CHAPTER 10

KIKWARI: COMMUNITY-LED INTEGRATED WATER RESOURCE MANAGEMENT

Photograph by Monique Mikhail.

Kikwari village was chosen as a case study in Maharashtra because it is a village that encapsulates the spirit of integrated water resource management. Their creativity, innovation, and commitment to their community has allowed the villagers to protect and effectively manage the water resources available to them. Their story is truly unique, yet their success lends hope and instruction to other villages attempting to meet their multiple water needs in the dry state of Maharashtra, India. Their ability to garner financial resources from the government and propel themselves forward to become a model village is an inspiration to other villages in the state.

Much information for the case study came from interviews with IDE field staff that have worked and continue to work with Kikwari community members throughout the Jalswarajya scheme construction. Field staff had conducted a participatory rural appraisal and shared the information from that process. They had collected village demographic data from the Village Development Officer. They had also met with leader farmer Mr. Keda Barku Kakulate and spoken individually with 10 households in the tribal area and 20 households in the village settlement area. The remaining information was collected during a visit of international and national IDE staff during April 2007, during which the following meetings were held:

- Interview with Mr. Kakulate
- Interview and village tour with the another VWSC member
- Interview with a woman from the SHG farming the community land
- Interview with six of the SHG members as a group
- A discussion with a group of young men hanging out on a village street
- A discussion with a doctor in the village
- Interview with visitors from a neighboring community who had come to see the work in the village to inform their own village water work

SITUATION ANALYSIS

COMMUNITY SETTING

Location

The Kikwari village is located on the banks of the Hatti River in the Sahyadri Mountain Range in the Dang region of Nasik District in the state of Maharashtra. It is about 110 km northwest from Nasik city, the district headquarters, and 20 km from Satana, the Taluka headquarters. An all-weather road allows easy access to Satana market from the village. A forest bounds the village on one side.

Population/Demographics

According to the 2001 census, the total village population of 1,764 residents is comprised of 242 households. The farming families are mostly Maratha (upper caste). There are 4–5 Muslim households and 7–8 Dalit households (Scheduled Caste). The 60–65 tribal households are Bhilla (Scheduled Tribe). Seventy percent of the population live in the village settlement, and 30 percent live on farms located within 1–2 km from the village.

Socioeconomic Situation

About 75 percent of the families have land (172 households) and 25 percent are landless (mostly tribal). Nine percent (21 households) are farm laborers, making agriculture the primary livelihood in the village. Landholdings of the villagers are 1–10 ha. Annual income from agricultural land is INR 10,000–INR 50,000 per hectare ($220–$1,100). Some households have family members in other sectors like education, electricity supply, medicine, and engineering. The average annual family expenditure is INR 10,000–INR 20,000 ($220–$440). Food requirements, education, clothing, and health expenditures comprise 70–80 percent of total income. About 89 percent of the population is literate. There are a total of 93 households with annual income below the poverty line (about INR 20,000—$490) and 139 households with income above the poverty line.

INITIATING CONTACT WITH THE COMMUNITY

The region that Kikwari is located within is drought prone and has experienced below-average rainfall for several years. This has caused the water level in open wells to drop. Over the past ten years, the nearby river that once held adequate flow year-round only has sufficient flow during the rainy season in heavy rain years. For many of these reasons, Kikwari was selected for participation in the Jalswarajya Project, making it a candidate for inclusion in the MUS action research activity.

IDE was interested in Kikwari partially because it was near to Nasik city, the headquarters of the office in Maharashtra. IDE had also previously established good relationships with the village leader and Baglan Seva Samiti (BSS). BSS, a local NGO, is Kikwari's Support Organization (SO) for the Jalswarajya Project. But perhaps most important, Kikwari has a long history of integrated water resource management. Through the progression of various projects, the community has demonstrated a keen understanding of the concept of integrated water resource management and the need for project designs that account for multiple water uses. So not only did the IDE MUS goals and Jalswarajya Project goals overlap, but the community consciousness was well-primed to take the MUS concept and run with it in exciting new ways.

When initiating MUS efforts, IDE staff met with BSS to get information about the villages included in the Jalswarajya Project that they were working

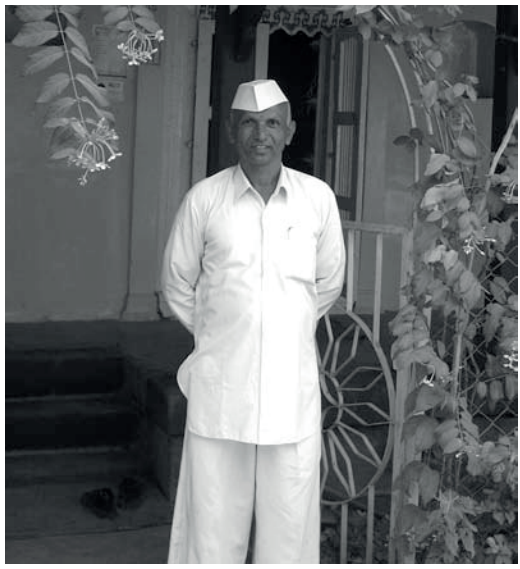
with. BSS told IDE of Kikwari's interesting water history. IDE staff then approached the Gram Panchayat (GP) members in Kikwari and the Village Development Officer who coordinates activities of the GP on behalf of the Block Development Office. IDE met with BSS to discuss potential MUS work within the Jalswarajya Project.

INTEGRATING WATER RESOURCES

The story of Kikwari's water resource management is inextricably linked with one leader farmer by the name of Mr. Keda Barku Kakulate (see Figure 10.1). Without his insight and leadership, the community would probably not be where it is today. In 1998 Mr. Kakulate heard about a group of 14 farmers who were going to Israel to learn about irrigation application for raising agricultural yields. As a wealthy farmer who was willing to experiment with new technologies, Mr. Kakulate knew that the trip to Israel would be useful to him. He had also met a farmer from a nearby town who complained that the farmers who had previously traveled to Israel never used the water resource management knowledge they gained. Mr. Kakulate vowed that he would keep his mind open and work to apply his knew knowledge when he returned from Israel.

When he came back from Israel, Mr. Kakulate used some of his new knowledge on his own fields. But then in 2001 a severe four-year drought hit the region, and the wells ran dry. They were forced to bring in tankers for

Figure 10.1 Mr. Kakulate in front of his home



Photograph by Monique Mikhail.

drinking water and had no water for their crops, negatively affecting food security for many in the village. Because Kikwari had never before faced water scarcity, Mr. Kakulate realized that something must be wrong with the way they were managing their water resources. It encouraged him to recall his water-management training in Israel and come up with viable applications for the whole village.

In 2001–2002, the government of Maharashtra initiated two different projects dealing with water resources—the Soil and Water Conservation Program and the Sanitation Campaign. Since both programs were initiated at roughly the same time, Mr. Kakulate saw the connection between the two and encouraged participation of Kikwari in both.

SOIL AND WATER CONSERVATION PROGRAM

Partly in response to the statewide drought, the government of Maharashtra instigated the *Mahatma Phule Jal Bhumi Sandharan* (Soil and Water Conservation Program) as a way to create incentives for community watershed work without direct project intervention by the state. As mentioned in chapter 9 this program encouraged villages to undertake soil and water conservation efforts on their own with the hope of winning prize money from the state if their work was deemed successful by the Program. Mr. Kakulate's visit to Israel had uniquely positioned him to work on restoring the community's watershed. The two main goals were to recharge their wells and obtain prize money from the state that they could spend on other community projects.

Mr. Kakulate motivated the village to join him in the water-conservation efforts, starting with the nearby Hatti River. In 2003 the community built 24 underground check dams along 1.5 km of the river by creating a trench (4 feet wide and 15 feet deep) and filling it with porous material. With drought still prevailing a year later, the community was unconvinced that they had actually achieved much recharge. So they decided to build another 24 trenches along the same 1.5 km stretch. Construction was completed just before the monsoon season so that the trenches would fill with silt during the monsoon floods. Luckily, in 2005 and 2006 the drought ended and they received a sizeable rainfall, recharging the groundwater.

Mr. Kakulate recognized the importance of the 7–8 streams in the village catchment with farmland all along the banks. He convinced the farmers that if they joined together for more construction work, they could better recharge their wells. He requested a portion of the prize money from the village and, in addition, collected an INR 500–INR 1,000 contribution per farmer (depending on land size). Together, they built earthen check dams across the streams with outlets leading to recharge ponds.

Energized by their efforts, the community next focused their energy on the 106-ha forest adjacent to the village. A forest committee was created to design a forest conservation plan. First, they protected the forest by banning wood cutting. Instead, farmers were encouraged to use wood from their own

Figure 10.2a Rainwater harvesting structure

Photograph by Ratnakar Pawar.

Figure 10.2b Handpump fed by rainwater

Photograph by Ratnakar Pawar.

agricultural land. Landless villagers were only allowed to take wood from dead trees, not cut from live ones. Second, animal grazing was banned in the forest. Villagers were asked to feed their animals fodder from crop waste. Those with goats were allowed to graze them at the sides of the streams, but not in the forest. These few simple forest-management changes brought about significant behavioral change. And because the whole community was involved in the Program, there was no need for policing. Everyone followed the rules the community had established. The forest committee was disbanded after these successful efforts.

The village knew that the Zilla Parishad had money available from their 12th five-year plan, so they requested funds to build two cement check dams. One was built on the Hatti River, and the other was built on a big stream that divides Kikwari from the neighboring village. To use drainage water from the rainy season for groundwater recharge, they made two small drainage canals that collected runoff from the road. They also installed a rainwater-harvesting structure (Figure 10.2a) on the primary school that filters water through a three-layer sand filter, thus recharging water to a village well with an attached hand pump (Figure 10.2b). This structure revived the previously dry well that serviced the hand pump. Now, the GP is encouraging installation of similar structures on village houses. This hand pump is largely used for the school. Villagers also use it during power cuts or when the domestic-system tank is empty.

Kikwari then sought to expand their work to the neighboring communities. A canal on the Aram River that was used in the past by the whole region had fallen into disrepair and was no longer being utilized. Kikwari organized 14 surrounding villages to work with them in repairing the canal. They collected a contribution from farmers who had land along the canal and approached a local sugar factory to give them a donation as well. With these moneys they dredged the canal.

The villagers also realized that along with groundwater recharge, they needed to use water more responsibly. Mr. Kakulate encouraged people to irrigate horticulture with drip irrigation systems instead of cultivating water-thirsty sugarcane. At the beginning there were only a few who were interested in making the shift, but now there are 60–70 farmers who have 1–2 acres of fruit trees.

Individuals were also prohibited from putting in bore wells. The village lies on volcanic rock with a shallow aquifer, an impervious layer below it, and a deep aquifer below that. The shallow aquifer can be accessed with an open well without harming the deep aquifer. But to put in a tubewell, the impervious layer is drilled through. This creates a passage from the shallow aquifer to the deep aquifer and can cause contamination of the deep aquifer. Water can also leech from the shallow aquifer to the deep one, decreasing the amount of water available for the community wells. For all of their soil and water conservation efforts they won two awards from the government.

SANT GADGE BABA VILLAGE SANITATION CAMPAIGN

At the same time as the Soil and Water Conservation Program was being promoted, the government of Maharashtra began the Sant Gadge Baba Village Sanitation Scheme. Similar to the Soil and Water Conservation Program, this campaign was meant to create incentives for community action on sanitation. It encouraged communities and schools to become involved in breaking the fecal-oral contamination chain by changing habits and behavior patterns. Activities promoted through the campaign included the construction and use of dry-pit latrines, hand washing, keeping food and water covered, using safe drinking water , and maintaining a clean environment by constructing drainage/soak pits and garbage disposal.

Before the sanitation campaign each family had its own compost pit close to its house. There were animal sheds in the village and no organized way for removing waste. To start the sanitation campaign, the villagers were encouraged to move the animals and compost pits from the village settlement out to their farms. Then, 60–70 percent of the households each made a 3 foot by 3 foot by 5 foot soak pit by their houses, which was then filled with gravel. A pipe was inserted to carry water from the bathroom and kitchen to the center of the pit. The remaining houses were connected to village gutters to remove wastewater. Due to both location of houses and cost, not all houses could be connected to the village drainage system. After this first effort, they won an INR 25,000 ($612)[1] award at the Taluka level.

The community decided to use some of the award money to continue Sanitation Campaign efforts. Every 100 feet, the drainage system was covered with chambers where the drainage was collected for solids to settle. In order to avoid problems with open drains and a disposal lagoon, Kikwari villagers agreed to establish a wastewater recycling system. The drainage water was piped to a collecting tank at the edge of the village. The drainage system is designed to avoid choking due to household debris, and, as such, connecting latrines or septic tanks to the greywater drain is not allowed. From the primary collection tank where all heavy materials settle, the greywater passes through two sand filters and is stored in a second tank (see Figure 10.3). Once this system was constructed, most households decided to connect to the village gutters using award money and stopped using their soak pits. Only 10–15 households still use the soak pits.

Every day approximately 13,000–14,000 liters of recycled water is collected. It is then used to irrigate a 1.5-acre community garden. The community decided to have GP staff cultivate the plot with custard apple and coconut and sell the produce to augment their low salaries. A second wastewater collection tank was built near the primary school. It uses the same type of recycling system and irrigates the ornamental plants around the school.

Next, the villagers established four garbage-collection sites and made the GP responsible for garbage collection. The garbage is disposed in a masonry tank where it is recycled by the Nadep method.[2] Household waste is also used

Figure 10.3 Filtration of village wastewater

Photograph by Ratnakar Pawar.

Figure 10.4 Community latrine

Photograph by Ratnakar Pawar.

for vermi-composting or organic manure. For aesthetic and health purposes, the GP sweeps the roads once a week. Each household is responsible for cleaning the area surrounding its home. Every house then constructed a dry-pit latrine. Fully 70–80 percent of the households paid for their own latrines. At this point, the village won an award of INR 500,000 ($12,240) from the district government. With this new award money and labor contribution from the families themselves, they built latrines for the poorer/lower-caste households. At the end of the year (2004), they won another INR 1,000,000 ($24,480) prize, this time from the division level, for all sanitation work they had completed. Currently, there are 218 households with their own latrines as well as eight community latrines (see Figure 10.4) and one latrine for the nursery.

They rounded out the Sanitation Campaign work with village beautifica-

Figure 10.5 Solar street lamp

Photograph by Ratnakar Pawar.

tion. All village buildings were painted pink, and trees and flowers were planted throughout the village. More award money was used to install ten solar street lamps (see Figure 10.5). Each lamp would have cost INR 26,000 ($637), but the government gave a subsidy because they chose to use solar energy. Due to 16 hours of power cuts per day in the area, the solar lamps were a way to get light without using electricity from the grid. In 2005 Kikwari received the state-level prize of INR 750,000 ($18,360) and in 2006 were awarded INR 200,000 ($4,896) from the national level.

PREVIOUS DOMESTIC WATER SYSTEM

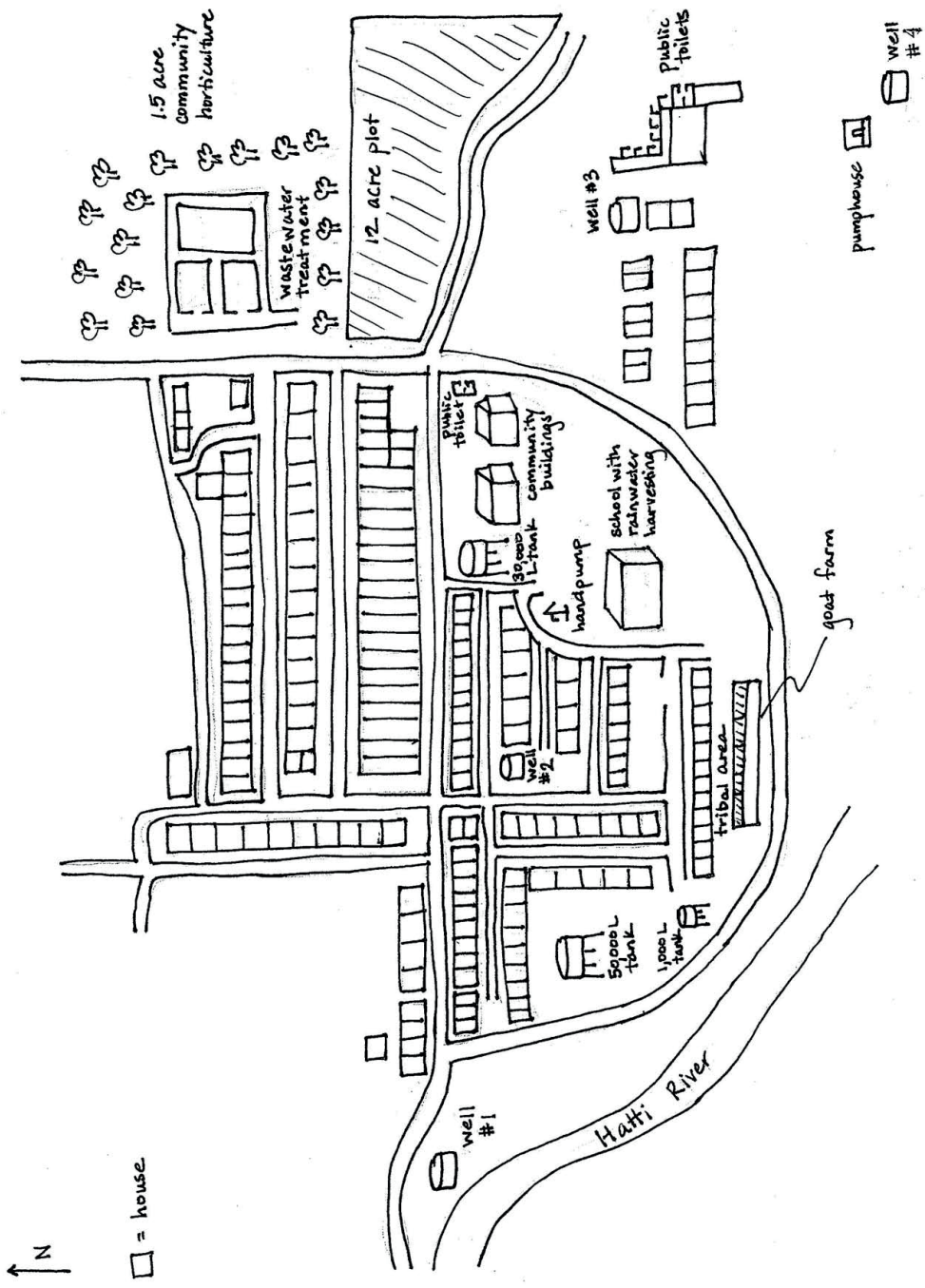
In the 1960s and 1970s Kikwari villagers used a community well that the GP had built for domestic water. At the time, the GP was also using water from the well to irrigate community land (see well #3 on Figure 10.7). Unfortunately, in 1977 this well went dry, so most households reverted to using the traditional system of narrow dug wells. At that time the water table was higher than it is today, so they were able to access water from these dug wells by using a bucket and wooden wheel. Those who did not have private dug wells used a traditional well in the center of the village.

In 1982, the first government drinking water scheme was built in Kikwari. It consisted of a stone and concrete well (90 feet deep and 20 feet in diameter) with an electric motor that pumped water to a 30,000-liter overhead tank. The water from the well (well #1 on Figure 10.7 and Figure 10.6) is pumped 650 m by a five-horsepower electric motor through a 2.5-inch steel pipe which then conveys it through a 3.5 inch PVC pipe to the overhead tank. For the past 25 years it has operated as the main drinking water source for the village, releasing water twice a day simultaneously to all households.

Figure 10.6 Old drinking water well that feeds the 30,000 liter tank

Photograph by Monique Mikhail.

Figure 10.7 Schematic of Kikwari village



Courtesy of BSS, Kikwan's Support Organization

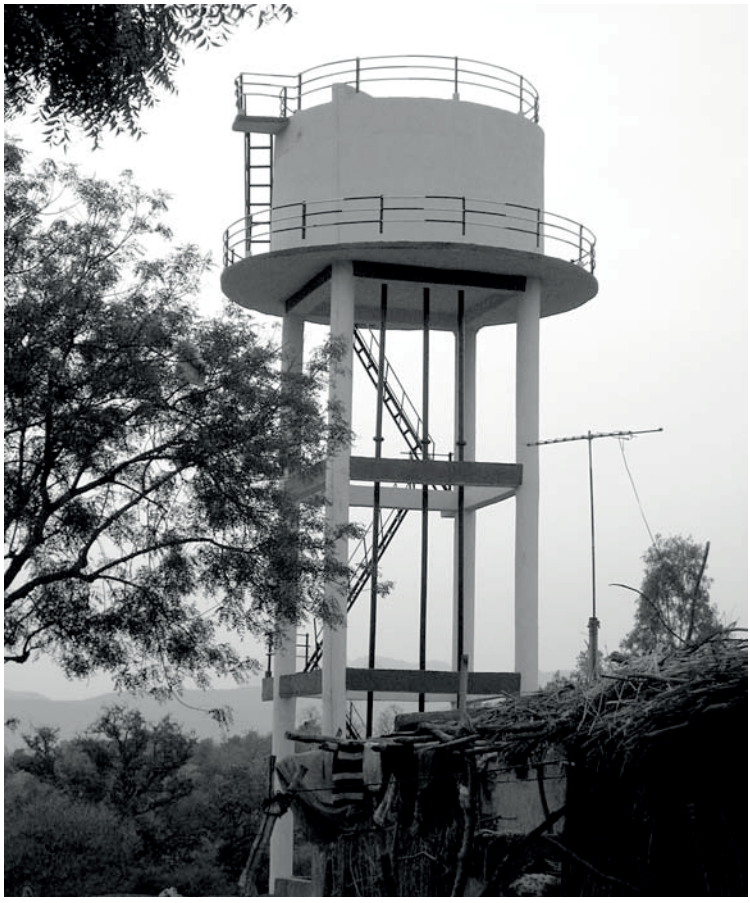
Figure 10.8a Pumphouse for new scheme

Photograph by Monique Mikhail.

When constructing the scheme, the water was tested to determine the necessary chemical treatment. One community member was trained by the Department of Health to collect a water sample during each rainy season and take it for testing at the district hospital lab. The community adds 150 g of TCL powder daily into the 30,000-liter tank. Water treatment costs are covered by the water tax fund the GP collects for service.

All residents had access to one of the eight public taps, requiring payment of a monthly maintenance fee. If a household chose, it could pay a higher sum of INR 360 per year ($8.17) for a direct connection between the main distribution line and residence. In total, 73 households are paying for pipe connections. Once the domestic water needs for the day were met, the remaining water was piped to a four-acre community plot. For private farmland, farmers used their own wells to irrigate.

Figure 10.8b 50,000 liter tank for new scheme



Photograph by Monique Mikhail.

However, community members soon realized that water distribution was very uneven. The high discharge to the private connections caused the pressure to drop and lowered the discharge from the public taps. And households that had chosen a one-inch pipe direct connection were receiving more than those that had a three-quarter-inch pipe direct connection. To get around the imbalance in distribution, some households had actually connected pumps directly to the mainline to increase their access to water. All of these inequities caused a great deal of conflict. But prior to 2000, the community was unorganized. Once they started working together on the Soil and Water Conservation Program and Sanitation Campaign, they realized that they could work together to better manage the domestic water system. Thus by 2002 the community voted to restrict the discharge from the private connections. To accomplish this change, they first adjusted the household connections by

moving them outside of each house. Then Mr. Kakulate envisioned a creative solution based on his knowledge of drip irrigation: a section of pipe at the entrance of each direct connection was replaced (originally 20–25 mm diameter) with more restrictive 8 mm tubing. The distribution time was fixed at two hours each morning and evening. Since the diameter and length of the pipes and timing of access were the same for each household, a more equitable distribution of water was established. The flow to directly connected households was reduced, and the pressure and flow to the public taps increased.

In 2000 the community realized that while the households in the village settlement all had their own water storage, tribal households did not. This made them more vulnerable to water shortages and power cuts. Therefore, the community decided to build a 100-liter storage tank in the tribal area. The overflow from the tank is directed to the old, dry community well (well #3 on Figure 10.7) to recharge groundwater. An extra hand pump for the tribal area was also installed as backup when the tank was empty.

THE JALSWARAJYA PROJECT

By the time the Jalswarajya Project was begun in Nasik in 2005, Kikwari was already heavily involved in their water resource management and sanitation activities. Considering that ensuring sufficient drinking water was the instigating factor for their incredible work thus far, they were no less interested in obtaining a new drinking water project from the state to augment their previous system. Although the Jalswarajya project is designed to supply only drinking water , Kikwari is creatively combining the previous drinking water system with the Jalswarajya scheme to cover both their drinking and productive-use needs.

When the Jalswarajya Project started, the Village Development Officer (VDO) received information about Jalswarajya from the Block Development Officer. The VDO passed this information to the GP, who explained the requirements and application procedure to the villagers. In their application they explained that while their water resource work had strengthened the groundwater supply, the existing well and overhead tank were still insufficient for their needs. They still suffered scarcity in times of drought. Since sanitation work and water source strengthening work are prerequisites for receiving a Jalswarajya project, and Kikwari had been so successful at both, they were quickly selected to receive a project.

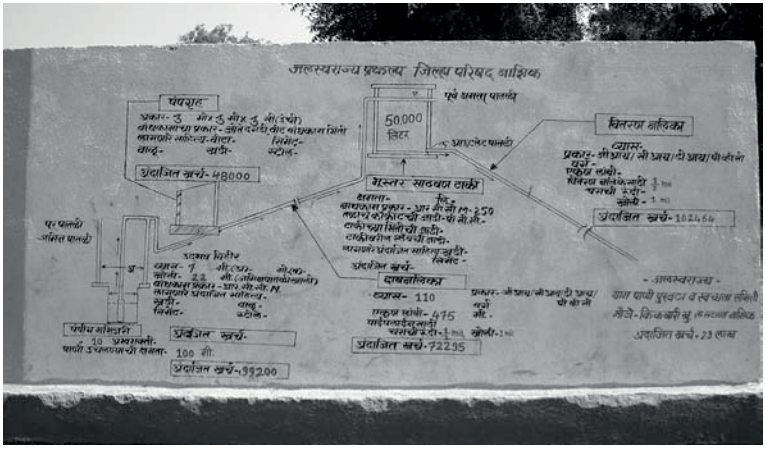
Once they were selected, the Jalswarajya Project gave the GP committee training on how to select a local NGO to be their support organization (SO) and technical service provider (TSP) to design the system. They also had to select a contractor to actually build the water system that the TSP designed. The SO, TSP, and contractor were chosen from a predetermined Project list. Four local NGOs came to the village and pitched their organizations to the villagers. They explained the kind of support they could provide to the com-

munity. Kikwari selected Baglan Seva Samiti (BSS) largely because of their proximity to the village.

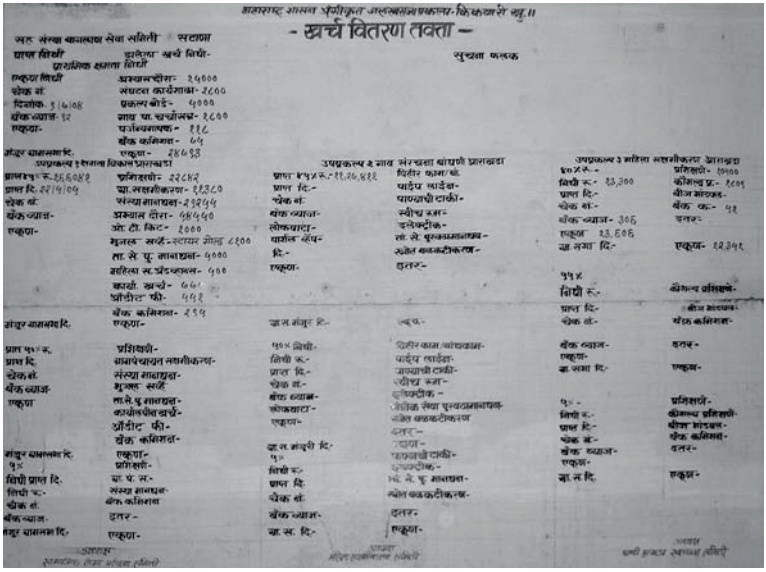
BSS first performed a participatory rural appraisal. The community delineated their current water system and explained their need for the future system. Second, BSS also worked with the community to form the three designated committees—Village Water Supply and Sanitation Committee (VWSC), Women Empowerment Committee (WEC), and Social Audit Committee (SAC) (all described in chapter 9). Third, BSS helped the VWSC negotiate terms with the TSP and contractor of the water scheme.

Figure 10.9a (Top) Water balance drawn on building wall

Figure 10.9b (Bottom) Scheme budget information with expenditures



Photograph by Monique Mikhail.



Photograph by Monique Mikhail.

Finally, BSS gave the results of the participatory rural appraisal to the TSP. The TSP then surveyed the village and surrounding area to plan the scheme: how the pipelines should be distributed, the overhead-tank capacity needed, etc. In order to determine the tank capacity required, the TSP took the projected 20-year village population and multiplied by 40 liters/capita/day. Assuming that the tank would fill twice per day, the tank design most suited to the need was selected from a preset Project list.

For Kikwari, the TSP selected to build a new 50,000-liter tank (Figure 10.8b), a new 30-m deep well (well #4 in Figure 10.7), and pumphouse (Figure 10.8a/Plate 16) to supplement their existing drinking water system. Water will be pumped from the new well through 600 m of PVC pipe to the new 50,000-liter tank. Each household in Kikwari will receive a direct household connection with a 10 mm offtake (see Figure 10.11) from the new tank. Water will be distributed to each of the five designated village zones equally on a timed rotation. The community could have chosen to use their preexisting distribution system for water from both tanks. However, the previous drinking water system was already 25 years old and the pipes sometimes leak. The additional volume of water would place undue stress on the old distribution network. Since they were offered a new distribution system with direct connections as part of the Jalswarajya Project, they thought that they would lose less water through leakage from the new system and prevent the need for constant repairs.

In order to save water, they are installing an automatic switch to stop the pump once the tank is full and fitting each household connection with a press tap (it must be pressed in order to release water, thereby preventing leakage and waste). And to protect their water sources, they are planning to cover all wells to keep out rainwater runoff and other contaminants. As part of Jalswarajya requirements, Kikwari was required to collect 10 percent of the project costs in cash and labor contribution from villagers. Group members call BSS on an as-needed basis, usually to assist in documentation of the scheme progress.

The total cost of the Kikwari project was projected to be INR 2,803,460 ($70,086) on completion. Therefore, the per capita cost will be INR 1,580 ($39). For operation and maintenance costs, the community decided to charge INR 75 ($1.80)/capita/year for wealthy and middle-income members and INR 60 ($1.50)/capita/year for low-income members. They have not yet planned the water-treatment regimen for the new tank. As a way to create transparency in the project, the water balance and expenditures are written on the wall of a public building in town. These can be seen in Figures 10.9a and 10.9b.

INCORPORATING MUS

When IDE began working on MUS in Maharashtra, one of the first steps was to determine which communities were already using systems as de facto

MUS. Staff had heard about Kikwari and their exemplary Soil and Water Conservation Program and Sanitation Campaign work and were interested in establishing a relationship with the village. IDE staff requested information about Kikwari from BSS during their participatory rural appraisal activities to determine whether or not Kikwari might be a good village to approach for MUS. Staff visited the village and met with Mr. Kakulate, the GP chairman, the Village Development Officer, and other villagers. Ultimately IDE staff determined that with Kikwari's water resource management history and willingness to try new technologies and approaches, the village would be a perfect fit for adding a MUS component to their Jalswarajya scheme.

To initiate MUS work in Kikwari, IDE staff first met with the whole VWSC and other villagers in January 2005 to introduce the concept of MUS and assess community interest in establishing kitchen gardens with drip irrigation kits. They discussed the advantages of the irrigation kits, instructions for use, care and maintenance, and the cost of the kits, and they demonstrated their use. The community displayed keen interest in introducing this component along with their other work. They reasoned that with the addition of the new infrastructure, there would be sufficient water for fulfilling their domestic needs, and additional water could be used for productive purposes.

In the three months following this initial meeting, IDE staff visited Kikwari twice a month to attend VWSC meetings, discuss the progress of the Jalswarajya scheme, and plan for the MUS component. As part of the plan, they determined the number of households that would have space for a kitchen garden, how much community land they wanted to irrigate, and the number of livestock they needed to water. In Kikwari most of the houses are very close to one another, so space for kitchen gardens is limited. However, due to the very small space and water requirements of IDE's kitchen garden kits (20 m^2), 150 households are installing kitchen gardens.

As the Jalswarajya project progressed, BSS worked with women to form five Self-Help Groups (SHGs) in the village, teaching them how to keep bank-account records. One SHG is much more active than the other four[3], and in 2004 the GP contracted out four acres of community land to them for INR 9,000. The SHG cultivated wheat and earned a net income of INR 12,000 ($294). Due to this success, the SHG again leased the land in 2005, choosing to grow sugarcane instead of wheat because of the higher returns. This gave them a net return of INR 105,000 ($2,574) for the group. In 2006, they again grew sugarcane with a similar return. In 2007 the GP decided to lease the SHG eight more acres of community land, for a total of INR 65,000 for all twelve acres. The group shifted the four previous acres to growing pearl millet in the *kharif* (winter) season and wheat/maize in the *rabi* (summer) season. They then planted the eight new acres with sugarcane (see Plate 17). To irrigate this additional community land, the community used some of the award money to build a separate pipeline to the fields from well #1. And with the source-strengthening activities in the village and the return of heavy rains,

Figure 10.10a Tribal area with goat farm

Photograph by Monique Mikhail.

Figure 10.10b Tribal families tending goats

Photograph by Monique Mikhail.

there is enough water in the existing well to use excess water to flood irrigate these plots. Despite the availability of sufficient water for flood irrigation, the community wishes to conserve water. Thus, the SHG is now planning to drip irrigate the community plots

One other SHG is starting to become more active, and in January 2007 the women began a catering business for the five nursery schools and one K–7 school in Kikwari. They use excess water from the 30,000-liter tank for their business and are receiving payment from the Zilla Parishad for this work.

Again, the community recognized the relative poverty of the 12 tribal households and drafted a plan to increase their income. Households that own their own farm generally keep livestock at the farm, but tribal households do not have their own farms. Therefore, the GP constructed a goat farm near

Figure 10.11 Two different household connections with the new scheme

Photograph by Monique Mikhail.

the tribal households (just outside the village settlement) where they keep mostly goats, but also cattle (see Figures 10.10b /Plate 18). These households keep their own goats and are paid to look after the goats of some non-tribal households. The manure is composted and sold as fertilizer to farmers. Previously, the drinking water supply was not ample enough to water their livestock, so they either used a portion of their household water or used river water. Now that the new system has just been completed, they receive water for their goat farm from the previous drinking water system's 30,000-liter tank.

Now that the new drinking water scheme has just been finished, the community uses the new 50,000-liter tank and well for drinking and other domestic purposes. The old drinking water system's 30,000-liter tank is used

Figure 10.12 Community tree planting

Photograph by Ratnakar Pawar.

to supply all productive needs including village plants, the community plots, the goat farm, and other activities. Households that have space are just now beginning to install backyard kitchen gardens with drip irrigation kits. The productive-use water is distributed through the old pipelines. The 8 mm tubes the irrigation offtakes at each household for their kitchen gardens (see Figure 10.11). This is in essence creating two separate water supply systems for each household: the new system is used for domestic purpose, while the preexisting system is used for productive use like kitchen gardening, horticultural plants, and flowers near the houses. And although there are already some fruit and nut trees and flowers planted (Figure 10.12) along village streets, more are planned. The community will irrigate these plants with drip as well, and the produce will be consumed by all community members. If any household is found to be using water in excess of their allotment by the VWSC for productive use, the VWSC will decide whether this use is acceptable and, if so, what to charge the household for the extra supply.

OUTCOMES

Considering that the system construction has just been completed and MUS activities are still underway, it is impossible to provide outcomes specifically from MUS at this time. However, villagers expressed outcomes and impressions from all of the village efforts over the past several years, which have relevance to MUS. In general, previous successes have raised community morale and encouraged continual improvement of the village through innovative water-management efforts.

IMPROVED HEALTH

According to a group of about ten young men who were standing on a village street during the April visit, the main benefit in the village was a decrease in disease. A village doctor echoed their sentiments by stating that he'd seen a decrease in disease outbreak in the village over the past five years. He declared that malaria had decreased because of fewer mosquito-breeding opportunities. Tuberculosis and bronchitis cases have also diminished. A decrease in the number of flies was also reported. One of the members of the SHG that is farming community land explained that there was a Chikungunya[4] disease outbreak last year in the whole region. Although residents of several neighboring villages fell ill, not a single person in Kikwari got sick. She believes that they were not susceptible to the disease because of their high level of base health. However, it is also likely due to the decreased number of mosquitoes. The use of direct household connections instead of public taps,[5] the new drainage system and wastewater treatment have all helped bring about this decrease.

INCREASED CONFIDENCE FOR WOMEN

The six female members of the SHG who are farming community land declared that working with the SHG has given them confidence. They feel that by working together, they can accomplish more. This feeling has motivated them to become more active in their community in general. They are enthusiastically beginning new projects together and strengthening the group.

RAISED COMMUNITY PROFILE

Through all of their efforts, Kikwari has become well-known in the area as a model village for water resource management. This has had a positive effect on the morale of the community. The pride they feel in their village only motivates them to initiate new community projects, building on the momentum of past development. While taking a tour through the village, IDE staff met with visitors from a neighboring community who had come to see the work in Kikwari to inform their own village water work. They were impressed with all the village had done and wanted to emulate their success.

CONCLUSIONS

The clearest lesson that comes through the Kikwari case is the importance of a lead figure in mobilizing a community to take control of managing their resources in a creative way. Without the ingenuity and passion of Mr. Kakulate, Kikwari would be a very different place today.

But even with all of the village improvements, the stratification of the village has not completely changed. There is still evident disparity between

Figure 10.13 Self help group member flood irrigating the sugar cane plot

Photograph by Monique Mikhail.

the tribal households who are the most disadvantaged and other villagers. Although water resource efforts have clearly helped all Kikwari residents through public-health improvements and productive-use possibilities, the efforts appear not to have addressed the residents' economic inequality in any significant way. However, all of the tribal households as well as many others are installing and beginning to cultivate kitchen gardens with drip irrigation near their homes. Perhaps once the kitchen gardens are operational, it will help some of those with less access to land raise their income.

Despite some efforts to shift toward horticulture and use microirrigation, the importance of shifting away from cultivating water-intensive crops seems not to outweigh the economic drivers. Despite the severe drought a few years back and the extraordinary efforts at groundwater recharge, there has not been much of a shift in crop cultivation: sugarcane remains the major cash crops. Although the women grew wheat on the community plot in their first year, they quickly shifted to sugarcane once they knew that the water was avail-

able (see Figure 10.13). There are many factors that encourage sugarcane cultivation. Not only do the people already know how to grow it, but they receive much higher profits than from other crops. Lack of readily available farm labor in the area is another limiting factor. The young men in the village do not want to farm, and all others are already farming. The women's SHG said that they contract with the local sugar factory before harvest. The factory sends a harvesting team, pays the SHG for their product, and takes it away to process it. This not only helps eliminate their need for additional labor and transport, but it reduces the risk of not being able to sell the full crop. Unfortunately, sugarcane is an extremely water-thirsty crop. The fact that they are cultivating it despite recent water problems indicates that there is inadequate community water budgeting, insufficient incentives for judicious use of groundwater, and no penalties for excessive use. This may have been due to a lack of knowledge transfer from BSS, whose responsibility it was to train them in water conservation. Unfortunately Jalswarajya does not pay SOs well[6], and their income is often not enough to pay for the transportation required for frequent visits to the community. Although Kikwari was very organized and seemed not to need the assistance of their SO as much as other communities with Jalswarajya schemes, it may have hurt them to some extent. Or community members may feel that water is no longer a problem due to recent water abundance and the Jalswarajya scheme. Ultimately, the shift to less-water-intensive crops must be encouraged from the state government level. Currently the incentives to grow sugarcane are too high for many to resist.

Another issue that Kikwari needs to address is water treatment. It may not be cost effective for them to treat productive-use water. If the 30,000-liter tank is used solely for productive uses, treatment for that tank will not be necessary. However, if future population growth necessitates combining some of the water from the old system with the new Jalswarajya scheme for domestic uses, treatment will need to be resumed. The VWSC should create a plan for water testing and treatment.

Kikwari is an excellent example of a community that integrated its water-use needs on their own and used several limited government programs to overcome scarcity and achieve community water-use goals. Although the Jalswarajya project did not specifically include productive-use water in its plan, Kikwari was able to combine it with its existing system to allot water for each need, using one tank for domestic water and the other for productive use.

Due to severe water scarcity in certain years, Kikwari must plan allocation among various uses, mobilize resources from several sources, and utilize water efficiently (like the use of greywater for community agriculture). Through working together, they gained consensus among all users to equalize distribution and incorporate all users' needs. Although neighboring communities will need to devise their own strategies for their own unique water resource situations, the greatest lesson they can learn from Kikwari is that community mobilization, cooperation, adaptation, and innovation are needed to achieve the desired water-management results.