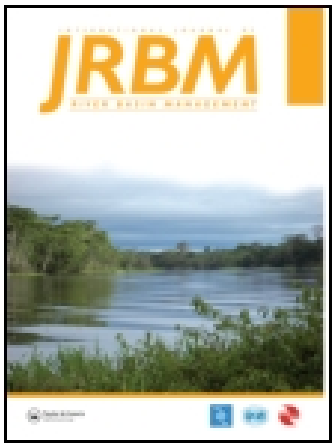

International Journal of River Basin Management
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/trbm20

Groundwater irrigation and livelihoods in the Ganga Basin: Analysis of minor irrigation policy in North Bengal, India

Tushaar Shah [a]

[a] Principal Researcher, International Water Management Institute , E-mail:

Published online: 23 Aug 2010.

To cite this article: Tushaar Shah (2009) Groundwater irrigation and livelihoods in the Ganga Basin: Analysis of minor irrigation policy in North Bengal, India, International Journal of River Basin Management, 7:2, 125-133, DOI: 10.1080/15715124.2009.9635375

To link to this article: http://dx.doi.org/10.1080/15715124.2009.9635375

Intl. J. River Basin Management Vol. 7, No. 2 (2009), pp. 125–133

Groundwater irrigation and livelihoods in the Ganga Basin: Analysis of minor irrigation policy in North Bengal, India

TUSHAAR SHAH, *Principal Researcher, International Water Management Institute. E-mail: t.shah@cgiar.org*

ABSTRACT
In terms of water resources, North Bengal is one of the best-endowed regions in India. While the region has huge ground and surface water potential, it also concentrates a large number of rural poor who depend on smallholder farming and farm labor for their livelihoods. The issue central to water governance is how to best design instruments of public support to stimulate smallholder (minor) irrigation and harness the abundant groundwater resources to improve conditions for the region's rural poor. Extreme poverty precludes private investments in minor irrigation on the scale necessary to make a significant and quick impact. As a result, subsidy support for minor irrigation investments has remained crucial in North Bengal as well as in much of the eastern Ganges basin. This paper assesses the North Bengal Terai Development Project (NBTDP) developed by the Government of West Bengal. During much of the 1990s, the North Bengal Terai Development Project shaped and implemented the Minor Irrigation Policy of the Government of West Bengal in this region. This paper deals with three distinct sets of questions regarding the subsidy policy: (1) What is the rationale for minor irrigation subsidies in North Bengal? (2) Does the North Bengal Terai Development Project's subsidy policy achieve its minor irrigation objectives in an efficient, sustainable, and socially adequate manner? and (3) Is there scope for designing minor irrigation subsidy policies for better impact? The conclusion also explores what should be the objective of minor irrigation policy for North Bengal's socioeconomic and aquatic conditions and how this might be achieved.

Keywords: North Bengal; groundwater; minor irrigation; subsidy policy.

1 Introduction[1]

This paper analyzes North Bengal's minor irrigation policy as it evolved under the North Bengal Terai Development Project during the late 1990s. The paper uses a broad social policy framework, reviews several North Bengal Terai Development Project studies (CDS 1995, Das 1997, Ghosh and Ghosh, n.d., Kranenburg 1994, ORG 1995), and includes results from participatory field research carried out by the author. The author also explores a range of political economy issues that have shaped the formulation and implementation of minor irrigation policy in the North Bengal region. Thirty years of evidence shows that despite the Green Revolution, a tubewell revolution across the North Indian plains, and massive groundwater resources, dense rural poverty continues in North Bengal. This enigma makes the North Bengal Terai Development Project both interesting and significant as a strategic intervention. The North Bengal Terai Development Project has zeroed in on minor irrigation development as the centerpiece of its agricultural development programming strategy.

North Bengal[2] is one of the most water-rich regions of India. With huge ground and surface water potential, the region is drained by numerous large and small rivers, including the Teesta, Torsa, Jaldhaka, and others that flow through North Bengal into Bangladesh. Groundwater tables in most areas are less than 5 m below the surface pre-monsoon and 2.5–4 m post-monsoon. Despite irrigation development, groundwater monitoring data show no significant decline in water table depths. This indicates that increased water draft during post-monsoon months is amply replenished through recharge from rainfall, rivers, and irrigation return flows. The aquifers in the entire region are unconfined up to over 30 m. Thus, water flows horizontally to lower ground, often causing perennial flooding and waterlogging problems in low-lying areas. According to Central Groundwater Board estimates, Coochbehar has 2,067 million m^3 and Jalpaiguri has 4,838 million m^3 of annual recharge; and the present level of use is barely 217 million m^3 and 106 million m^3 respectively. The two districts thus have 0.36 million m^3 and 0.56 million m^3, respectively, available for future development per square kilometer.[3] In fact, the two districts alone account for more than half of all of

Received on January 22, 2007. Accepted on July 8, 2008.
[1]The paper draws heavily on a previous working paper by Shah (2001).
[2]North Bengal is a term, for the part of West Bengal, which often denotes Cooch Behar, Darjeeling, Jalpaiguri, North Dinajpur, South Dinajpur and Malda districts together. Originally North Bengal also included the northern districts of Bangladesh such as Rongpur. Since partition of India, North Bengal has come to mean only the northern parts of Bengal in India, although in Bangladesh the term has a different geographical reference.
[3]Assuming that 60% of the geographical area is agricultural land, this implies enough groundwater to drown all agricultural lands of Coochbehar and Jalpaiguri under 3.6 m and 5.6 m of water every year without crossing the limit imposed by long-term recharge.

Bangladesh's groundwater resources – its unutilized groundwater resources were estimated to be 11,600 million m^3 during the mid-1980s (see Orr *et al*., 1991, 29) – and most of its groundwater resources are located within 7 m from the ground, even during the dry season. All 11 blocks (sub-district administrative units) of Coochbehar and 13 blocks of Jalpaiguri have been declared "white" by the National Bank for Agriculture and Rural Development NABARD.[4] Thus, the danger of overdevelopment of groundwater resources in the region is remote, except in very small pockets where groundwater withdrawals will need some monitoring.[5] If anything, there is a strong case for reducing post-monsoon water levels in many low-lying areas of Coochbehar and Jalpaiguri districts.[6]

2 The North Bengal Terai Development Project

Despite its underdevelopment, North Bengal has an array of irrigation technologies: traditional and modern, muscle powered and machine driven, small and large. There are traditional, manually operated *dhenkul and taar-balti* systems; there are modern manual hand-pump tubewells (HTWs) and treadle pumps (TPs), diesel pumps to pump water from ponds, bamboo tubewells, streams and rivers, unlined field channels and over-ground poly-pipes used as water transmission systems. Over five decades, government and donor agencies have created deep tubewells (DTWs), medium-duty tubewells (MDTWs), shallow tubewells (STWs), and pump dugwells (PDWs) – all with or without underground cement or PVC pipeline networks with spouts. They have also built major and mini river lift irrigation (RLI) systems. Local agencies have simplified some of these technologies to cut costs of operation and maintenance.

With this wide range of technologies has come a variety of irrigation institutions: public ownership and management by government bureaucracies, panchayati raj institutions (decentralized government), beneficiary committees, and individual owner-managers. Big river lift irrigation systems and deep tubewells – with a design command often exceeding 100 ha and covering some 80–100 small farmers, are established by government agencies under various minor irrigation programs, including those supported by the World Bank, the National Bank for Agriculture and Rural Development (NABARD), and the North Bengal Terai Development Project. While in recent years beneficiary committees have been organized to take over their operation and maintenance, larger schemes are still controlled and run as public utilities by the agri-irrigation departments of State Water Investigation and Development (SWID). Though beneficiary committees are formed in these schemes, they are powerless and play only a marginal role. Building robust user organizations may hold the key to efficient management of these highly capital-intensive irrigation assets. Beneficiary committees are more active in mini river lift irrigation systems; however, the turnover program is still young and it is rare to find these systems under complete control of well-functioning beneficiary committees (Kanwar and Bandyopadhyay, n.d.; Rao 1995a, 1995b). In contrast, beneficiary committees have a much larger role in smaller group schemes. For instance, basic river lift irrigation systems sponsored by block-level panchayat samitis (local government bodies), and serving 8–20 members in their command, are constructed by panchayat samiti contractors and handed over completely to beneficiary committees as soon as they are commissioned. Beneficiary committees set the water pricing policies; are responsible for the operation and maintenance; and manage water distribution. This is the case with shallow and pump dugwell schemes as well. Most panchayats stock diesel pumps and rent them according to the needs of farmers. Gram panchayats (village councils) and block-level panchayat samitis have great influence over water management through their power to constitute beneficiary committees.

In contrast to the initiatives described above that involve some form of public or collective management of shared irrigation assets, there is a large and growing "private" sector, complete with vibrant pump irrigation service markets. Hand pumps and traditional water lifting devices are typically individually owned and operated – it is not possible to rent these. In contrast, within the agriculturally dynamic areas of Coochbehar, there is an increasing number of privately owned diesel pumps (mostly 5 hp) and an extensive market for pump irrigation service (Shah, 2001). Unlike elsewhere in India, bamboo tubewells are so cheap to produce in North Bengal that pump irrigation markets basically involve circulating the diesel pump around the village. In that sense, purchased pump irrigation is quite efficient. Since water is pumped from the field being irrigated, the distance over which it has to be transported is small; as a result, conveyance losses (of water as well as energy) are negligible, even though water is commonly conveyed in unlined field channels. In areas where the density of bamboo tubewells is low because of a low water table, diesel pump owners rent the pump along with 70–100 m of rubber pipe at a price premium.

The North Bengal Terai Development Project has extended support for several of these technologies. Until it discontinued support a few years ago, the project provided a 100% subsidy on capital costs to major river lift irrigations and deep tubewells – which also get over 70% subsidy on operation and maintenance

[4]Areas with less than 65% development of groundwater potential are categorized as white; those with 65–85% development are "grey"; and those with more than 85% are called "dark." Areas classified as dark are overexploited groundwater resources.

[5]This is because the cropping pattern of a sizeable proportion of farmers is already as highly water intensive as possible, with little room to use more water. There already are large areas in which two crops of [irrigated high-yielding, winter season] *boro* rice are taken, and together with one [monsoon-season] *aman* rice crop constitute the most water-intensive crop cycle. Even if two *boro* rice crops a year were expand to the entire region, it is unlikely that groundwater use would exceed 25% of the replenishable recharge in North Bengal for a long time to come.

[6]Most villages of the region include upland and lowland areas with farmers in higher areas generally better off, even though groundwater pumping is easier and cheaper for farmers on lower grounds. Low-lying areas remained flooded for two to three post-monsoon months, constraining farmers to one *aman* rice and one *boro* rice crop at best.

costs from state governments. In Phase III, the North Bengal Terai Development Project offers a 100% capital cost subsidy for mini river lift irrigation (as well as to medium-deep tubewells, but none of these has been planned yet), a 75% capital cost subsidy for shallow tubewells and pump dugwell clusters, a 90% subsidy on hand-pump tubewells (targeted to women as an irrigation-cum-drinking water support system), and no direct subsidy on treadle pumps. This paper deals with three distinct sets of questions regarding the subsidy policy under the North Bengal Terai Development Project Project:

- What is the rationale for minor irrigation subsidies in North Bengal?
- Does the North Bengal Terai Development Project's subsidy policy achieve its minor irrigation objectives in an efficient, sustainable, and livelihood-intensive manner?
- Is there scope for designing minor irrigation subsidy policies for better impact?

The conclusion also explores what should be the objective of minor irrigation policy for North Bengal's socioeconomic and aquatic conditions and how this might be achieved.

3 Are minor irrigation subsidies justified in North Bengal?

North Bengal has one of the most complex webs of minor irrigation technologies and institutions in India. As outlined in Tables 1 and 2, the nature of the technology seems to drive the institutional choice. Hand tubewells and treadle pumps do not need an exchange institution; their low capital requirements and operating costs make them within the reach of marginal farmers. These technologies are also "self-selecting" in that they appeal to those with small landholdings, plenty of family labor, and low opportunity costs. As a result, individual ownership without rental markets is the inevitable institutional format for these manual technologies. Regarding diesel pumps, we find all three types of institutional arrangements, the most widespread of which is individual ownership with pump irrigation markets. Large farmers, typically those with more than 5 ha, seem neither interested nor able to spare pumps for rental purposes. Likewise, cooperative- or panchayat-owned and managed pumps are rare outside government or donor-sponsored programs. The diesel pump technology does not provide any intrinsic impetus for collective action, especially since bamboo tubewells are common and there are numerous sources of surface water. Rented diesel pumps are, however, used by medium-scale farmers (as in a large part of Eastern India). However, here too, many more farmers irrigate with rented pumps than use their own or government-aided irrigation assets.

State government policy is to promote river lift irrigation systems as a method of augmenting groundwater recharge (P.K. Sen, personal communication). Lifting river water for irrigation by private farmers is common in most of North Bengal; however, the technology typically includes a diesel pump and often some overground polyethylene-pipe for water conveyance. Big river lift irrigations and deep tubewells are naturally suited for collective

Table 1 Institution-technology mix in North Bengal irrigation.

		Institutional alternatives: Existing or under experimentation				
		Individual ownership; autarky	Individual ownership: irrigation service markets	Collective ownership and management	Public ownership and bureaucratic management	Panchayat ownership and management
1.	Hand tubewells	*				
2.	Treadle pumps	*				
3.	Diesel pumps for own use and renting	* (only large farmers)	*			*
4.	Shallow tubewells/Pump dugwells clusters: diesel pump and well for a group of 4 farmers			*		
5.	Shallow tubewells/Pump dugwells clusters: 6 STWs +2 pumps			*		
6.	Basic River lift irrigation: 1 pump & distribution system			*		
7.	Mini River lift irrigation and Medium-duty tubewells: 3 pumps and distribution chamber and pipe system			*		*
8.	Deep tubewells				*	
9.	River lift schemes				*	

Source: North Bengal Terai Development Project Monitoring Reports.

Table 2 Institution-technology compact in North Bengal Terai Development Project, ca. 1997.

Parameters	Dimension	HTW	TP	PDW	STW	Mini RLI/MDTW	DTW	RLI
Ownership and management		Individual	Individual	Group of 4	Group of 5	Group of 40	Group of 70–100	Group of 70–100
Farmer contribution in capital cost	% of total capital cost	10	100	25	25	0	0	0
Farmer Contribution in O&M costs	% of total O&M cost	100	100	100	100	100	20	20
Water output	l/s	0.3	0.9–1.1	6.1	8.3	28	56	111
Potential command	ha	0.14	0.19	3	4	20	40	80
Beneficiaries/unit	households	1	1	5	5	37	50	100
Depth	m	15	3–7	12	40	river	150	river
Capital cost/unit	Rs	2,000	600	9,000	12,000	450,000	530,000	72,5000
Cost/ha	Rs/ha	11,764	750–1,200	3,000	3,000	22,500	13,250	9,063

ownership and management. However, such arrangements are self-sustaining only if they have significant technological and economic superiority over shallow tubewells or where there is no alternative (e.g., North Gujarat).[7] Most deep tubewells and big river lift irrigation systems were built by the government, panchayat samitis, or zilla parishads (local government body at the district level) with World Bank or North Bengal Terai Development Project support.

Given that subsidies will continue to be extensively used in North Bengal and elsewhere in the country to spur development and promote smallholder livelihoods, the use of minor irrigation subsidies in North Bengal is justified on several grounds: on environmental grounds, as stimulating groundwater withdrawal in a judicious manner can create positive externalities in many parts of the region by reducing waterlogging and flooding in low-lying areas; on developmental grounds, as minor irrigation development can kick start a much-needed green revolution in the region; on rural poverty and capital scarcity grounds, as left to itself, the region will take a long time before its green revolution takes off. This is because the primary constraint to the expansion of groundwater irrigation is pump-capital scarcity, which in turn is caused by rural poverty, low capital accumulation, and lack of enterprise. Vast evidence suggests that the powerful productivity and livelihood impacts of minor irrigation development far outweigh the investment costs; and North Bengal will, in any case, continue to receive funds for development given its "backwardness." Minor irrigation investments are one example of a better use of subsidies than those that do not generate positive impacts on productivity and livelihoods.

In analyzing the North Bengal Terai Development Project subsidy policies, several normative criteria were used. They include: (1) Is the design of North Bengal Terai Development Project subsidy policies appropriate, especially from the viewpoint of resource-poor farmers' investment and repayment capacity? (2) Does the current subsidy arrangement influence the choice of farmers? (3) Are the subsidies targeted appropriately? (4) Does the subsidy policy also affect the choice of irrigation technology by farmers and government decision-makers, and, if so, does the subsidy policy help in efficient delivery of irrigation systems? and (5) Is the subsidy policy realistic in its assessment of the organisational preconditions necessary for their efficient and viable operation?

4 Assessment of the minor irrigation subsidy policy

Our analysis fully validates North Bengal Terai Development Project's decision to discontinue support to major river lift systems and deep tubewells. Our limited field research and other studies of these systems in North Bengal suggest that the region is no exception to the general experience of many countries in South Asia and most Indian states where public. Deep tubewells have not been successful and the analysis also supports the decision to discontinue the "four hectare scheme" (a medium and deep tubewell scheme); besides being financially and economically unattractive, one can also argue that buried pipeline transmission systems in general are far more costly, sophisticated, capital intensive, and unsustainable than their usefulness justifies, especially in a flat, water-abundant region like North Bengal.

North Bengal Terai Development Project subsidy support to mini-river lift irrigations and medium-deep tubewells is likely to produce somewhat better outcomes in that these systems are smaller and technically simpler, the design of the scheme requires that they be turned over to a beneficiary committee as soon as they are commissioned, and with fewer farmers in their command, it

[7] In many parts of North Gujarat, especially in Mehsana and Banaskantha districts, groundwater tables have fallen to 300–400 m over the past four decades. In the absence of surface water resources, the survival of agriculture has depended upon farmers chasing falling groundwater tables. Doing this has required progressively deeper tubewells, larger pumps, and costlier irrigation. The capital costs and the risks of well failure are so high that even large, affluent farmers cannot afford individually owned tubewells. In this region, we find tubewells owned and managed collectively by farmers' tubewell companies. In Mehsana district alone, there are over 3,000 such tubewell companies.

would be easier to build a user organization to operate the scheme on a sustainable basis. The threats to the program to expand mini-river lift irrigation and medium-deep tubewells arise from ambiguity about the government order stipulating the turnover of the schemes to beneficiary committees; the process-intensive organization of users that a government department may have neither the will nor capacity to undertake; the high capital cost per family and per hectare of these schemes; and the unfamiliarity of the small farmer and local technicians with some components of the technology, especially the buried pipeline distribution system, and the consequent difficulty that they may encounter in its maintenance and repair (Palmer-Jones 1995).

From the technological-economic and organizational standpoint, North Bengal Terai Development Project subsidies are probably put to best use in shallow tubewell and pump dugwell cluster schemes; as these fit farmers' needs and constraints quite well. A group of four small farmers seems ideally suited to achieve a viable level of utilization. Having to contribute 25% of the capital cost helps farmers build solidarity and obliges them to transparently decide at the outset the rules for operation and maintenance cost-sharing. Small farmer beneficiaries are fully familiar with the technology involved, especially diesel shallow tubewells, and they are comfortable with using largely local resources and skills for maintenance and repair. All in all, shallow tubewell and pump dugwell cluster schemes are financially viable and economically rewarding. Some worrisome aspects are that the allocation of budgets between pump dugwells and shallow tubewells, as well as the allocation of schemes to different areas, appears to be somewhat arbitrary. The cost of the system tends to be significantly higher than what farmers alone would incur. Schemes fitted with electric pumps run into a variety of problems due to unreliability of power supply and flat electricity tariffs. Moreover, the scheme may attract pressures from farmers who would normally be ineligible to receive benefits from the scheme. There is a propensity on the part of the better-off to form "dummy groups" and effectively privatize the scheme. However, the negative equity impacts of such oligarchic propensities are probably far less serious than one would think and could be addressed using a broad practical-political-economy approach. Finally, at times, panchayat decision-makers have a propensity to be partisan in the choice of beneficiaries; many resource-poor farmers we talked to lamented that subsidies are directed toward the politically agile and verbose.

Hand pump tubewells are a case apart; they are promoted as multipurpose devices to obtain drinking water as well as to irrigate backyard vegetable gardens. Their primary target are resource poor women; and as a result, a rather large subsidy on hand-pump tubewells (90% on a unit cost of Rs 3,500) should be assessed not so much against their productivity and income impacts but against their contribution to health, sanitation, and gender equity. There are cost effectiveness issues here, however: in terms of water output, hand-pump tubewells perform as well as treadle pumps but cost five times as much. The high cost is explained by the deeper bore (up to 15 m) and the use of (galvanized) iron pipes required to tap deeper aquifers for drinking water. Cost issues need to be probed further.

5 Issues related to the design and administration of subsidies

Important issues emerge from the North Bengal Terai Development Project's and West Bengal government's experience with the design of minor irrigation subsidies (see also Palmer-Jones, 1989). Ineffective subsidies create dependency, induce "money illusion" (which entices target groups to make choices they would not make with their own resources), and are arbitrary in the selection of beneficiaries. Effective subsidies minimize these, *ceteris paribus*; the best example we found of effective subsidies was the shallow tubewell cluster scheme. Another relevant second-order question is about designing a subsidy that gets the best bang for its buck. For this, subsidies should (a) be efficient in the sense that they minimize the cost of assisting a beneficiary in the manner defined; (b) be designed to produce sustainable change, that is, support technological and institutional interventions that beneficiaries can and want to sustain on their own; and (c) aim to address outstanding anomalies and inequities within a society.

This analysis has also used these normative criteria. The North Bengal Terai Development Project itself has implicitly used strikingly similar normative criteria to introduce changes it has made in recent years in its minor irrigation subsidy policy. Besides learning from its own experience, we believe the project also needs to constantly assess and learn from farmers and similar agencies. We found it striking that panchayat samitis' subsidy support for smaller river lift irrigation cost at best a quarter of the North Bengal Terai Development Project's mini-river lift irrigation scheme. We also found it striking that when they use their own money, farmers build even simpler river lift irrigation schemes – the super mini – that have just a pump on the river bank and a distribution system made of flexible polypipes that can be shifted. While it is true that basic and super mini river lift irrigation schemes are simpler and have a smaller design command, and the poly-pipes used by farmers for transmission last all of 12 months, *ceteris paribus,* chances are that the Rs 1 million spent on two mini river lift irrigation schemes of the North Bengal Terai Development Project will produce less actual area irrigated and benefit fewer small farmers than the same amout spent on 10 basic mini river lift irrigation schemes or to subsidize 75% of the capital cost of around 50 super-mini river lift irrigation schemes of the type that small farmers build using their own resources.[8]

[8]NBTDP mini RLIs cost around Rs 500,000, have a design command of 20 ha, 3.5–8 hp diesel pumps and buried pipe transmission system with 8–14 spouts; panchayat samiti-supported basic mini RLIs cost around Rs 100,000, have a design command of 4–6 ha, 18 hp diesel pumps, and a buried PVC pipe transmission system; farmers' super mini RLIs cost less than Rs 25,000, have a 5 hp diesel pump and 200 m of polypipe; its design command is 3–4 ha. Real-life experience suggests that a mini river lift system with a troubled organization or management system will fall far short of its design command, and a super mini river lift system of a private water seller will commonly exceed its design command.

Similarly, the North Bengal Terai Development Project needs to analyze the advantages and limitations of the pump-for-rental scheme adopted by almost all gram panchayats of Jalpaiguri. That so many have adopted it suggests that the critical bottleneck to expanding minor irrigation is not a shortage of boreholes or water sources but of pumps. If this were true, there is a need to reassess the merit of 75% subsidy on the cost of shallow tubewells and pump dugwells in the shallow cluster scheme. Moreover, even if the project wanted to continue support for boreholes, it needs to assess whether it should encourage farmers to build bamboo bores at Rs 1,500 rather than the Rs 18,000 galvanized iron-pipe shallow tubewells, and thus benefit many more farmers.

There is also the question of overall strategy: if pump capital scarcity is the prime bottleneck in minor irrigation expansion in North Bengal, the project would produce greater strategic impact through a pure pump subsidy rather than spending limited resources on construction-intensive minor irrigation schemes that devote the bulk of the subsidy funds to minor irrigation miscellanies (such as buried pipe transmission systems, GI-pipe shallow tubewells, etc.) that resource poor farmers seldom build with their own resources. A hypothetical shallow tubewell/pump dugwell scheme follows: any group of four small and marginal farmers who deposit Rs 5000 along with the required documentation in their panchayat samiti are instantly issued a delivery order for a diesel pumpset of their choice, a fuel-saving contraption, and 500 feet of poly-pipe; the procedure for approval can be simple and completed at the level of the panchayat samiti itself; the farmers can produce the delivery order in front of the concerned dealer to procure their pump and poly-pipes. A program such as this could, in our assessment, reach a larger number of small farmers and produce more minor irrigation. It will also be effective, because, given a chance, farmers will choose the technology with which they are most familiar and comfortable.

6 The case for redesigning the minor irrigation strategy for North Bengal

Based on the previous analysis, the critical challenge of minor irrigation development, and of overall agrarian growth in North Bengal, is the scarcity of capital for pumps. North Bengal has a pump density of 1–3 pumps/1000 ha of net sown area. Eastern UP and North Bihar, similarly flush with groundwater, had pump densities in this range during the mid-1980s. Today, these regions have expanded their pump capital to achieve pump densities in the range of 25–40/1000 ha. An earlier study of those regions shows that the expansion in pump capital has been at the heart of the green revolution in these regions, and was achieved in the past 10 years through active government policy.

North Bengal, instead, has been busy building minor irrigation miscellanies that guzzle funds but make little net addition to minor irrigation. Most of India, including states like Gujarat, Rajasthan and Maharashtra that need them, discontinued building new public deep tubewells 15 years ago. North Bengal on the other hand does not need deep tubewells, yet the state continued building them until recently. One can also find fault with the extensive use of buried pipeline technology in North Bengal. In Gujarat, the savings in energy and water and their advantage in overcoming topographical barriers in conveying water are so huge that even private farmers invest in buried pipeline systems despite their extremely high building and maintenance costs. However, the use of buried pipeline distribution systems in North Bengal, a flat terrain with marginal value groundwater at subzero levels, is a doubtful strategy. In the course of the fieldwork, we found numerous farmers who owned or leased flexible poly-pipes for conveying water; but we met none who invested in buried pipes. Overall, then, the bulk of public resources for minor irrigation development, in our rough estimate around 50–60%, continue to be devoted to minor irrigation miscellanea and very little to providing pumps to farmers.

Finally, through a series of design reversals, North Bengal's pump subsidy scheme has become all but unworkable. Of the nearly 200 small farmers interviewed in the course of our fieldwork, not one had benefited from it, although most knew about it and had tried it without success. Now the scheme has acquired such a bad reputation among the poor that they have stopped trying. Banks have been dragging their feet in lending for pumps; subsidy resources available to the scheme seem woefully limited. Of what is available, the bulk has been captured by the gram panchayats (at least in Jalpaiguri district) for their pump-rental programs; the process of getting approval for loan-subsidy applications, which involves 8–10 independent decision-makers, is so lengthy, laborious, and hassle-filled that the scared small farmer has all but written off the scheme as unattainable; and the pump dealer, who made the scheme a success in Eastern Uttar Pradesh and North Bihar, has remained completely marginalized in North Bengal. The result is a pump density of 1–3/1000 ha when it could have been 25–40/1000 ha by the turn of the century.

One can argue that the present minor irrigation strategy of North Bengal is more suited to states like Gujarat or Maharashtra, regions scarce in water but abundant in capital, and where governments and farmers have the resources and reasons to sink deep tubewells and lay buried pipeline networks, and where the sheer economics of large tubewells force sustainable collective action amongst the farmers of the command area. North Bengal has none of these conditions: its farmers have too much water but no pump capital; collective management of a large irrigation system is neither necessary nor worthwhile; nor have they the economic drive and maturity to make collective enterprises work. The correct minor irrigation strategy for Gujarat is clearly wrong for North Bengal.

North Bengal's conditions, socioeconomic as well as geographic are similar to those of Eastern UP and North Bihar; therefore, its minor irrigation policy should be similar to those regions. Since this is not the case, one can argue that in promoting minor irrigation, North Bengal can learn some lessons from Eastern UP and North Bihar. Over the past decade, these regions have expanded their pump capital remarkably, and the resultant intensification of minor irrigation has created a green revolution; our studies have also shown that this process was by no means autonomous but was induced by an astute minor irrigation policy.

7 Fitting minor irrigation policy to context: Learning from the experience of Eastern UP

Eastern UP and North Bihar have long since given up on minor irrigation miscellanies such as deep tubewells and mega river lift irrigation schemes, community management of large minor schemes, and buried pipeline systems. These initiatives use a lot of resources to produce little minor irrigation; policy instead places a single-minded thrust on overcoming pump capital scarcity through the free boring scheme (FBS) whose sole objective is to provide pumps to small farmers with the least hassle, delay, and transaction costs. To this end, the FBS design has been modified in stages to a level where it has become a precision tool to achieve just this aim. All resources available have been pumped into the scheme to create a sense of sufficiency and to avoid stringent rationing. The system for processing applications for the pump subsidy and loan scheme has been simplified, and in each tehsil (subdivision), an intensely competitive group of diesel pump dealers has been placed into the central coordinating position in the implementation of the scheme. As a result, over the past decade or so, 70–80% of approximately a million new borewells and pumps installed in these regions have been supported by the FBS.

The process that a small farmer goes through in these states to acquire a pump subsidy-loan is extremely simple, involving the following steps:

- Equipped with his photograph, land and caste documents, the farmer approaches one of several dealers in diesel pumpsets and presents the papers to him.
- The pump dealer then takes over. After examining the documentation, the dealer immediately delivers the engine and pump set, takes the farmer to the minor irrigation office, and gets subsidized pipes issued to him on the same day.
- The farmer returns to his village with the pipes and pumpset and approaches a rigging operator to tap into the aquifer. If he and other villagers can share the labor, the cost of boring, depending upon the depth of the watertable, is about Rs 225. If the rigging operator has to provide all the labor, the cost may go up to Rs 350–400, which the farmer pays with his own resources.
- In the next few days, the rig operators mount the boring operation and, once begun, they commission the borewell within 4–5 hours. The farmer's borewell is thus operational at a personal cash outlay of less than Rs 500 within a week.
- The dealer then takes the farmer to the bank to complete the loan formalities. All the farmer has to do is sign the form. The loan for the National Bank for Agriculture and Rural Development (NABARD)-determined unit cost of Rs 12,500 gets sanctioned and is directly received by the dealer toward the cost of the pump.
- Some days/weeks later, someone from the block office visits the farmer to ascertain that the boring has indeed been done; he also collects information on the depth of the bore, the nature of the geological formation, etc. to estimate the boring costs.
- After several months, the boring subsidy comes in the form of a minor irrigation department check. This often exceeds the actual cost of boring to the farmer to cover the unofficial payment he was required to make to the minor irrigation inspector.

Nearly 200 beneficiary-farmers we interviewed in Maharajganj, Deoria, and Gorakhpur districts of Eastern UP during November–December 1996 considered the FBS scheme to be a great boon and the diesel pump dealer very helpful – despite the fact that they charged an average premium of Rs 1000 on the subsidy-loan pump. Most farmers considered this a small price to pay for the efficient and smooth functioning of the system.

Compared to this, a small farmer in North Bengal has to go through an arduous process to get the subsidy loan benefit on the diesel pump. According to a Jilla Prishad *krishi karmadhyaksha* (Agriculture Head of an elected District Council) in North Bengal, the procedure of accessing the pump subsidy-loan scheme involves the following steps:

- The farmer gets his name listed as an eligible aspirant with the gram panchayat along with all documentation. During the first stage, the gram panchayat has to agree to forward his application to the block development officer.
- A gram panchayat member has to personally recommend the application to the block development officer.
- The application is discussed in the bimonthly meetings of the bank, gram panchayat pradhan (elected leader of the village council), and panchayat samiti member concerned to assess the creditworthiness and eligibility of the aspirant. If the aspirant clears this stage, his application is completed and forwarded to the bank with the recommendation of the panchayat samiti.
- After this, the bank claims the subsidy from the district rural development agency and releases the loan – but only after the district rural development agency pays the subsidy.
- The bank issues the delivery order to the beneficiary who can go and claim his diesel pump.

The procedure takes about a year, and in recent years, it seldom gets completed because banks, facing massive non-performing assets in government subsidy schemes, are dragging their feet. The block development officers we met asserted that the delay was caused mainly by the banks; and the Central Bank officials we met passed the blame to district rural development agency and panchayat authorities. These in turn argued that the banks do not proceed unless the panchayat samiti forwards an application; and the panchayat samiti does not forward it without the gram panchayat's recommendation. None of the 200 small farmers we met in North Bengal had anything but frustration to share about the pump subsidy scheme.

Even in Eastern UP, things were not always as good as they are now. For example, a study in 1984 showed that the process of approval of an application for a subsidy and loan for a diesel pump took over 11 months. At the time, the minor irrigation department played a central role in implementing the subsidy policy (FBS); the department maintained a stock of diesel pumps of one or two preferred brands. Similarly, the block office maintained an

inventory of PVC and galvanized iron pipes, rigs, foot valves, and other material needed to make borewells, and employed an army of staff to make borings. When a small farmer applied for a shallow tubewell under a subsidy-loan scheme, he had to accept the diesel pump stocked by the minor irrigation department and wait for months for the government ministry to make a boring. Moreover, the final cost of the shallow tubewell often turned out to be higher under the subsidy-loan scheme than if the farmer had done it on his own. The diesel pumps stocked by the government sold in the open market at 20–30% discount compared to what the department charged; similarly, farmers who made borings on their own got them done for under Rs 2,500; but under the government scheme, the small farmer ended up paying over Rs 10,000 for the boring. The bulk of the actual subsidy was thus claimed by "intermediaries;" and as a result, farmers lost interest in the scheme.

Today, the scheme has a more farmer-friendly design because it has created a uniquely beneficial "dealer dynamic:" the pump dealer (not the MI department) has emerged as the point of access to the subsidy. As a result, over the years, all trading towns have grown a small community of specialist pump dealers who deal solely or mostly in diesel engines. Even small district towns can have 15–20 such specialist dealers. This pump dealer community offers to farmers a choice among a wide variety of brands. Each dealer would naturally look for the easiest way to corner as much of the subsidy as possible; however, he would be constrained from overdoing it because of the fierce competition in a growing market. Competition amongst alternative brands and dealers prompts the dealers to choose the hard way and offer to farmers quality products and services that go beyond their "call of duty." In return, if they extract an unofficial "service charge" by jacking up pumpset prices more than they would have in the absence of the subsidy, the farmers we met did not seem to mind it very much. Unlike earlier, in the present system, the farmer is spared the agony and hassle of dealing with the various agencies involved in approving the loan-subsidy; his interaction with them is mediated by the dealer. The dealer who can offer a stable business is able to strike a better bargain with those in charge of processing subsidy-loan applications and change to the *hafta*[9] system rather than settling the rate for each application. Pump dealers with larger turnover have an obvious advantage in dealing with the administrative system: they can form long-term contractual arrangements – informal of course – with bank staff and minor irrigation staff to secure speedy clearance of loan and subsidy applications. They can also afford to pay larger *hafta* and charge a lower premium to the farmer on the subsidy pump, which is probably why the discount on direct sale varies from Rs 700 to Rs 1,800. This dynamic propels dealers to constantly try to increase market share by offering better services and fewer hassles to farmers.

In an earlier study (Shah *et al.*, 1996), our overall assessment of the free boring scheme as it has operated in Eastern UP as well as North Bihar was that the entire subsidy amount did not reach the farmer; this is evident in the difference of an average of Rs 700–900/pump (6–8%) compared to the over-the-counter price; however, the small farmer is extremely happy with *this particular* subsidy scheme, which cannot be said for most other subsidies. Moreover, the services offered by the pump dealer in helping the farmer through the entire bureaucratic process seemed highly valued. Thus, if the ultimate purpose of the scheme is to encourage small and marginal farmers to acquire and use bore and pumpsets for irrigation, the dealers' drive to compete for a larger share of the subsidy-induced demand for pumps helps the scheme along in achieving this purpose. The FBS has dramatically expanded the pump capital stock available in these regions and has served as a catalyst to a green revolution. In a subsequent study of North Bihar, we found the "dealer dynamic" vibrant: dealers fiercely compete among themselves for eligible applicants and sell the pump subsidy-loan scheme at margins as low as Rs 400–500. While there is some amount of rent seeking involved in the subsidy-loan approval process in Eastern UP, the small farmer there *does* get the pump and bore commissioned within a week, with a minimum amount of hassle and delays, at an 8–10% premium over the market price that he does not seem to mind paying as a service charge.

In North Bengal, too, the small farmer has to be prepared to pay the "service charge," yet he can seldom lay his hands on a pump and a bore under the subsidy loan scheme. The long-term ideal would be a situation where there is no rent seeking and the small farmer gets smooth and quick access to the subsidy. However, in the short run, a more practical approach is to accept the reality for maximizing the effectiveness of the schemes.

As a strategic alternative, thus, we believe that a pump subsidy scheme of the type that operates in Eastern UP can be a powerful addition to North Bengal's present armory of programs. However, to reproduce the same results, it should have the following features:

- Sufficient resources for the subsidy as well as loans should be earmarked so that there is no need for stringent rationing.
- The scheme should give complete freedom to the farmer to choose any make of engine and pump and to get a bore made himself rather than insisting that the government-appointed contractor do it.
- The application for loan-subsidy should be submitted at the panchayat samiti and processed there.
- Every branch of public sector and cooperative banks should be encouraged to advance loans for diesel pumps and bores.
- There should be a separate but similar scheme under which gram panchayats can acquire pumps for renting out so that they do not preempt subsidy-loan resources meant for small farmers.

These features would, in our assessment, reproduce the dealer dynamic that has helped Eastern UP and North Bihar expand their pump capital and launch their much-delayed green revolutions.

[9]Hafta (fee) is usually an illegal fee extracted by a person with more power.

8 Policy conclusions and recommendations

Irrigation interventions often produce a complex socioeconomic and institutional dynamic that has a decisive impact on their success or failure. In the North Bengal context, the North Bengal Terai Development Project's impacts were still largely unaffected by property rights issues (e.g., Coward, 1986; Gerbrandy and Hoogendam, 1996). The central issue has been how best to support rapid acceleration of groundwater irrigation to alleviate poverty. From the standpoint of pure microeconomic analysis, subsidies are seldom justified, except perhaps in the presence of externalities. Yet, development interventions everywhere use subsidies directly or indirectly, suggesting that planners are governed by a more pluralistic and complex set of considerations. In development policy, subsidies seem justified if they help pioneer a new idea (such as the fuel saving contraption of North Bengal Terai Development Project); if they are minimalist in nature – that is, they unleash a large change by removing a minor constraint that keeps it bottled (such as the treadle pump); if they have potential for large strategic impact in a society (such as by expanding pump capital in North Bengal); if they are appropriately targeted to achieve an important social end (such as gender equity through the hand-pump tubewell subsidy); and if they are rather "additive," that is, topping up what the target group is already prepared to incur, than "substitutive," that is, replacing what the target group would have spent anyway.

Most North Bengal Terai Development Project subsidies can be justified on one or more of these grounds. However, a relevant second-order question is about whether the project gets the "best bang for its buck." This can be assessed by judging a subsidy program against a set of normative criteria. To produce the desired impact, in our assessment, a subsidy should be efficient (i.e., minimize the cost of assisting a beneficiary), produce sustainable change, (i.e., support technological and institutional interventions that beneficiaries can and will want to sustain on their own), and significantly address outstanding social anomalies and inequities.

References

1. CDS (1995). (unpublished). Institutional Options for Management Transfer of Minor Irrigation Systems Developed under North Bengal Terai Development Project. Council for Development Studies.
2. COWARD, E.W. (1986). State and locality in Asian irrigation development: The property factor. In NOBE, K.C. and SAMPATH, R.K. (eds.), *Irrigation Management in Developing Countries: Current Issues and Approaches*. Studies in Water Policy and Management, No 8, ISARD.
3. DAS, P.K. (1997). Economic Evaluation of Minor Irrigation Schemes. North Bengal Terai Development Project, Jalpaiguri.
4. GERBRANDY, G. and HOOGENDAM, P. (1996). The materialisation of water rights: Hydraulic property in the extension and rehabilitation of two irrigation systems in bolivia. In DIEMER, G. and HUIBERS, F.P. (eds.), *Crops, People and Irrigation: Water Allocation Practices of Farmers and Engineers*. Intermediate Technology Publications, London.
5. GHOSH, B. and GHOSH, A. n.d. On the Path of Self-Reliance: The Case of Operation and Maintenance of Tubewells by the Beneficiaries of Two Villages. North Bengal Terai Development Project, Jalpaiguri.
6. KANWAR, D.M. and BANDYOPADHYAY, N.K. n.d. Transfer of O&M Responsibilities of Public Tubewells to Beneficiaries through Panchayats in West Bengal: A Milestone. Unpublished private report.
7. KRANENBURG, M.E.L. (1994). Still Waters Run Deep: An Anthropological Village Study of Three Small-Scale Irrigation Facilities, River Lift Irrigation Scheme, a Deep Tubewell Scheme and a Cluster of Hand Tubewells Installed under the North Bengal Terai Development Project. The University of Amsterdam, Amsterdam.
8. NBTDP (Nort Bengal Terai Development Project). Various Years. Monitoring Reports. Jalpaiguri: Project Support Unit, NBTDP.
9. ORG (1995). Economic and Financial Analysis of Minor Irrigation Schemes under NBTDP. Jalpaiguri: Euro-Consult Project Support Group.
10. ORR, A., ISLAM, A.S.M.N. and BARNES, G. (1991). The Treadle Pump: Manual Irrigation for Small Farmers in Bangladesh. Rangpur-Dinajpur Rural Service, Dhaka.
11. PALMER-JONES, R. (1989). Water Management and Irrigation Issues in West Bengal. Unpublished manuscript for Ford Foundation. University of East Anglia, School of Development Studies, Norwich.
12. PALMER-JONES, R. (1995). *Deep Tubewells for Irrigation: Efficiency, Equity, and Sustainability*, Unpublished manuscript. University of East Anglia, School of Development Studies, Norwich.
13. RAO, D.S.K. (1995a). "Farmer management of public tubewells in West Bengal", *Economic and Political Weekly*, (30)39.
14. RAO, D.S.K. (1995b). *A Study of Management Transfer of Irrigation Tubewells in West Bengal*. Bankers' Institute of Rural Development, Lucknow.
15. SHAH, T., INDU, R. and PALEJA, S. (1996). Muscle, Diesel and Electrical: Pump Irrigation Political Economy of Eastern India. Discussion Paper. The Policy School, Anand, India.
16. SHAH, T. (2001). *Elixir or Opiate? An Assessment of Minor Irrigation Policies in North Bengal*. Working Paper No. 7. International Water Management Institute, Colombo, Sri Lanka.