



Water and Sanitation Program

An international
partnership to help
the poor gain sustained
access to improved
water supply and
sanitation services

Discussion Paper # 1

Sustainability of Rural Water Supply Projects : Lessons from the Past

SOUTH ASIA REGION

Discussion Paper # 1

Sustainability of
Rural Water Supply Projects :
Lessons from the Past

Revisiting Community-Based
Rural Water Supply Projects in Uttar Pradesh

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The purpose of the Working Paper Series is to share information in order to stimulate discussion, broaden thinking within the sector, and encourage dialogue among our clients in developing countries.

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All opinions expressed herein are those of the authors and should not be considered to reflect the position of the Water and Sanitation Program.

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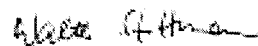
Foreword

The International Drinking Water Supply and Sanitation Decade (1981-1990) was a period of accelerated and concerted effort to expand water supply and sanitation services to the unserved and underserved poor populations. In the late 1980s water began to be viewed as a scarce economic good. This new conception of water led to the development of demand-responsive, cost-effective rural water supply and sanitation models globally. The Government of India's rural water supply policies and programs have keenly reflected the changing scenarios and in 1987, the Government of India created what is now called the Rajiv Gandhi National Drinking Water Mission with the objective of providing appropriate financial, technological and policy support to the sector. In 1999, the Indian Government launched the rural water supply Sector Reform program.

In this report, we document the history and status of the schemes introduced in Uttar Pradesh at a time when the current thinking was at its infancy. The Banki Piped Water Supply Project — a project with community participation — was one of three projects initiated in 1963 on an experimental basis and implemented with assistance from UNICEF, WHO and the State Government at a total cost of about Rs. 1,60,000. The scheme covered seven villages and was located in two *gram panchayats* of Sarsanda and Sahabpur in Barabanki district about 9 kms from Barabanki and about 40 kms from Lucknow. The purpose of this report is to determine what lessons may be learned from older community-participation rural water supply initiatives. Our findings are based on interviews, a study of available documentation and visits to each project site. We have used the published literature and official documents to establish the history of each scheme. Discussions with officials associated with the project and residents of the project communities have been used to substantiate some of the findings.

During a field visit in October 2001 by the Water and Sanitation Program-South Asia, it was determined that the Banki project operated until 1994. Based on information garnered from study of literature and interviews, it is evident that the objectives of these three schemes and their management models were very akin to those of numerous similar schemes that are currently being implemented by Government of India.

The Water and Sanitation Program-South Asia decided to undertake a detailed study of all the three schemes. The study aimed to capture the key factors leading to the projects partial success and eventual failure in order to inform the current 'demand-responsive' projects implemented by Government of India. Lessons from these projects, particularly the institutional and financial aspects, can assist policy makers and designers better develop sustainable RWS projects.



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Introduction*

An experimental community piped water supply program was initiated in three districts of Uttar Pradesh in 1962. The program was implemented by the Planning Research and Action Institute¹, Lucknow and the local public engineering department with assistance from WHO, UNICEF, and the State Government. The schemes were undertaken as pilots with the objective of identifying a suitable model for large-scale extension of rural water supply programs in the State. An initial investigation of the schemes revealed that their objectives, strategies and methodologies were remarkably similar to those of numerous schemes currently under implementation by the World Bank, the Government of India and bilateral donors². Current schemes provide for limited capital contribution by the sponsor and community responsibility for operations and maintenance with no capital cost recovery. An understanding of the factors that determined the outcomes of the three schemes may provide useful insights for effective implementation and sustainability of today's demand-responsive projects.

The current international thinking and practice in rural water supply and sanitation is the result of an international effort over the past twenty years. During the United Nations International Drinking Water Supply and Sanitation Decade in the 1980s, significant strides were made in the development of alternative low-cost water and sanitation technologies through the combined efforts of NGOs, UNICEF, WHO and other international organizations. The new technologies led to the recognition of the need for decentralized, participatory structures of operation and maintenance, which in turn demanded a major shift in policy and institutional structures. Beginning in the late 1980s, with the spread of the concept of sustainable development from the World Commission on Environment and Development, water began to be viewed as a scarce economic good. This new conception of water led to the development of demand-responsive, cost-effective rural water supply and sanitation models globally.

The Government of India's rural water supply policies and programs have keenly reflected the global shift in methodologies. In 1987, the Government of India created a National Drinking Water Mission, currently known as the Rajiv Gandhi National Drinking Water Mission with the objective of providing appropriate financial, technological and policy support to the sector. In 1999, the Indian Government launched the rural water supply Sector Reform program³. In the new approach, the emphasis has shifted from older top-down, target-oriented, engineering-based solutions to more demand-responsive schemes with active participation from local beneficiary communities as an integral element. Sector Reform focuses on local requirements, technology preference, ability and willingness to pay of beneficiary communities, and local management and control to secure the operational, financial and institutional sustainability of the system.

In this report we document the history and status of the schemes introduced in Uttar Pradesh (U.P.)⁴, to determine what lessons may be learned from older community-participation rural water supply initiatives. Our objective is two-fold: to delineate the differences across the three schemes in design and operating conditions and to identify the factors leading to the success or failure of the schemes. Our findings are based on interviews, a study of available documentation and visits to each project site. We have used the published literature and official documents to establish the history of each scheme. Discussions with officials associated with the project and residents of the project communities have been used to substantiate some of the findings. The report is organized as follows: in the next section, we discuss some of the historical and intellectual background relevant to the project, program objectives and roles of the agencies involved in project planning and execution. Sections three through five document the experience of the three schemes in detail. The final section summarizes the main findings and concludes the report.

* We are grateful to Rupert Talbot, Paramjyoti and Y.N. Chaturvedi for their helpful comments and discussions.

PRAI was established in Lucknow in 1954 and functioned as an independent institute directly under the Chief Minister of Uttar Pradesh with close links to the State Planning Department. In 1972, the Institute was made a part of the State Planning Commission and became known as the Planning Research and Action Division.

These schemes were first brought to the attention of WSP-SA by Samia Ahmad and later visited and documented by Vivek Srivastava.

³ The program of 'Sector Reform' pilots participatory, demand-responsive projects in 63 districts throughout the country. More information on the project can be obtained from www.wsp.org.

⁴ Uttar Pradesh (U.P.) is the most populous state in India with a population exceeding 166 millions.

Community Piped Water Supply Schemes in Rural Uttar Pradesh

Historical Background

It is informative to review the development of the rural institutions that formed the backdrop for the piped water supply projects in Uttar Pradesh. Following independence, supply of safe and adequate water for drinking and domestic purposes was a major development concern across rural India. In the nineteen fifties, Community Development became a nationwide movement but failed to achieve its objectives mainly because of a lack of beneficiary participation⁵. In order to encourage active involvement of beneficiaries, an attempt was made to entrust necessary authority and responsibility for rural development to local bodies through the creation of the three-tier Panchayati Raj structure in 1959. The rural governance structure consisted of Gram Panchayats at the village, Panchayat Samitis at the block level and Zila Parishads at the district level. The Samiti, an elected self-governing body, was recommended at the development block level to act as an agent of the State Government in the execution of special schemes of rural development. The Gram Panchayat, in turn, acted as an agent of the Samiti in execution of its schemes. In this model, the Zila Parishad served as a non-executive body performing the functions of co-ordination and general supervision⁶. Although most states adopted the Panchayati Raj Institutions, each state implemented its own model keeping in view the broad framework proposed⁷.

In this historical context, an experimental project was initiated in rural Uttar Pradesh by the Planning Research and Action Institute, Lucknow with assistance from WHO and UNICEF. The project was implemented jointly by the Institute and the Local Self-Government Engineering Department. At the time, in spite of access to a generous ground water source, majority of the

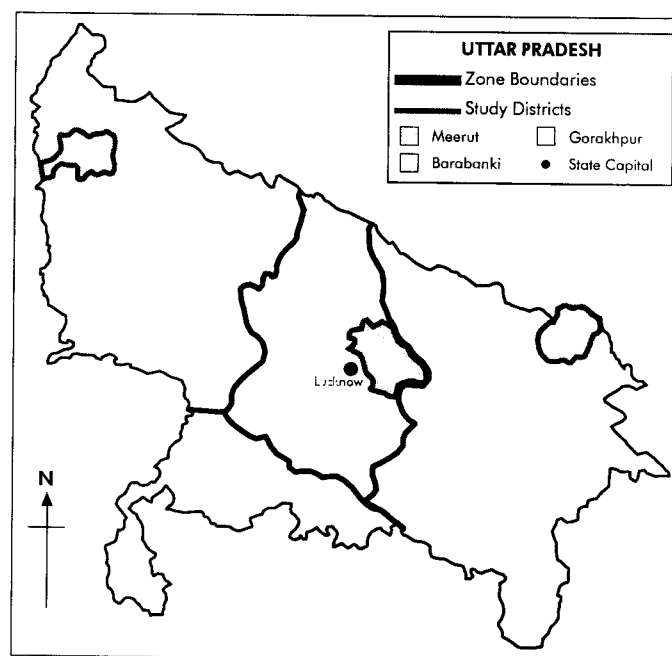


Figure 1: Location of the Three Project Districts

rural population met its drinking water needs from contamination-prone open wells or shallow handpumps, leading to high incidence of waterborne diseases. Piped water supply from a centrally controlled source was considered the best means of ensuring provision of safe water to rural communities.

The piped water schemes were implemented in three representative districts of U.P. including Meerut in the Western region, Barabanki in Central U.P. and Gorakhpur in the eastern part of the State. The Meerut district scheme was a single village scheme in Mohkampur. District Barabanki scheme involved seven villages in the Banki Block. The seven villages in the scheme were part of two Village Panchayats, Sursanda and Sahabpur. The Gorakhpur district scheme fell in the Development Block Pharenda and included eleven villages.

Project Objectives

The three schemes were designed as demonstration projects to pilot new community-based approaches to

According to Misra (1975), in the early 1950s, the State Irrigation Department constructed overhead tanks in some villages to provide water to the residents. However, the scheme failed because communities were not involved in planning and implementation, no arrangements were made for maintenance and people considered the schemes as belonging to the government. The National Water Supply and Sanitation programme was launched in 1954.

Under the Sector Reform program, the state government's role is to provide policy guidance and conduct evaluation of project implementation. The district level bodies are responsible for project formulation, administration of funds, selection of private sector partners and sensitization. The village level institutions are responsible for actual planning, implementation and operations and maintenance.

See Bajpai, 1997 for more on the historical development of Panchayati Raj and rural development. According to Bajpai, the state of UP was pioneering in establishing local self-government institutions in 1949 after passing the UP Village Panchayat Act, 1947. Village panchayats were constituted in UP before the three-tier structure of Panchayati Raj Institutions was adopted nationally at the village, block and district levels in 1959. State of UP also enjoyed a history of rural development programs and before the commissioning of the three PWS schemes was involved in programs of Community Development (1952) and National Extension Schemes (1953).

rural water supply and sanitation. By studying the projects, the Government of U.P., with the help of Planning Research and Action Institute hoped to develop a methodology to guide extension of village piped water supply systems throughout the state by the engineering department. With this in mind, technical, financial, and social features of the project were carefully planned and studied in detail. Project documents state the following objectives:

- Design and construct at minimum cost a piped water supply scheme suitable for rural areas;
- Document practical experience of the design, construction, operation and maintenance of a rural water supply system;
- Develop a methodology for educating the villagers about the health benefits of piped water supply and to study the impact on the health of the people of this educational program and the piped water supply;
- Study the acceptability of piped water supply by people living in rural areas and their participation in the execution and maintenance of such schemes;
- Show that villagers are capable of organizing themselves and administering piped water schemes independently;
- Evolve a set of rules on sound management practices, which may be applied elsewhere in similar schemes.

Roles of Agencies Involved

The overall responsibility for the program, including design and organization of community participation in administering the scheme and implementation of health education programs, was borne by the Planning Research and Action Institute (PRAI). However, the schemes were jointly implemented by the Institute and the Local Self-Government Engineering Department (LSGED)⁹. The design, construction, execution and an initial short phase of operations and maintenance of the schemes were assigned to the LSGED. The LSGED was also responsible for making arrangements for safe disposal of wastewater. The Environmental Sanitation Program of the World Health Organization provided

expert technical guidance. UNICEF provided assistance in the form of materials and equipment such as pumps, pipes, chlorinating plants and special fittings. The State Government funded the remaining expenditure on personnel, local expenses and supplies. The Director of Medical and Health Services, U.P. was assigned to periodically sample water from the piped water supply system and provide public health laboratory facilities for chemical and bacteriological analysis of water samples⁹.

For each scheme, a request was issued by the respective project community or a representative to the LSGED for the location of the scheme in their community. The rural communities donated land for the pump house and pledged some resources, mainly labor towards the cost of construction. Following this an Estimate report was prepared by the LSGED for each scheme. Once the technical specifications were approved, the schemes were executed by the LSGED and subsequently handed over to the village communities for operation and maintenance. In addition to the funds, equipment, and skilled engineering, beneficiary participation was understood to be central to the success of the project. In the project villages, water was available free of charge from low-maintenance open wells and shallow handpumps. Convincing villagers of the health advantages of piped water and motivating them to accept and contribute towards the maintenance of a new system of water supply was considered a challenging task. PRAI was responsible for overseeing these aspects of the project.

PRAI's institutional focus was on the Action Research Methodology. Through this approach, PRAI sought to involve people in the formulation, monitoring, management and evaluation of development projects. It was expected that this would create conditions under which plans for their socio-economic transformation would be owned by rural residents and they would be responsible for the execution of those plans. The Institute functioned by identifying and diagnosing problems, launching action research pilots to find solutions, testing in representative areas, and finally passing the methodology on to the concerned government department for large-scale extension¹⁰.

⁹ LSGED became the UP Jal Nigam in 1979.

¹⁰ It is our understanding that the careful planning of the project and the initial momentum it harnessed is partially attributable to a committed set of individuals attached with the various institutions involved. Apart from some of the local village leaders, names that cropped up in the documents and interviews included, Mr. W.C. Tabossia, Regional Adviser, Environmental Sanitation Division, WHO, Mr. A. K. Roy, Chief Engineer, LSGED and Dr. Ram Das, Director, PRAI.

PRAI devised various strategies for involving the community in each phase of the project including design, construction, operations and maintenance of the three piped water supply schemes. Through its staff consisting of sanitary workers and field teachers, the Institute collected baseline information on beneficiary attitudes to the project, their willingness and ability to pay for safe drinking water supplies and the health status of the population. The results indicated that people were generally opposed to the scheme for a variety of reasons ranging from the anticipated cost and taste of the water to cultural and sociological factors. More significantly, villagers seemed unaware of the many health and other economic advantages of piped water supply. In order to engender acceptance, the Institute initiated educational programs to develop community interest and participation through creation of village level health committees. According to Misra (1975), the educational efforts were initially aimed at village leaders, who later led the efforts oriented towards the village community as a whole. The Institute's field workers explained the biological basis for the spread of disease via contaminated well water and through surveys in the villages established the relationship between contaminated water and illness. To help develop locally accountable institutions capable of maintaining a piped water system, the Institute also led the creation of a Joint Action Committee in each project area. These committees were composed of elected representatives from the project panchayats and officials from associated government departments, and were responsible for collecting tariffs, coordinating operation and maintenance and monitoring the progress of the schemes.

Banki Block Scheme¹¹

History and Status

The Banki scheme

covered seven villages that formed part of the two Panchayats of Sahabpur and Sursanda, approximately 40 kms east of Lucknow on the Lucknow-Barabanki Road. Before construction of the piped water supply scheme, villagers relied on traditional hand-dug wells, which served 96 percent of the population. The other residents obtained water from handpumps. Although there was generally sufficient water quantity all year round, water quality was subject to significant bacteriological contamination, leading to high incidence of diarrhea, dysentery and typhoid¹².

The scheme constructed under the project abstracted water from a tube well with an electric pump to a 5000 gallon overhead tank. The well and the tank were located in Village Sursanda, near the center of the service area. Distribution was through a centrally networked supply to private house connections and public standpipes. The water was disinfected through a pressure-feed chlorination system located in the pump house, which chlorinated the water as it was pumped to the overhead tank. Catch-pits were constructed in the houses for channeling the wastewater through cast iron pipes to a village pond. Tables 1 through 3 provide greater details for the Banki scheme.

The Banki project covered villages that formed part of two main groups, Sahabpur and Sursanda and

Table 1: Key Dates and Details of the Three Schemes

Features/Scheme	Banki	Pharenda	Mohkampur
Estimate Prepared	1962	1962	1962
Scheme Commissioned	1965	1964	1966
Transfer of O&M to Village Committee	1965	1966	1968
System Abandoned	1994	Ongoing	1976
# Villages Involved	7	10	1
# Panchayats Involved	2	—	1
1962 Population	4320	8757	687
1962 Number of Families	800	1500	125
30-yr Design Population	5425	11000	1000
Design Water Consumption (gpcd)	10	10	15
Size of Overhead Tank (gallons)	5,000	20,000	5000
Disinfection Method	Chlorination	Chlorination	Chlorination
Capital Cost (1962 Rs.)	159,300	463,500	70,000
Annual Maintenance Cost (Rs.)	4,400	8,000	2,470
Per capita Capital Cost (Rs.)	32	42	70
Per capita Annual Maintenance Cost (Rs.)	1	1	3.5
# Families Willing to Pay at First Survey	270	280	12

Source: Joshi (1968), Field Visits.

Ram Das, 1993 offers a detailed exposition on the Institute's Action Research Methodology.

Findings related to the Banki scheme are based on Joshi (1968), PRAI (1972), Misra (1975), Srivastava (2001) and conversations with P.K. Misra, Field Teacher, PRAD, Y.N. Chaturvedi, Swajal both of whom were associated with the Banki scheme. We also met current village leaders some of whom are relatives of leaders who had managed the scheme. Other background information included discussions with U.P. Jal Nigam officials in Banki and Lucknow.

According to Misra, 1975 annual morbidity per thousand residents caused by waterborne disease in 1965 was as follows: Diarrhea: 83.8, Dysentery: 12.2, Typhoid: 3.3. By 1968 after the introduction of tap water, the annual morbidity rates had dropped to: Diarrhea: 19.0, Dysentery: 3.1, Typhoid: 0.

Table 2: Number of Functioning Private House Connections and Public Standposts

Connection Type	Banki Year	#	Pharenda Year	#	Mohkampur Year	#
Private Connections	1967	260	1967	279	1967	0
	1971	383	1971	547	1968	20
	1991	150	2001	184		
Public Standposts	1967	34	1967	123	1967	2
	1971	42	1971	125	1968	2
			2001	>3		

Source: Joshi (1968), PRAI (1972), Field Visits.

included a total population of 4420 in 1962. The scheme was initiated when the Gram Panchayat of one of the groups donated land for the project site. The village community also contributed Rs. 500 towards the capital cost of the scheme and labor worth Rs. 2700 during the construction phase. Most of the households in the Sahabpur group of villages were occupied with handloom production. The remaining population was engaged in agriculture, petty business, crafts and labor. Since handloom production requires water for dyeing and bleaching activities, this appears to have had direct implications for the willingness and ability to pay on part of handloom producing households in the scheme.

After the scheme was commissioned in March 1965, the LSGED operated the scheme for the initial six months. Subsequently, the Gram Panchayats of Sahabpur and Sursanda took over control of operation and maintenance of the scheme through formation of a Joint Action Committee. The number of house connections grew from 260 in 1967 to 383 in 1971 and number of standposts from 34 to 42 over the same period. The entire project population was covered under the scheme by 1971, through private house connections and public standposts. The wells and handpumps that existed in this area before the availability of piped water fell into disuse.

An educational program was launched by PRAI as a strategy to involve the community in the project and develop their acceptance of the scheme and community management. The health education program for the village was initially targeted at members of the Joint Action Committee. Later efforts involved direct discussions between the health workers and groups of

villagers with instrumental support from the Committee members. PRAI conducted a number of health surveys that compared morbidity rates resulting from drinking water from the piped water system against those for drinking water from open wells. In their discussions with the villagers, PRAI field workers used the results from these surveys, which indicated decreases in occurrence of water-borne diseases after the introduction of piped water supply, to demonstrate the health benefits of piped water supply. For example, incidence of

diarrhea among children below five years of age fell from 24 percent in 1965 to 5 percent in 1968. The health education program proved to be a success as residents' initial negative attitude to the scheme diminished and the number of house connections increased steadily during at least the first eight years of the scheme's operation.

During the first decade of its operation, the Banki scheme became a highly recognized demonstration model in South Asia and attracted attention of the development community from around the world. Papers by Joshi (1968), PRAI (1972), and Misra (1975) document the project's progress in its early years. This attention diminished markedly after the early 1970s. Problems with the Banki scheme began around 1974, when electricity supply dropped from nearly 24 hours per day to about 3 hours per day. The overhead tank with a volume of 5000 gallons was only one-sixth of the daily design consumption. Providing consistent and reliable service became impossible with the decline in electricity supply¹³. Around the same time, conflict between the two Panchayats that were jointly managing the scheme further undermined the viability of the scheme. Although the pump house was located in Sursanda, more than two-thirds of the users were residents of Sahabpur. The Sahabpur Pradhan acted as Chairman of the Joint Action Committee partly because the scheme had more users in the villages that formed part of the Sahabpur group. In addition to the deterioration in service delivery due to electricity problems, village leaders in Sursanda stopped paying their dues. As a result, many of the Sursanda residents with implicit sanction of their leaders responded by

¹³ Misra (1975) notes that villagers had expressed their concerns about irregular electrical supply and the social problems it could cause in communities served by piped water systems. He paraphrases villagers' concerns as follows: "It is never good to depend on tap water; unlike well water, it is not always available; when there is a failure of electricity in the cities, there is a lot of discontent from want of water; we do not want such situations in our villages." Misra reports that health educators answered these worries as follows: "There is no need ... to worry about possible failures of electric current; these will happen rarely and for short periods of time only: after all, motors, buses, railways and airplanes fail sometimes but this does not prevent us from using (them)."

refusing to pay their dues as well. The scheme ceased to be viable as service further deteriorated and the scheme went off-line from 1986-1990 allegedly for non-payment of electric charges. In 1987, the U.P. Jal Nigam began installing the India Mark II handpumps in the villages. According to Sri Ansari, Pradhan of Sursanda, the Panchayat used development funding that became available through the Jawahar Rozgar Yojana for reviving the scheme in 1990, by paying their electricity arrears. The scheme provided water to only about 150 house connections in 1991 and was not financially sustainable. The scheme persisted until 1994 and has been defunct since. The pump house still exists but the pump has been removed. Residents now obtain water from public India Mark II handpumps and public and private shallow handpumps. Village panchayats are very keen to reinstate piped water supply in the area and willing to contribute towards the capital cost. However, they expressed a strong need for help from the government and the engineering department.

Institutional Developments

Efforts of PRAI employees were able to foster successful development of local management institutions. For the management of the scheme, a Joint Action Committee was constituted consisting of elected Pradhans and nominated Panchayat members as representatives from each of the villages involved. The Committee was recognized by the State Government and consisted of a chairman, secretary, treasurer, and four members. This committee acted as the policy-making body and evolved a management structure for scheme operations and maintenance. The scheme employed three persons including one technical, one clerical and one chowkidar. These employees are reported to have received collections, kept records, operated the pump, and monitored the system for maintenance purposes. During the first decade of its operation, the Banki scheme became a model for rural development institution building.

However, the community institutions that had appeared robust in the early 1970s were not able to cope well with drastically reduced power availability beginning around 1975. The inter-village problems also contributed to the decay of the scheme. The presence of PRAI workers at the Banki site is also known to have come down substantially from 1972. The Joint Action Committee could not intervene effectively to alleviate the adverse effects on service either through its own resources or through the support of an external agency.

Financial Features

The Joint Action Committee drafted bye-laws for the collection of water tariffs from private connections and public standposts. Approval was obtained for the bye-laws from the State Government. According to the bye-laws, house connection subscribers were required to deliver their payment monthly to the project office to be collected by a clerk. Delinquent payments were to be charged an extra Rs. 0.50 per month, and the service was to be disconnected after three months of nonpayment. Exemptions from tariff were permitted by the Joint Action Committee for people drawing water from public standposts on the grounds that they had contributed to the scheme through volunteer labor.

Table 3: Annual Income from Water Tariffs (in Rs.)

Year	Banki	Pharenda	Mohkampur
196-66	589	---	Not Available
1966-67	3403	1354	
1967-68	6469	6569	
1968-69	8738	5688	
1969-70	5093	8029	
1970-71	8086	9388	
1971-73	16944	---	

Total Expenses 49321 31028

Total Tariff income 60335 33649

Source: PRAI (1972), Misra (1975)

Water tariff was set at Rs. 2.50 per ferrule per month or Rs. 30 per year. Collections were initially highly successful and the scheme operated at a profit during the first eight years after commissioning. From 1965 to 1973, net revenue from the house connection tariff, at the rate of Rs. 1.50 per household, exceeded expenditures by more than Rs.11,000 (see Table 3). Following the deterioration in electricity supply, increased electricity prices, and declining subscription to the scheme, tariffs were raised reaching approximately Rs. 10 in 1994. However, operations and maintenance costs in later years remained substantially greater than revenues. In the 1990s, operations and maintenance costs were reported to be three times revenues. Collections also became a problem in the mid-seventies as a result of a dispute between the two Panchayats. There were also allegations of mismanagement of funds.

Conclusions

Of the three schemes, the Banki Block project best fulfilled PRAI's vision for acceptance of health advantages and local management of piped water supply schemes. Although public interest and participation were initially low, the health education

program was implemented effectively and many residents chose to take house connections. The scheme remained financially viable under the management of the village level committee for a number of years.

The Banki scheme's experience also demonstrates the difficulties in creating sustainable participatory rural water projects. Ten years after the scheme was commissioned, it encountered serious problems stemming from deteriorating electrical supply and inter-village conflict. Although external institutional support was important to the initial success of the Banki scheme, that support was absent when the scheme encountered problems. Without extended external support, the Banki institutions appear to have lacked durability and authority.

Pharenda Development Block Scheme¹⁴

History and Status

The Pharenda scheme covered eleven villages in the Pharenda Development Block in Gorakhpur District, 42 kms north of Gorakhpur on the Gorakhpur-Nautanwa Road¹⁵. Before the introduction of the piped water supply scheme, residents consumed water from the upper most strata through open wells and shallow handpumps. At the time, the District Medical Office reported water borne diseases to be the most common cause of ailments in the area. The scheme extracted water from a tube well using a 10 hp electric pump into a 20,000 gallon overhead tank. Distribution was through circular mains of four-inch cast iron pipe to private and public connections.

A request was made by the Block Development Officer to the LSGED for the piped water supply scheme. The project villages were selected in close consultation with the Block Development office and the pump house and overhead tank were constructed on land donated by the Block Development office, in the compound of the Pharenda Block Office. Villagers contributed Rs. 427 towards the construction of the scheme and paid more than Rs. 1000 in advances for water tariff with some paying their water charges for up to 5 months in advance. The Scheme was commissioned in 1964 and was operated by the LSGED during its initial years. In 1966, management of the scheme was handed over to a local management body. The scheme enjoyed robust subscription in its early

years with demand overshooting expectations. The number of private house connections increased from 279 in 1967 to 547 in 1971. Over the same period, public standposts increased from 123 to 125.

Persistent yield problems from the tube well led to poor service even in the scheme's early years. Deteriorating power availability beginning in the early 1970s exacerbated the problem. The system was designed with the overhead tank storage volume equal to about one-sixth of the daily design demand for water. This relatively low capacity complicated operation of the system once filling the tank became difficult. As the number of house connections increased, service quality declined, particularly in the peripheral areas. Poor service led to nonpayment of tariffs and disconnection. Operator salaries and electricity prices continued to rise, and the system became subject to a financial crisis by the mid-1970s. At some point, the system collapsed and was handed over to the U.P. Jal Nigam, which assumed responsibility for operations and has since operated the system. Sometime after 1971, and again in the early 1980s, the tube well was rebored and the pump replaced, and the well reportedly no longer has yield problems. The tube well and the 10 hp pump are now housed in a new pump house approximately 150 meters to the southeast of the overhead tank.

The Pharenda scheme is still operating in 2001, with 184 house connections and several standposts. The staff at the pump house consists of an operator. The pump is run for the duration of an hour three times a day, providing water for approximately 12 hours per day. The service area has contracted so that more than eighty percent of the house connections are in the two communities nearest to the overhead tank, Anand Nagar and Mahedava Bujurg. The Pharenda Block has developed substantially since 1962. Anand Nagar, the largest village in the scheme, became a town in 1989. Many customers of the scheme own small businesses or are other relatively well off town residents. U.P. Jal Nigam applied in 2001 for funding to build a Rs. 100 lakh urban piped water scheme for Anand Nagar, which would greatly expand service in that town. The new scheme, if approved, would not provide piped water to the other villages covered by the 1962 scheme.

The India Mark II handpump began to be installed in the area by U.P. Jal Nigam at no cost to users in

¹⁴ Documentation of the Pharenda scheme is based on Project Estimate Report (1964), Joshi (1968), PRAI (1972), Agarwal (2001) and conversations with P.K. Mira, Field teacher, PRAD, U.P. Jal Nigam officials, Block level officials, employees and users of the scheme. Gorakhpur District has since split and Pharenda block now lies in Maharajganj District, established in 1989.

1982. The Pharendra Block like others has surpassed the official "saturation" level of one Mark II pump per 250 residents. Residents near the site that we spoke to were cognizant of the health benefits of using Mark II water for drinking and stated that people often use Mark II water for drinking purposes and water from a shallow handpump for other domestic needs. Groundwater remains abundant and accessible. The District Chief Medical Officer currently ranks waterborne disease as a low priority, even though he estimated that it accounts for about one-quarter of all diseases reported, with incidence levels increasing during the monsoons.

Institutional Developments

The Pharendra scheme had close links with the block level institutions. A Committee was formed in the Pharendra Block consisting of gram pradhans and representatives of the project villages. This Committee was assisted by the Development Block and the Block Pramukh acted as its Chairperson. This Committee was referred to as the Samiti by the residents. According to PRAI (1972), this Committee had managed to repair equipment on three occasions of breakdowns that had threatened to disrupt water delivery. However, according to the villagers management of the scheme by this Committee did not last for an extended period of time unlike the Banki scheme. Within a few years of PRAI's last documented involvement in the project, the scheme was in a state of collapse. Since then management by the State Engineering Department has kept the scheme in operation on a highly subsidized basis. While the Jal Nigam made considerable maintenance expenditure on the project, it considered maintenance of service to the peripheral villages impractical. The introduction of the Mark II handpump to the Pharendra service area in the 1980s made restoration of service to the peripheral villages even less attractive.

Financial Features

The project Estimate Report, prepared by the LSGED, estimated the annual recurring costs at Rs. 7,880 arising from electricity charges, salaries of operators, repairs to building, pipe lines and machinery and cost of bleaching powder etc. Annual income was estimated around Rs. 16,660 from private connections and taxation of public standposts assuming that only twenty percent of total supply would be through private connections. The annual income estimates assumed the price of water to be Re. 1 per gallon for private connections and a tax of Rs. 0.25 per gallon on water from standposts. Based on these assumptions, half the revenue was expected

from private connections and the remaining from public standposts. However, the actual rates and incomes differed.

Tariffs for the system were set at Rs. 2.50 per household, plus Re. 1 per tap. Revenues exceeded expenditures by Rs. 2600 over the first five years (1966-1971) of the scheme's operation, but by the mid-1970s the system was in debt. According to Joshi (1968) the Committee was having difficulty collecting tariffs due to poor service and the wide geographical area of the system. Collection of water tax from users of public standposts was especially difficult reportedly on account of inadequate drainage facilities. For this reason, supply of water from public posts was stopped. Despite the problems in revenue collections, the scheme's net savings reported by PRAI in 1972 suggest that collections were being made viably. Soon after this last PRAI report, the service problems described above apparently drove many users to default on the payment of their dues. The current tariff is officially set at Rs. 20 per household per month. Annual operating costs are estimated at Rs. 5,40,000. Even if tariffs were collected from all users, annual revenue would be only Rs. 44,160. The balance of operating expenses is covered by the State Government through the Jal Nigam.

Conclusions

Although local participation in the management of the Pharendra scheme did not persist as envisioned by PRAI, the scheme managed to survive. It has lasted seven years beyond its design life and is scheduled to be replaced by a new and much larger capacity piped water system. The service area of the Pharendra scheme has changed in 40 years from a collection of villages to a town area, with a business center surrounded by residential property and agricultural villages. The Pharendra scheme demonstrates both the advantages and drawbacks of a large, multi-village scheme. Its design service area was so large that providing adequate service to peripheral areas was prohibitively difficult and expensive. Despite these problems, the scheme maintained a core group of middle-class, paying subscribers. The scheme appears to have survived its continuous technical difficulties due to access to the engineering department.

The Mohkampur Scheme¹⁶

History and Status

This scheme covered the single village of Mohkampur located about 8 kms south of Central Meerut just off

¹⁶ Findings reported on the Mohkampur scheme are based on Project Estimate Report (1962), Project Execution Report (1968), Joshi (1968), Agarwal (2001) and conversations with PK.Misra, Field Teacher, PRAD, U.P. Jal Nigam officials and Mohkampur residents.

the Delhi-Meerut Road. In 1962, residents of Mohkampur drew water from public open wells, private and public handpumps. The more influential families had access to tube well water. The open wells and shallow pumps were subject to contamination, and the Project Estimate Report states that approximately fifty percent of village residents were infected with some waterborne disease. The scheme constructed under the project abstracted water from a tube well using a 5 hp electric pump. The pump and chlorinating system were located in a plot of agricultural land on the western edge of the village.

The scheme was requested by the Gram Pradhan of Mohkampur. The land for the pump house was donated by the Gram Sabha. According to Joshi (1968), the village was populated by a single community, which was under the economic and social control of a single powerful family. As Table 2 shows, Mohkampur residents had little interest in paying for piped water supply at the inception of the project in 1962. When the water supply system was commissioned in 1966, it was operated by LSGED for about one year and subsequently transferred to the Gram Panchayat. When the scheme was first commissioned, none of the residents took house connections, and the scheme supplied water only to a pair of standposts. The Gram Pradhan, Sri Chhuttan Singh made a personal commitment to increase subscription to the scheme¹⁷. According to the Project Execution Report, by March 1968, 20 residents had house connections with another 20 scheduled to receive service and plans to reach the design level of 100 house connections by December 1968. As part of this lobbying effort by the Pradhan, the Panchayat spent Rs. 2900 to extend the mains.

Between 1968 and 1974, the scheme was maintained by the Gram Panchayat. Sri Jai Prakash followed Chhuttan Singh as the Gram Pradhan in 1974. The new pradhan did not take an interest in tariff collection or maintenance of the project, and the scheme stopped operating in 1976 and has not operated since then. The 5000 gallon overhead tank and mains remain, as do the underground mains, though no information is available on the condition of the underground pipe network. The brick pump house is still standing, though the pump and chlorination equipment have been removed, and the well has been plugged. There is currently no piped water system in the village.

Residents currently extract water from approximately 10 India Mark II handpumps, private tube wells, and many shallow handpumps. Near-surface groundwater quality has been declining steadily due to agricultural pollution, and the current Sabha Sad is keen to get more Mark II handpumps in the village and to develop for water supply a now-abandoned monitoring bore recently dug in the village by the Central Ground Water Board. Mohkampur was primarily an agricultural area at the time of project commissioning. Substantial industrial development has taken place in the area since then; most residents are now employed in factories.

Institutional Developments

Institutions capable of sustaining the operation of the scheme appear not to have developed in the Mohkampur scheme. Although the Estimate Report provided guidelines for the formation of a Joint Action Committee at the village level, it is reported that responsibility for management of the scheme always lay with the local-body leader, the Gram Pradhan. The Pradhan in whose time the scheme was commissioned demonstrated a personal commitment to the success of the scheme and it managed to survive in his lifetime. When that particular Pradhan died, the scheme appears to have disappeared too. Popular support for the scheme seems to have been a problem from the outset. There is no evidence of the development of the health committees, which were successful in developing interest and commitment to the schemes in Banki and Pharenda.

Financial Features

Due to the single village coverage of the scheme, the Mohkampur scheme had higher per capita capital and operating costs than the other projects. The Project Estimate Report laid out rules for tariff structure, collections, and a water tax, though few of these plans seem to have been implemented. The tariff for house connections was set at Rs. 2 per month. At the design level of 100 connections, annual income would have been Rs. 2400, which would have nearly covered the projected annual operation and maintenance costs of Rs. 2470. Surplus project water was to be sold to farmers for irrigation. Unlike the Banki and Pharenda schemes, no records are available on the actual revenue collected and expenditure incurred even for the initial years of scheme operation.

¹⁷ As part of project design, land for the pump house was to be donated by the Gram Panchayat. During our field visit, the villagers reported that the land for the site was donated by Sri Chhuttan Singh.

Conclusions

Of the three schemes, the Mohkampur project was least successful in meeting PRAI's community participation and water supply goals. Community enthusiasm for the project appears to have been low; the few house connections that were taken seem to have been the result of a personal effort by the village Pradhan. Health education was absent, and the Pradhan's commitment to the project did not spread to the community. The scheme collapsed soon after the leadership changed.

The Mohkampur scheme suffered from problems that might be expected to arise from a lack of genuine public need or involvement in the project¹⁸. Residents had several no-charge alternatives to paying for piped water supply. The health benefits of piped water supply were insufficient incentive for all but a few residents to switch to the new system. The need for the Pradhan to lobby residents to take connections further suggests general apathy about the scheme. Although the scheme did operate for eight years, a critical mass of subscribers never developed. In the Pharenda case, when panchayat management failed, the Jal Nigam took over management of the scheme, presumably because the scheme was seen as worth saving and had a large number of subscribers, and because the scheme had strong connections to Block personnel.

Summary and Conclusions

Summary

A study of the three-piped water supply schemes in the project illustrates that although the schemes formed part of the same program, they demonstrated an interesting dissimilarity in the method of implementation and extent of achievements. A comparative assessment of some key institutional features of the three schemes is summarized in Table 4. As mentioned earlier, the Mohkampur scheme appears to be the least captivating of all the schemes in terms of the degree of community participation and measure of success. The scheme collapsed early in relation to its

design life primarily because of a general lack of involvement on part of the beneficiary population. This may be attributed to the general lack of commitment before construction on behalf of the target population¹⁹. Despite its dismal performance, the scheme does offer lessons that may be relevant for the current sector-reform schemes. The Mohkampur scheme was a single village project and therefore did not suffer from multi-village management problems as faced by the Banki scheme. However, it appears that prior assessment of demand is especially crucial for the sustainability of smaller schemes.

The Banki and Pharenda Block schemes registered an initial phase of growth. It is our understanding that the excellent performance in the initial years of the Banki scheme is closely linked to the established presence and activities of Planning Research and Action Institute's field workers in the area. The Institute is headquartered reasonably close to the Barabanki District. The Institute's field staff contributed significantly towards capacity building of the community and to the monitoring of the scheme until 1971-72 and from a distance for a short time afterwards. The Pharenda scheme offers an interesting variation to the Banki scheme based on the supervision and control exercised by the Block Development institutions on the Pharenda management in apparent contrast to the Banki model (see Figure 2). Although both the schemes fell in a development block, the extent of involvement of the Block differed. It seems likely that the Pharenda scheme bail out in mid seventies by the Jal Nigam and continued supply from the scheme is at least partially attributable to the links with the Block Development institutions. In Banki, the scheme was highly successful in its initial phase when investments were made as part of project design in the mobilization and organization of community. This phase was also

Table 4: Key Features of Piped Rural Water Supply Schemes

Features/Scheme	Banki	Pharenda	Mohkampur
Commitment before Construction	High	Medium	Low
Investment in Physical Infrastructure	Medium	Low	High
Investment in Social Infrastructure	High	Medium	Low
Form of Participation	Committee	Committee	Pradhan Led
Formal Institutional Support	PRAI ²⁰	Dev. Block	Absent
Monitoring & Evaluation Mechanism	PRAI	Dev. Block	Absent
Immediate Cause of Closure	Electricity	Ongoing	Change in Pradhan

¹⁸ It is our opinion as well as that of Mr. Misra, Field Teacher, PRAD that Mohkampur may have been selected as a project site because of a personal connection with the then Director of PRAI, Dr. Ram Das and probably always suffered from an elitist bias.

¹⁹ Narayan, 1995 provides a detailed study of the impact of participation on project outcomes and agency and beneficiary characteristics that foster participation.

²⁰ In the Banki scheme, formal institutional support and monitoring and evaluation were available from PRAI only up till early to mid seventies.

characterized by a momentum built up by the key individuals involved and associated with the various agencies involved. The agencies involved had defined roles and open communication channels and there was some ongoing monitoring of the schemes in this phase.

After this initial phase of success, appearance of a combination of factors within a short interval of time influenced the sustainability of the schemes adversely. All schemes faced some sort of crisis in the mid-seventies alongside a changing approach to water supply²¹. Deteriorating electricity supply conditions and rising electricity costs created a vicious circle in which a decline in service levels led to a drop in tariff collections, which further deteriorated supply conditions. For this reason people substituted to and supplemented with other alternatives to the piped water supply²². All this made the systems expensive to operate and impossible to operate as designed. The other key factors that appear to have contributed to project failure include absence of formal institutional options for providing support for community managed services after completion and transfer of management to village panchayats. There also existed a crucial absence of an in built monitoring, feedback and evaluation mechanism.

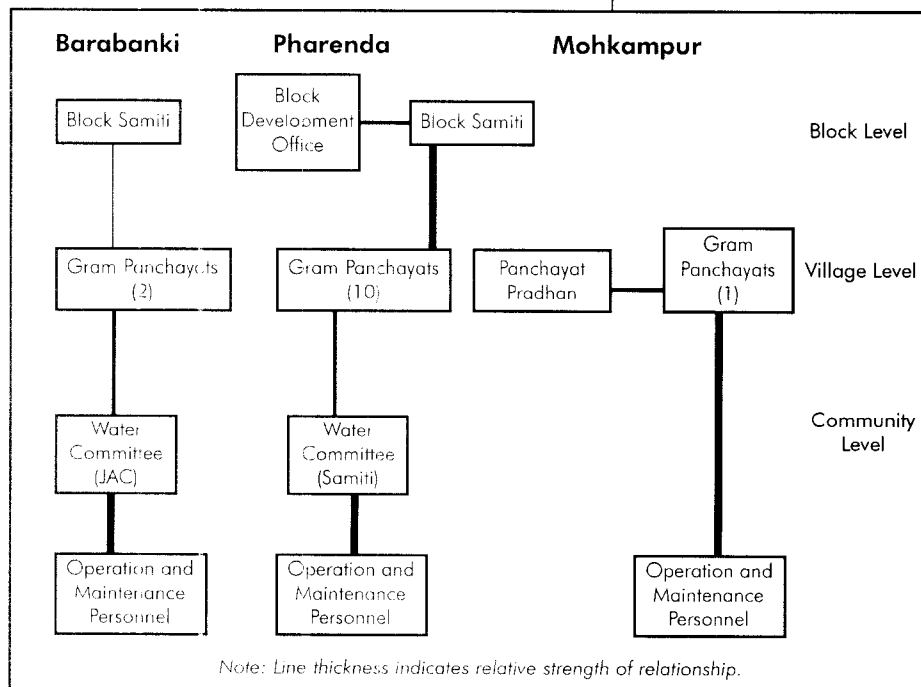
Conclusions

The experience of the schemes implemented in U.P. offers important insights for the effective implementation of rural water supply projects. Although the projects currently under implementation by the Government of India have the advantage of offering a choice of rural water supply technologies and in being demand-responsive in design, some useful lessons emerge from the earlier initiative. The U.P. project demonstrates that, given exposure to an educational program, rural communities prove capable of understanding and appreciating the health and other benefits of improved water supply. The initial success and growth of the Banki and Pharenda schemes show that rural communities behave as rational consumers. Given the reliability of service delivery, rural communities are efficiently able to evaluate alternative sources of water supply and are willing to pay higher prices for higher level of services. However, once the reliability of service delivery is undermined, people shift swiftly to more stable albeit low quality alternatives. Moreover, inconsistency and lack of continuity in government policy can seriously threaten the performance of otherwise viable schemes. Co-existence of highly subsidized schemes, such as the India Mark II handpumps, with paid alternatives

requires reassessment.

The project clearly underlines the importance of investments in basic infrastructure in affecting the outcomes of programs that have high potential health, economic and social benefits. The project also illustrates that with some support, villagers are capable of organizing themselves in administering water supply schemes. Both PRAI and LSGED offered support to the Banki scheme in its initial years and block

Figure 2: Organizational Structure of Scheme Management



²¹ This is roughly around the time when there occurred a shift in focus to the target-oriented approach at the national level.
²² introduction and promotion of an effective though heavily subsidized alternative scheme of handpumps in the early eighties as a powerful instrument of political patronage.

level institutions and LSGED assisted in the management of the Pharenda project. Once the support to the Banki scheme was withdrawn, the scheme faltered under electricity bottlenecks and multi-village conflicts. This raises issues of concern for projects currently under implementation. What

kinds of institutions are required to provide support to rural communities, to what extent and for how long should this support be offered. The U.P. schemes demonstrate the need for extended, though occasional help from an external support agency to the local operations and maintenance committees.

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The Water and Sanitation Program is an international partnership to help the poor gain sustained access to improved water supply and sanitation services. The Program's main funding partners are the governments of Australia, Belgium, Canada, Denmark, Germany, Italy, Japan, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom; the United Nations Development Programme and The World Bank.
