribution of water to users, minimizing head-tail inequity, collecting ISF.

Fix the Infrastructure: The second proposition put the blame for poor service delivery squarely on the poor state of the physical infrastructure, especially the outlet and below. Many Indian systems are decades, if not centuries, old. These need to be properly rehabilitated before PIM and Irrigation Management Transfer (IMT) can take effect.

Figure 1 The canal irrigation problem-shed



[1]This IWMI-Tata Highlight is based on research carried out under the IWMI-Tata Program (ITP), with support from the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. It is not externally peer-reviewed and the views expressed are of the authors alone and not of ITP or either of its funding partners.

[2] This paper is available on request from p.reghu@cgiar.org

Modernize Yesterday's Infrastructure for Today's Needs: The third proposition went beyond physical deterioration and argued that most Asian irrigation systems were designed at a time when farmers were happy with a much lower level of irrigation service than they demand today. If farmers have to take active interest in PIM, irrigation systems need not only rehabilitation but also modernization with greater room for providing farmers the differentiated level of water control and irrigation services that they demand today.

Reform Irrigation Bureaucracy: Finally a fourth proposition has argued that large irrigation systems serving hundreds of thousands of Asian small farmers cannot be managed effectively by a remote, disinterested, unaccountable bureaucracy. To improve service levels, irrigation agencies need to be put through an intensive program of attitudinal change and service orientation through bureaucratic reorientation. This led to massive program of training and capacity building for irrigation agency staff, besides investments in a cluster of 16 WALMIs[3] in different states.

The experience so far

Over the past fifty years, evidence has piled up to suggest that most of the intervention programs have come largely unstuck, canal irrigation continues to stagnate and we are back to square one. Numerous studies of WUAs have shown most of them to be feeble paper organizations. Very few of these can be considered successful and effective, that too, with the bar set at the lowest possible level (Shah 2009). Many observers consider PIM successful even if all that it does is "save money for the government, as it divests itself of the responsibility to finance routine costs of O&M of irrigation systems" (Vermillion 1996:153) no matter whether PIM improves service delivery, water productivity, conflict resolution, and such like. In India, for example, few WUAs in canal commands would match booming dairy farmers' cooperatives in terms of the centrality that the latter enjoy in the lives and household economies of their farmers members. Similarly, there is hardly any IMT anywhere in Asia comparable to the experience in Mexico (Kloezen 2002), or with irrigation systems serving commercial farmers in South Africa (the former Water Boards) (Shah et al. 2002). On massive investments in rehabilitation and modernization of irrigation system, the report card in India is negative and underpinned by stories of the "build-neglect-rebuild syndrome". After several decades of such symptomatic treatment of the ills of canal irrigation, the Indian debate on how to improve their performance has reached a dead end. There is dire need for some fresh thinking about what ails India's canal irrigation and how best to revitalize it.

Learning from history and elsewhere in Asia

A large body of indirect and circumstantial evidence suggests that, on many counts, canal systems in India performed better for a long time in the past than they do now. Of irrigation in medieval era, we only have sketchy accounts. However, we have better documentation of government irrigation systems during the colonial era. A 1902-03 account by Burton Buckley (1905) shows that colonial irrigation investments were not only attractive in financial and economic terms but these were also prudently and tightly managed for techno-economic sustainability. Farmers paid high ISF and taxes; but they also received higher level of service. "After all, even in a colony, levying taxes without some guaranteed delivery of water was not done!" (Ertsen 2007:5). For every Rs. 100 invested in fixed capital, Rs. 87 was the annual irrigated crop output, Rs. 10 were collected as ISF, Rs. 2.6 was spent on regular maintenance, and around Rs. 5 was spent annually on O&M. About 100 years later, comparable figures were much worse: for every Rs. 100 invested in fixed capital stock, value of irrigated crops was Rs. 18, ISF collected was Rs. 0.2; the annual O&M spend was down to Rs. 2.53; and on infrastructure maintenance, Rs. 0.86 (Table 1). A virtuous 'build-serve-earn-maintain-grow' syndrome had given way to a vicious 'build-neglect-rebuild' one.

There is, therefore, a need to explore the factors that vitalized the interaction between the irrigation agency, farmers and the physical system (Figure 1) in ways that made irrigation systems more productive and sustainable in the past than they are at present. Learning from history suggests that the agency-farmer-system interaction in the historical past was influenced by four exogenous variables: nature of the state, nature of the society, the state of agrarian institutions and the state of irrigation technology. All of these have undergone a profound transformation between "then" and "now" as outlined in Table 2.

The Indian 'state' is softer today than it was during colonial and pre-colonial[4] times and the local authority structures are weaker today than they were in the past.

[3] Water and Land Management Institutes

[4] "... all the various types of social indiscipline which manifest themselves by deficiencies in legislation and, in particular, law observance and enforcement, a widespread disobedience by public officials and, often, their collusion with powerful persons and groups ... whose conduct they should regulate. Within the concept of the soft states belongs also corruption (Myrdal 1970:208).

Table 1 Symptoms of managerial decline in Indian canal irrigation

		Major and Medium systems in British India, 1902-03	Major, Medium and Multi-purpose Irrigation Projects in India		Major and Medium Irrigation Systems in India, 2001
			1977-8	1986-7	
1	Source	Burton Buckley 1905	Vaidyanathan Committee report (GoI 1992)		CWC 2006
2	Capital investment in major and medium projects (nominal)	£ 30 million	Rs. 3004 crores	Rs. 26014 crores[4]	Rs. 295,000 crores
3	Area irrigated by all government schemes (m ha)	7.4	18.75	25.33[5]	18
4	Water fees collected as percentage of capital investment	10	1.43	0.3[6]	0.2
5	Value of crops irrigated as percentage of capital investment	87	na	Na	18.3[7]
6	Water fees collected as percentage of value of crops irrigated	11	Na	2[8]	1.2
7	Water fee collected as percentage of Working Expenses	280	45	20[9]	7.9
8	Maintenance expenditure as percentage of working expenditure	53	42	38	34
9	Maintenance expenditure as percentage of capital investment	2.6	na	Na	0.95

Weakening state and rural authority structures have been beneficial in containing repression but have also weakened rule enforcement. Then, through much of history, the state as well as people lived off the land. The medieval and colonial state promoted irrigation to enhance land revenue which was its principal source of income. This is no longer the case today. Many state governments now levy land revenue as token rates, and many have abolished ISF which in colonial Punjab of 1930s generated more state income than even income tax

Table 2 Canal irrigation contingencies: Then and now

	Then	Now
Nature of state	Hard state and strong authority structures	Soft state and weak authority structures
	Land revenue the only source of state income	Land revenue insignificant for the state
Nature of society	Forced labor was common	Forced labor is uncommon
	Low demographic pressure on farm land made extensive farming viable	High demographic pressure encourages intensive land use
	Most Asian irrigation systems irrigated rice	Irrigation systems support diversified cropping patterns
Institutions	No private land ownership with farmers	Farmers have secure ownership rights on land
Technology	Well irrigation was laborious and costly	Well irrigation is easy and, thanks to power and other subsidies, relatively cheap

[4] GoI 1992, Annexure 1.5

[5] GoI 1992, Annexure 1.7-A

[6] Computed using irrigation charges collected as in Table 2.6 in Goi 1992 as percentage of capital investment in row 3.

[7] Assuming 18 million ha of canal irrigated area growing crops worth Rs. 30000/ha at 2000-1 prices.

[8] GoI, 1992, 2.25 "The Irrigation Commission had suggested that water rates should be fixed at around 5 percent of gross income for food crops and 12 percent for cash crops. At present, the actual gross receipts per ha of area irrigated by major and medium projects is barely 2 percent of the estimated gross output per ha of irrigated area, and less than 4 percent of the difference between output per ha of irrigated and unirrigated areas."

[9] Computed from Table 2.6 in GoI 1992

did (Islam 1997). Forced labor for canal construction and maintenance was a rule then but is almost totally absent now. Until 1900s, demographic pressure on farm land was so low that farming land chased cultivators, and one irrigated harvest would easily support a farming family in an extensive farming regime. In India, as in much of Asia today, high population pressure on farm land has made intensive diversification of land use the key livelihood strategy for small farming households. Most Asia's irrigation systems were designed for rice irrigation; and farmers were mostly growing rice. Today, however, farmers everywhere want to diversify their land use to high value farming system as a pathway to agricultural growth. Naturally, irrigation systems designed for rice cultivation are unable today to offer farmers the level of services they need for their diversified cropping pattern. Agrarian Institutions also supported communally managed canal irrigation under the authority of strong states and local overlords in the past, because peasants seldom owned the land that they were cultivating. Local leaders and the state enjoyed greater power to enforce discipline and order, and control the anarchy inherent in surface water distribution. With farmers having secure private ownership right on their lands, imposing discipline and controlling anarchy are harder today than ever in the past.

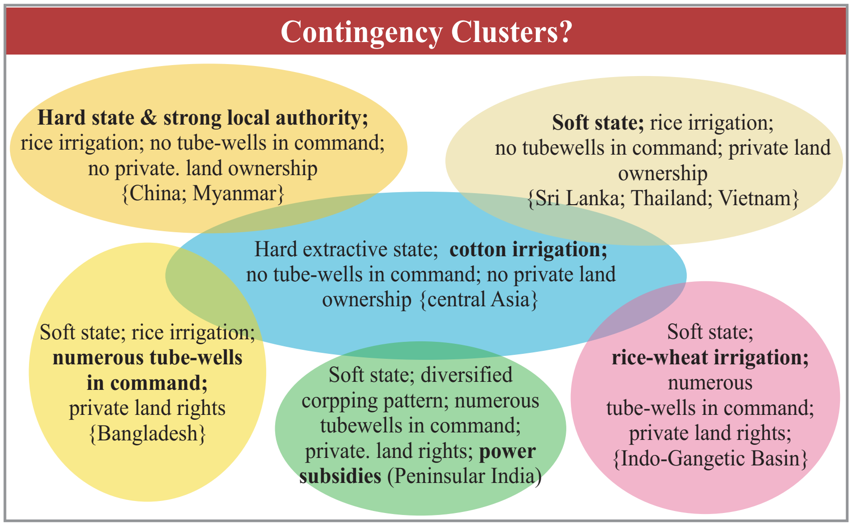
By far the most important difference is in irrigation technology. Lifting water from wells and surface sources using human and animal power has been an age-old practice. However, lift irrigation was always too costly and laborious for irrigation of field crops. Wells were widely used for domestic use and for garden irrigation throughout colonial India; however, they were seldom used for large-scale irrigation of field crops except in north-western parts with shallow alluvial aquifers (Shah 2009). Development of tube well technology and availability of affordable mechanized pumps and pipes has made private irrigation a powerful and widely preferred alternative to gravity flow irrigation from canal systems. The rise of atomistic pump irrigation economy has played no mean role in consigning canal irrigation to stagnation and decline.

Clear evidence for this in India is provided by the power that agency managers enjoyed over farmers barely forty years ago. In many Indian irrigation systems, farmers routinely organized to collect contributions from farmers to bribe irrigation managers to provide them service of required level (Wade 1980). Today, with proliferation of tube wells in canal command, irrigation managers have lost their power to extract rents from farmers even though it is a fact that most tube wells in canal commands recycle canal irrigation seepage.

Canal irrigation contingencies

This comparative perspective of the socio political environment in which irrigation systems functioned in the past and do today suggests that their performance has a great deal to do with their external task environment. In contrast, most initiatives to improve canal irrigation performance have focused on changing the agency-farmer-system interaction with little regard to the external task environment. We need, therefore, to work with a broader hypothesis to explain the factors that determine the performance of irrigation systems. In organization theory, a widely accepted proposition, known as contingency theory, suggests there is no 'silver bullet' to improve the working of any organization. Applied to our problem, it suggests that there is no best way to organize and manage a canal irrigation system or to improve its performance. Instead, the optimal course of action is contingent upon its internal and external situation.

Figure 2 Clusters of Contingency Factors Relevant to Canal Irrigation



In reading the current state of Asian irrigation, Figure 2 suggests clusters of contingency factors that define the external task environment of canal irrigation systems in different parts of Asia. Irrigation systems in China, North Korea, Myanmar, face totally different contingencies compared to irrigation systems in central Asia or in peninsular India; and those in high-income Malaysia face an altogether different set of contingencies that is encouraging it to revert to the estate mode of irrigation agriculture that was practiced in colonial Africa. There is

Table 3 Colonial schools of irrigation design and management

	French in Indo-China	Dutch in Netherlands East Indies	British in South Asia	Soviets in Central Asia
Originally designed for	French farmers	Dutch and local farmers	Local farmers	Soviet farmer collectives
Original Design objectives	High economic returns	High economic returns	Maximizing Land and water tax	Maximize cotton production
Level of local water control	High with active management by agency staff	Moderate to high with active management by local staff	Low; water regulation through '*warabandi*' and outlet size	High with active management by Russian engineers and collectives
Original management objectives	High level irrigation service through local water control	High level irrigation service through local water control	Spread available water over largest area	Irrigation as part of a collective farming strategy
Choice of crops allowed	Controlled	Controlled	Not controlled	Controlled
Presence of ex-pat staff at local level	High	Moderate	Low	Low

thus no point in comparing the performance of an irrigation system in one cluster with that in another, though comparative performance analysis within clusters may make sense if key contingencies were identified and factored in properly. The strategies for improving the performance of irrigation systems under these different "contingency clusters" - as well as the notion of management performance itself - have to be defined in a context-specific framework simply because what would work under one 'contingency cluster' is unlikely to work in another. Similarly, there is no "silver bullet" that can revitalize canal irrigation throughout Asia at one fell swoop. The need is for a granular understanding of what are the internal and external context variables of irrigation systems in different socio-political settings to evolve a change management roadmap for each contingency cluster.

Four meta questions were posited to begin with as a possible research strategy:

1. What is the relevant concept of 'irrigation system performance' under different 'contingency clusters'?
2. How best to benchmark the performance of irrigation systems in different 'contingency clusters'?
3. How to use performance benchmarking to identify and design levers for change; best practices and 'next practices'?
4. How to use performance benchmarking to evolve and implement change-management strategies for canal systems?

IWMI research agenda: discussion

The 'contingency hypothesis' of canal irrigation performance was used to generate an internal debate among IWMI researchers in Asia about what might be meaningful questions that IWMI might pursue in helping irrigation managers and policy makers within India and elsewhere to get more out of their irrigation systems. Kai Wegerich (IWMI, Tashkent) deepened the exploration of colonial antecedents of irrigation design and management in several parts of Asia by comparing the French, Dutch, British and Soviet 'schools'. Key ideas from his exploration are summarized in Table 3 below. Years after independence, the colonial design and management tradition continued to hold sway in all these countries. However, many contingencies that shaped the working of irrigation systems changed. Crop control was abandoned everywhere. Land reforms in many countries changed the structure of irrigated agriculture. Expatriate farmers with large commercial holdings were replaced by indigenous farmers with small holdings. Colonial hard state gave way to soft, welfare state. Commercial viability lost primacy; small holder development and food security became key objectives. Yet, irrigation design, planning and management changed little to achieve a better fit with these new contingencies.

There was a lively debate on research questions proposed. Aditi Mukherji (IWMI, New Delhi) suggested that regardless of the hypotheses and research questions, what IWMI should ensure is to work closely with irrigation managers, governments and organizations like the ICID. Palanisami (IWMI, Hyderabad) emphasized the need to improve performance with technological improvements and innovations, which sometimes can produce results regardless of institutional barriers. Others questioned the questions themselves.

There was support for the 'contingency hypothesis' as well as to understanding the historical context of each irrigation system. However, there was little support for benchmarking irrigation systems, even within contingency clusters. Indeed, talking about 'irrigation system performance' in a traditional sense itself seemed to be of doubtful value to Diana Suhardiman (IWMI, Laos) and Kai Wegerich (IWMI, Tashkent). Prathapar (IWMI, New Delhi) questioned the basic premise that irrigation systems perform poorly; he also argued that for whatever ills we find, it is wrong to blame irrigation engineers/ managers. Suhardiman argued that of greater interest and use is an exploration of the interaction between farmers and irrigation agency staff and how this changes over time. Others felt that even within a cluster, each system has its own history and socio-ecological context which limits the value of comparative analysis of performance. Instead, each system needs to be studied, assessed and judged in its own context.

Writing about South East Asian experience, Chu Thai Hoanh (IWMI, Laos) argued that the coalition dynamic among old and new stakeholder groups often changes or distorts the objective for which an irrigation system was first established. Hoanh illustrated his point with the example of Cambodia. During the 1970's, the Khmer Rouge took vigorously to rehabilitating the Angkor Era canals; but their aim was more to control people than to supply water. After the Cambodia war, donors with large budgets to help rebuild the war-torn country began digging up the canals all over again; their aim, however, was to spend large sums of donor funds. Now, government is organizing irrigators more as part of community development than improving irrigation performance. Hoanh also emphasized that the level of service that was considered acceptable in rice irrigation era is no longer acceptable. Quoting from a study of coffee irrigation, he argued that supplying water to meet FAO's crop-water requirement would produce far lower yields of coffee than alleviating moisture stress at a specific stage of coffee plant growth. Farmers today need 'water control' more than water supply, which many irrigation systems are not equipped to provide. Francois Molle (IWMI, Cairo) argued that many schemes have to function with less water and more uncertainty than in the past. The resultant boom in groundwater supplementation has only made canal operation more complicated for managers. This uncertainty and foot-dragging by managers are the core reason for the failure of PIM/ IMT in much of Asia. Bulk allocation of agreed-upon amounts of water at a particular point for a specific period can be a possible first step to improving service delivery.

Asad Qureshi (IWMI, Pakistan) too felt that irrigation system performance is unfairly assessed against objectives for which they were not designed. Pakistan's Indus Basin Irrigation System (IBIS) was designed in the 19th century to spread small amounts of available water on as large an area as possible to facilitate human settlement and support subsistence farming at around 70 percent cropping intensity. Today, we bemoan the fact that IBIS is unable to support modernized agriculture at 200 percent cropping intensity on a much larger area to feed five times more mouths than was ever envisaged by the planners of IBIS. To make matters worse, the over-stretched system is getting a fraction of what it needs by way of regular repair and maintenance. IBIS replacement value today would be around US $ 70 billion; at regulation 3 percent per year, Pakistan should be spending around US $ 2 billion annually for routine maintenance and upkeep. In fact, such sums are not spent even over a decade. Qureshi disagreed with others who suggest that the boom in groundwater use in command areas is the result of poor canal irrigation service delivery. In Pakistan, he argued, it has more to do with the fact that IBIS, which irrigated 8 million ha in 1975, is now irrigating 10 million ha, that irrigated double-cropping is a rule rather than exception, that farmers have moved from water-saving crops to water-guzzling ones such as sugarcane and rice and that the original system of water rights has been allowed to weaken. It would thus be of little use to compare 150-year old IBIS with a modern system designed with today's needs in mind. The meaningful thing to do is to assess each system against a unique set of indicators appropriate to it.

Upali Amarasinghe (IWMI, Hyderabad) also argued that benchmarking the performance of irrigation systems against a common set of indicators might neither be meaningful nor useful. Instead, it might be worthwhile to undertake a quick assessment of few critical system level indicators: water delivery versus consumptive water use, financial performance, etc at the level of the entire system as well as its components. Such assessment can be the basis for recommending specific interventions at farm level[11], distributary level[12], main canal level[13] and the system level[14] to improve overall system performance. An action oriented assessment such as this can have early

[11]Such as for reducing over irrigation, laser leveling, on farm storages, micro irrigation, agriculture diversification, smaller farmer groups/land consolidation/ resources conservation, SRI, direct seeding, intermittent irrigation, varieties , fertilizer and inputs applications, training of farmer trainers and so on.

[12]GoI 1992, Annexure 1.7-A

[13]Physical rehabilitation, pipe water supplies, drainage, public-private partnerships for O&M/ water distribution/ fee collection

[14]Physical and institutional rehabilitation, automation of canal operation.

positive outcomes for farmers, irrigation managers as well as the irrigation system as a whole. It can also present ample research opportunities to understand what works, what does not and why in view of changing rural demographics, economic growth, and climate change scenarios. Along with such action research program, we can also develop performance accounting/ monitoring program as a tool for course-correction for the uptake elsewhere.

In Central Asian systems, improving irrigation performance involves a whole new dynamic. Again, the design objective of irrigation systems in Central Asia was neither water efficiency nor economic return on investment but creating new rural settlements and maximizing cotton production for export. There are also unique socio-ecological contingencies in the region. Kai Wegerich (IWMI, Tashkent) showed that conjunctive management of surface and groundwater needs a different take in Central Asia because groundwater utilization here is very limited. Moreover, a key issue is salinization, what with drainage water diverted back into the river or into the irrigation water delivery system itself. The 'contingency approach' can contribute to IWMI research in canal irrigation by strengthening the 'learning and engagement' approach of intervention. Taking a larger 'systems approach', research can begin by understanding what was the original design including bureaucracy, agricultural policy, social setting and value system. Junna Mohan (IWMI, Tashkent) agreed that "there is no silver bullet to solve irrigation problems, and irrigation improvement is an evolutionary process."

A concluding note of dissent

This highly useful virtual discussion produced many useful insights. However, there was little support in the group for benchmarking irrigation system performance - and the four meta questions - as a vehicle through which a research institution such as IWMI can meaningfully contribute to improving canal irrigation performance and impacts. As the lead author of this 'Highlight', however, I believe that it can. Benchmarking is a major driver of performance improvements in all manner of public systems in India and elsewhere. Ratings based on the benchmarking of performance of colleges and universities are used by students to choose which college of university to go to, which in turn drives managers to improve their performance. Benchmarking of corporate governance practices drives companies to adopt global best practice. CGIAR centers are benchmarked for performance; and within each Center, we researchers too are performance benchmarked in ways that influences, if not drives, our actions. Even countries and provinces are benchmarked for their HDI performance, for corruption, for ease of doing business and numerous other indicators. In Gujarat, the government is presently galvanized into action because although the state is an economic powerhouse, its performance in alleviating infant malnutrition, under-6 child sex ratio, and school enrollment is way below par when compared with poorer states. IFPRI every year ranks countries on its Hunger Index whose methodology is widely questioned. That benchmarks are imperfect is not the issue; nor is the fact that the entities being compared - colleges, universities, business schools, companies, CG centers, provincial and national governments - differ from each other in million ways including their histories, endowments, contextual peculiarities and thousand other details. The point is that good, credible performance benchmarking work galvanizes action and expands effort to improve performance.

The extent to which performance benchmarking galvanizes action to improve performance would depend upon: [a] the alignment between Key Performance Indicators used for benchmarking and the objectives managers strive for; [b] whether indicators chosen for benchmarking are predominantly linked to human / managerial effort and not forces beyond human control; [c] transparency of the benchmarking process; [d] guidance on how laggards can emulate high performers to achieve high performance; and [e] a system for recognition and reward (pecuniary and/or other) for high performance. The reason why IWMI's own benchmarking of irrigation systems has not gone very far are two: [a] IWMI helped develop a detailed methodology for benchmarking (Bos et al. 2005) which, however, has not been applied to any cluster of systems for use in performance improvement; and [b] when IWMI did apply the methodology to a cluster of systems, it benchmarked irrigation systems for only 'basin water productivity' as the single performance indicator, which few irrigation managers pursue as their only or even prime management objective. Moreover, in most systems IWMI identified as high performing on this indicator, high performance was a result of factors beyond managerial control. IWMI work was never taken forward to a stage where it provided practical guidance on how can (and why should) irrigation managers strive for achieving even high basin water productivity, leave alone overall performance as outlined by Bos et al. (2005). There has also been a common confusion between irrigation *system* performance and irrigation *management* performance. One irrigation system may perform better than another because it is newer, better designed, has more enterprising farmers, better soil profile - all factors beyond control of present management. Needed is benchmarking of irrigation *management* performance: given all prevailing constraints, can system managers deliver higher quality service, water productivity and so on by improving O&M.

That performance benchmarking can be the first step to performance management is evident in the Indian state of Maharashtra where the Maharashtra Water Resources Regulatory Authority (MWRRA) has been regularly monitoring and evaluating irrigation systems along 12 indicators (Table 4) that reflect overall system performance, agricultural productivity, financial performance, environmental impacts, equity and ISF recovery. It is not surprising that Maharashtra has emerged as a torch bearer among Indian states in improving public irrigation performance.

Table 4 Key performance indicators used for irrigation system performance benchmarking by Maharashtra Water Resources Regulatory Authority

A. System Performance
1. Annual Irrigation Water Supply Per Unit Irrigated Area
2. Potential Created and Utilised
B. Agricultural Productivity
3. Output (Agricultural Production) Per Unit Irrigated Area
4. Output (Agricultural Production) Per Unit Irrigation Water Supply
C. Financial Aspects
5. Cost Recovery Ratio
6. Total O&M Cost Per Unit Area
7. Total O&M Cost Per Unit Volume of Water Supplied
8. Revenue Per Unit Volume of Water Supplied
9. Man days For O&M Per Unit Area
D. Environmental Aspects
10. Land Damage Index
E. Social Aspects
11. Equity Performance
F. Additional Indicator
12 a. Assessment Recovery Ratio in Irrigation
12 b. Assessment Recovery Ratio in Non Irrigation

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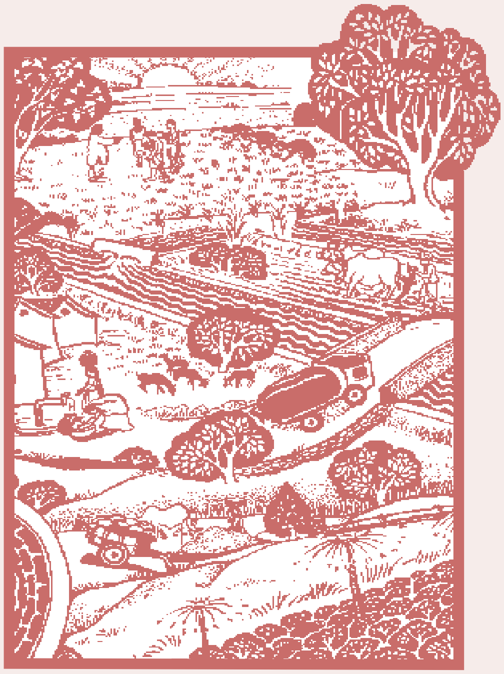

About the IWMI-Tata Program and Water Policy Highlights

The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water-management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Highlights and IWMI-Tata Comments.

Water Policy Highlights are pre-publication discussion papers developed primarily as the basis for discussion during ITP's Annual Partners' Meet. The research underlying these Highlights was funded with support from IWMI, Colombo and SRTT, Mumbai. However, the Highlights are not externally peer-reviewed and the views expressed are of the author/s alone and not of ITP or either of its funding partners.

IWMI OFFICES

IWMI Headquarters and Regional Office for Asia
127 Sunil Mawatha, Pelawatte
Battaramulla, Sri Lanka
Tel: +94 11 2880000, 2784080
Fax: +94 11 2786854
Email: iwmi@cgiar.org
Website: www.iwmi.org

IWMI Offices

SOUTH ASIA
Hyderabad Office, India
C/o International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
401/5, Patancheru 502324, Andhra Pradesh, India
Tel: +91 40 30713735/36/39
Fax: +91 40 30713074/30713075
Email: p.amerasinghe@cgiar.org

New Delhi Office, India
2nd Floor, CG Block C, NASC Complex
DPS Marg, Pusa, New Delhi 110 012, India
Tel: +91 11 25840811/2, 65976151
Fax: +91 11 25842075
Email: iwmi-delhi@cgiar.org

Lahore Office, Pakistan
12KM Multan Road, Chowk Thokar Niaz Baig
Lahore 53700, Pakistan
Tel: +92 42 35299504-6
Fax: +92 42 35299508
Email: iwmi-pak@cgiar.org

SOUTHEAST ASIA
Southeast Asia Office
C/o National Agriculture and Forestry Research Institute (NAFRI)
Ban Nongviengkham,
Xaythany District,
Vientiane, Lao PDR
Tel: + 856 21 740928/771520/771438/740632-33
Fax: + 856 21 770076
Email: m.mccartney@cgiar.org

CENTRAL ASIA
Central Asia Office
C/o PFU CGIAR/ICARDA-CAC
Apartment No. 123, Building No. 6, Osiyo Street
Tashkent 100000, Uzbekistan
Tel: +998 71 237 04 45
Fax: +998 71 237 03 17
Email: m.junna@cgiar.org

AFRICA
Regional Office for Africa and West Africa Office
C/o CSIR Campus, Martin Odei Block,
Airport Residential Area
(Opposite Chinese Embassy), Accra, Ghana
Tel: +233 302 784753/4
Fax: +233 302 784752
Email: iwmi-ghana@cgiar.org

East Africa & Nile Basin Office
C/o ILRI-Ethiopia Campus
Bole Sub City, Kebele 12/13
Addis Ababa, Ethiopia
Tel: +251 11 6457222/3 or 6172000
Fax: +251 11 6464645
Email: iwmi-ethiopia@cgiar.org

Southern Africa Office
141 Cresswell Street, Weavind Park
Pretoria, South Africa
Tel: +27 12 845 9100
Fax: +27 86 512 4563
Email: iwmi-southern_africa@cgiar.org

IWMI SATELLITE OFFICES
Kathmandu Office, Nepal
Jhamsikhel 3, Lalitpur, Nepal
Tel: +977-1-5542306/5535252
Fax: +977 1 5535743
Email: l.bharati@cgiar.org

Ouagadougou Office, Burkina Faso
S/c Université de Ouagadougou Foundation
2iE 01 BP 594 Ouagadougou, Burkina Faso
Tel: +226 50 492 800
Email: b.barry@cgiar.org

IWMI-Tata Water Policy Program
c/o INREM Foundation
Near Smruti Apartment, Behind IRMA
Mangalpura, Anand 388001, Gujarat, India
Tel/Fax: +91 2692 263816/817
Email: iwmi-tata@cgiar.org

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