

# **WATER GOVERNANCE**

## **A Case Study of Tawa Irrigation System**



**Society for Promotion of  
Wasteland Development**

**Towards Action And  
Learning**

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**Chitra Khanna & Amod Khanna  
Towards Action And Learning**

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## Abbreviations

|         |   |
|---------|---|
| AE      | Assistant Engineer  |
| CCA     | Culturable Command Area                                   |
| CE      | Chief Engineer  |
| crs     | Crores  |
| DC      | Distributory Committee                                    |
| DLWUC   | Divisional Level Water Utilization Committee              |
| EE      | Executive Engineer  |
| ha      | Hectare   |
| kms     | Kilometer   |
| LBC     | Left Bank Canal   |
| m       | Meter   |
| mm      | Millimeter  |
| MCM     | Million Cubic Meter                                       |
| MGNREGS | Mahatma Gandhi National Rural Employment Guarantee Scheme |
| MP      | Madhya Pradesh  |
| MW      | Mega Watt   |
| NGO     | Non Government Organization                               |
| O&M     | Operations and Maintenance                                |
| PC      | Project Committee   |
| PIM     | Participatory Irrigation Management                       |
| RBA     | Right Bank Canal  |
| SDO     | Sub Division Officer                                      |
| SE      | Superintending Engineer                                   |
| sq      | square  |
| TC      | Territorial Constituency                                  |
| UNDP    | United Nations Development Programme                      |
| WRD     | Water Resource Department                                 |
| WUA     | Water User's Association                                  |

# 1. Tawa River System

The Tawa river rises in the Mahadeo hills of the Satpura range in Chhindwara district of Madhya Pradesh near Cherkathri village at an elevation of 900 m. The river flows in the westerly direction for a length about 68 kms up to Golai village in Betul district. Beyond this it runs for 60 kms north and is joined by its tributary Denwa. The river then enters a wide gorge that is 4 kms in length. Whereupon it emerges from the gorge it widens itself and flows through the plains for a length of 39 kms up-stream of Hoshangabad. The total length of the river is 172 kms before it joins Narmada from the left at Bandarabhan north east of Hoshangabad.

The Tawa drains a wide watershed and has numerous tributaries of which Sukhtawa, Gurugugaon and Malni are considerable streams. Its most affluent tributary is Denwa which rises in the eastern slopes of the Panchmarhi hills and after descending in northwesterly direction turns west and flows down the parallel ridges of the Satpuras to meet Tawa just before it quits the jungle. Denwa as a tributary of Tawa is equal in volume to its main river.

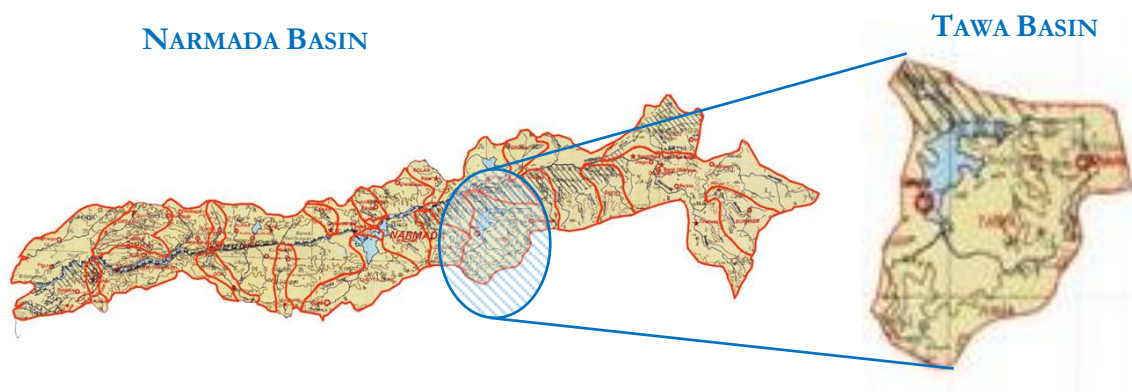
Tawa till it meets Denwa flows through hilly and thick forest area. Denwa drains water from Pachmarhi and Tamia area which have the heaviest rainfall in the entire Narmada basin. Tawa river drains a total area of 6333 sq kms.

## Box 1 NARMADA BASIN

Narmada basin is spread over an area of 98796 sq kms. It is bound by the hill ranges of the Vindhyas in the north, Maikal in the east, Satpuras in the south and by the Arabian Sea in the west. Most of the basin area is at an elevation of less than 500 m with a small area near Pachmarhi at a height of 1000 m.

The climate of the basin is humid tropical that ranges from sub-humid in the east to semi-arid in the west with pockets of humid climates around higher hill reaches. The annual rainfall of the basin is 1178 mm which is mostly fed by the south west monsoon and accounts for 94% of the annual rainfall. The mean annual temperature of the basin varies from 17.5-20°C during winters and from 30-32.5°C during summers.

The surface water potential of the Narmada river system was assessed to be 49241 MCM in 1949 (Khosla formula) and at 44331 MCM in 1965 by the Narmada Water Resources Development Committee set up by Government of India. The 75% dependable flow has been assessed by the Narmada Water Disputes Tribunal at 34537 MCM.



## 2. Tawa Irrigation Scheme

### 2.1 Need for River Valley Development

**Flood Control:** The river Narmada as it runs through the Broach district of the then Bombay state generally over flowed its banks causing damage to country side due to floods. This fact prompted the Government of Bombay and the Government of Madhya Pradesh to investigate for basin wide development of the river with flood control as one its major objectives. However, as the investigations commenced the objectives of irrigation, power generation and navigations were also added as the purpose of investigations.

The investigations on the Narmada basin revealed that good storage sites existed on the main river Narmada as well as its tributaries where by constructing dams of medium height can lead to development of reservoirs that can hold excessive precipitation during monsoon months. This water can be utilized for irrigation, power generation, fish culture and domestic use in the entire basin.

The floods in Bharuch were proposed to be controlled by reserving water in the upper portion of the basin. Seven such sites were identified at main river and tributaries where water could be stored to control floods at Bharuch. These seven sites were further studied for irrigation, power generation and navigation purposes.

**Grow More Food Campaign:** The successes and failures of the Grow More Food Campaign had highlighted the need for long term investment in the country that is able to bring increased area under irrigated agriculture and thus promote double cropping systems on a large scale.

Early investigations of the Narmada had led to identification of two prominent areas that were found to be suitable for agriculture. The first was in the plains lying in Jabalpur, Narsimhapur and Hoshangabad districts and the second in the plains lying in the Baroda and Bharuch districts of Bombay state. The first area was further split in to the upper portion which could be irrigated by the dam at Bargi which would take care

of the plains at Jabalpur and Narsimhapur and the other dam at Tawa river which would irrigate the Hoshangabad district. With dams in the upper reaches of the Narmada basin there would be regulated flow in Baroda-Bharuch plains which could be fed with a pick up wier and a system of canals for irrigation purposes.

### Box 2 Grow More Food

As the war with Japan became imminent the Government of India realized in December 1941 that it could no longer rely on Burma rice to supplement the country's food supply. The Advisory Board of Imperial Council of Agriculture Research recommended that India should *grow more food* herself. In April 1942, Food Production Conference recommended *inter alia* 'an increase in the area under food and fodder crops by bringing new lands under cultivation and by double cropping... and an increase in the supply of water for irrigation by improvement and extension of existing irrigation canals.' Though the campaign was a short term expedient primarily to meet war time exigencies it was also planning for long term increase in India's food production. One of the important factors that was considered during this time was implementation of large scale irrigation schemes to sustain increased agriculture production.



The seven sites identified during the investigations in Narmada were submitted to an ad hoc committee appointed by the Government of India for scrutinizing the proposals. On the recommendation of the Committee only those proposals were taken up that were found to be most promising in terms of fulfilling the objectives of the Grow More Food Campaign. Accordingly four sites were given the highest priority, namely Bargi, Tawa, Dudhi and Bharuch. Subsequently detailed investigations on the four projects were started in 1948.

## 2.2 Structural Details

Tawa dam site is located 27 chains downstream of the junction of Tawa and Denwa river. Though a multipurpose dam, Tawa is primarily an irrigation project. The project was initially designed to irrigate 2.43 lakh hac and generate 22 MW power at the cost of Rs 13.95 crs for irrigation and Rs 4.39 crs for power generation aggregating a sum of Rs 18.34 crs. The project received administrative approval in 1956.

The cost of the project was revised to Rs 34.14 crs in 1967 and later on to Rs 94.12 crs in 1979 and finally to Rs 142 crs in 1997 when the project was formally completed irrigating an area of 2.47 lakh hac. Handia branch canal was approved that increased the cost of the project to Rs170.56 crs and the total irrigated area to 2.56 lakh hac.

### Dam Data

|                    |         |
|--------------------|---------|
| Type of Dam        | Masonry |
| Height of Dam      | 57.91 m |
| Top Width          | 8.63 m  |
| Length of Dam      | 1815 m  |
| Type of Crest Gate | Radial  |

### Reservoir Data

|                      |          |
|----------------------|----------|
| Top Bund Level       | 359.66 m |
| Maximum Water Level  | 356.69 m |
| Full Reservoir Level | 355.39 m |
| Spillway Crest Level | 343.21 m |
| Dead Storage Level   | 334.24 m |

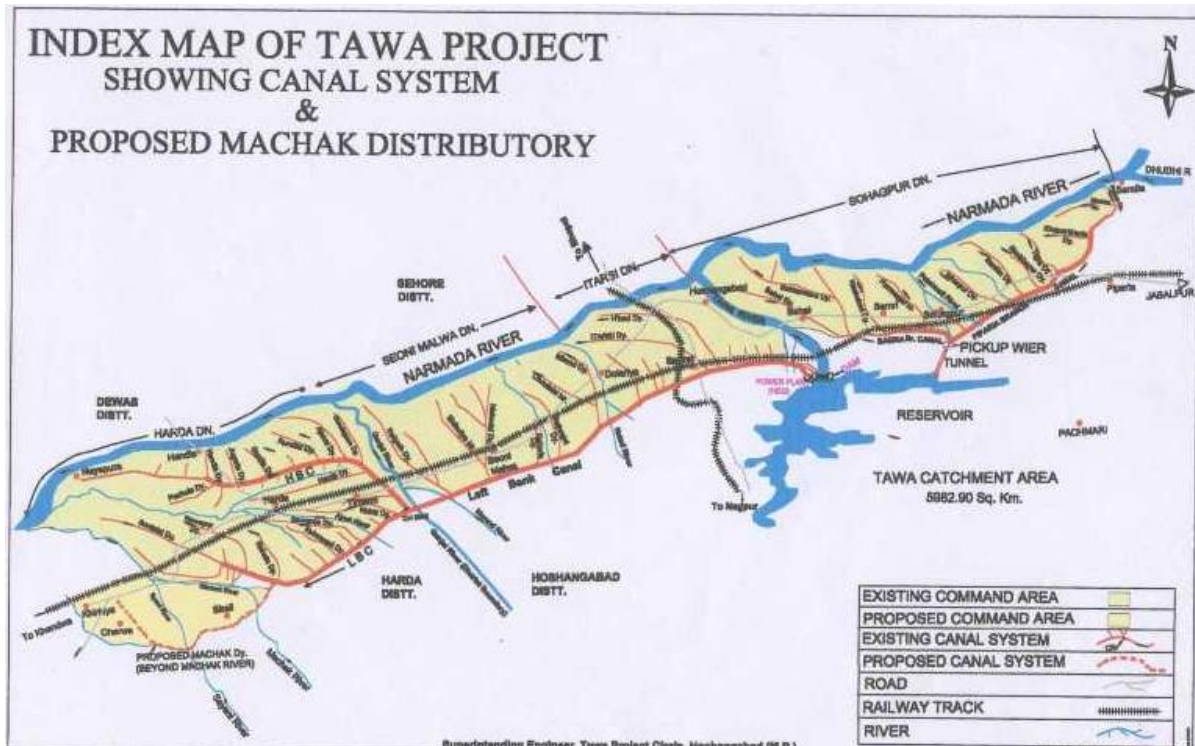
**Distribution System:** The Left Bank Canal is 185.5 kms with a head discharge of 103.6 cumecs. The bed slope varies from 1:2500 to 1:9000 with a free board of 1.2 m in the head and 0.45 in the tail region. The canal is mostly unlined earthen canal with lining being in the first 6 kms and in approaches to major structures. The Right Bank Canal commences from the fringes of the reservoir through a tunnel of 3.81 m dia. The water is led by 2.79 km long exit channel in to Longa nallah in to the pickup weir. Pipariya (58.50 kms) and Bagra (23.25 km) branch canals take off from the banks of this pick up weir. The head discharge of these canals is 13.73 cumecs and 13.34 cumecs respectively.

| Distribution System |                |        |         |
|---------------------|----------------|--------|---------|
|                     | Distributaries | Minors | Length  |
| LBC                 | 108            | 584    | 1947 km |
| RBC                 | 28             |        | 418 km  |

Standing wave flumes have been constructed to measure discharge above 1.5 cumecs

1.90 lakh hac (76% of command area) with field channels and water courses.

The design of the scheme did not contemplate irrigation by lift. But as the water reached different areas in the command, private lifts were installed and water from canals was taken by the farmers (7500 hac). Patches on LBC and RBC were identified where culturable area is at a higher elevation. Two lift schemes were sanctioned, namely, Kamthi and Jamani together covering an area of 5496 hac.



### 2.3 Irrigation Potential and Utilized

Irrigation in Tawa scheme was started in 1974-75 with irrigation of 1.09 thousand hectares in rabi season. Since then the annual irrigation has grown to 3.33 lakh hectares. However the year wise data is available till 2002-03 that is plotted in Figure 1 below.

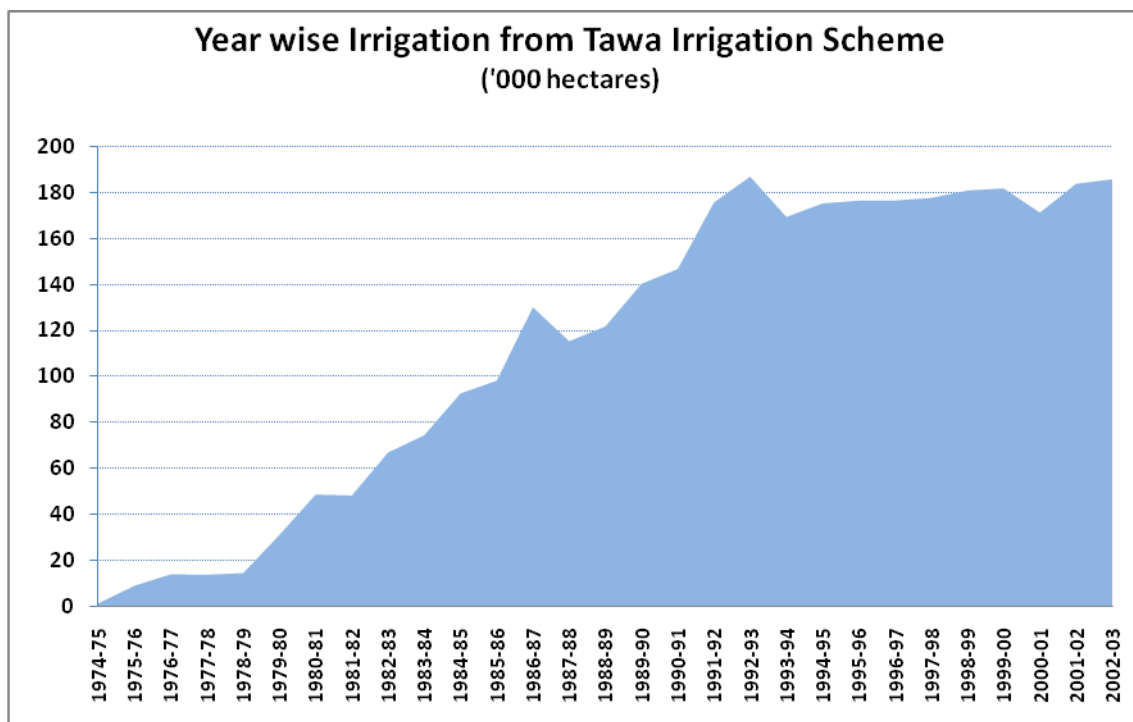


Figure 1 Year wise Area Irrigated in Tawa Scheme



There are three distinct phases when the irrigated area under the scheme underwent major change. The first phase is from 1974-75 to 1986-87 when the irrigated area increased every year and crossed 100 thousand hectare. During this period there was only one year of negative growth (1981-82) when the irrigated area decreased by 0.76% and then again it picked up the next year and then continued to grow.

The second phase of irrigation is from 1987-88 to 2002-03 when the area increased and plateau above 175 hectares. During this phase there were three years when there area under irrigation decreased but remained above the level of 175 hectares that was reached in 1992-93.

The third phase of irrigation is post 2002-03 when the area under irrigation increased beyond 200 thousand hectares since then. At present the Culturable Command Area of Tawa irrigation system is 2.47 lakh hectares of which 1.86 lakh hectare (or 75% of the total CCA) lie in the area irrigated by the left bank canal system and 0.61 lakh hectare is irrigated by the right bank canal system.



**Photo 1 State of a Fall in the distributory at Tawa**

The irrigation intensity is 138% in the Left Bank Canal area and 125% in the Right Bank Canal system. In case of former summer crops are taken in about 4% of the area (7448 ha) where as no



**Photo 2 Village Road Bridge across Main Tawa Canal**

summer crop is taken in the right bank canal system. The annual irrigated area from the irrigation system is 3.33 lakh hectares.

#### *2.4 Institutional Arrangement*

The institutional arrangement for the Tawa Irrigation Scheme includes the institutions that are involved in the decision making process related to the water distribution and management as well as the decision related to O&M of the canal infrastructure. The three critical institutions at Tawa are as follows.

**Divisional Level Water Utilization Committee:** For major projects in the state a DLWUC is formed comprising of the Divisional Commissioner as the Chairperson and Superintending Engineer Water Resources (Territorial) as the Member Secretary of the Committee. The other members of the Committee are the Superintending Engineer of the concerned project and Executive Engineer (in charge of the project) from Water Resource department; and Joint Director and Deputy Agriculture; along with the Collectors of the districts in which project is located.

The Committee is expected to assess water in storage/diversions that needs to be carried over to the next crop; determine the area that needs to be brought under irrigation; develop operational programme of canals- their opening/closing and frequency of watering; minimize conveyance losses; ensure conjunctive use of surface and ground water; and optimize use of available water by selecting suitable crops for the command area.

Tawa Irrigation Scheme runs across the two districts of Hoshangabad and Harda. The District Collectors of both these districts along with the Divisional Commissioner of the Hoshangabad and the representatives of the Water Resources and Agriculture Department constitute DLWU Committee that takes critical decisions related to water distribution (how much water to be released, when to release and so on).

**Water Resources Department:** The administrative unit of Water Resource Department is the Circle. In case of Tawa Hoshangabad Circle represents the administrative unit headed by a Superintendent Engineer posted and stationed at Hoshangabad. The executive unit is the Divisions in charge of an Executive Engineer responsible for execution and management of works within the division. At Tawa there are four Divisions of which one is located on the Right Bank Canal at Suhagpur and the other three are located on the Left Bank Canal at Itarsi, Seoni Malwa and Harda. Each of these Divisions is further sub divided in to Sub Divisions that shall be in charge of an Assistant Engineer designated as Sub Divisional Officer. In Tawa there are 15 such sub-divisions (Itarsi- 4; Seoni Malwa- 4, Harda- 5, and Suhagpur- 2). A sub division is further sub divided in Sections that are placed in charge of Sub Engineers respectively.



**Water Users Association:** According to the Participatory Irrigation Management Act for Madhya Pradesh there should be a Project Committee at the project level and Distributory Committees at the distributory levels. At the time of the study none of these committees had been constituted in the Tawa Irrigation project. There were, however, 131 Water User Associations that had been formed and were functioning in the project.



**Photo 3 Sontalai WUA Meeting**



**Photo 4 State of Pahanvarri Distributory on the day of water release in Main canal**

### 3. Water Governance

UNDP defines water governance as the *range of political, social, economical and administrative systems that are in place to develop and manage water resources and the delivery of water services at different levels of the society*. The definition is comprehensive as it includes policies, laws, regulations and their enforcement mechanisms that directly or indirectly affect the availability of water as a resource and as an economic good. Further it also incorporates normative issues related to that of equity, participation, transparency, accountability and responsiveness as commonly accepted principles of good governance that are critical for equity in water distribution among different users, geographies and social classes.

The issue of water governance as the subject of study is in its early stages of development. The present study therefore relied more on the exploratory methodology that is based on discussions with different stakeholders identifying and articulating the issue and deepening it by further explorations. The ensuing section details this journey of exploration within the overall framework of water governance.

#### 3.1 Legal Framework

There are two acts that are applicable for irrigation management in the state is Madhya Pradesh Irrigation Act, 1931 and the Madhya Pradesh Sinchai Prabandhan Me Krishakon Ki Bhagidari Adhiniyam, 1999 (*referred to as the PIM Act*). In addition the Madhya Pradesh Works Department Manual (Vol I and II), 1983 and the Technical Circulars for Irrigation Works issued from time to time constitute the legal framework within which the water governance related to irrigation in the state is carried out.

**Madhya Pradesh Irrigation Act, 1931:** The act vests **all rights** in the water of any river, natural stream or natural drainage channel, natural lake or other natural collection of water to the Government. The act is comprehensive in that it empowers the state government to appoint canal officers to manage the functioning of the canal, it's up keep and collection of revenue from irrigation; creates an enabling provisions for the government to enter in to agreements with permanent holders/occupiers of land for the supply of water for irrigation; fixing of rates for irrigation; and construction and maintenance of canals/field channels. Judicial powers are also conferred to canal officers on irrigated related crimes and their power to levy and enforce penalties on defaulters of irrigation revenue.

The act also provides for the formation of Irrigation Panchayats for every village or *chak* for a group of villages in the command area of the canal. The Irrigation Panchayats are headed by a Sarpanch. The Sarpanch and Panch of these Panchayats are directly elected by the permanent land holders and occupiers of the land from and amongst themselves. These Panchayats *shall assist*<sup>1</sup> the irrigation department in arranging of water course in recording and checking irrigation, and in making measurements and settling disputes. The act also empowers the irrigation

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<sup>1</sup> Sec 62 (2) (b) of the MP Irrigation Act, 1931 states *Irrigation Panchayats shall assist the officers of the irrigation department...*

panchayats to collect irrigation revenue and remit it to the treasury and arrange for the repair of water course.

The lack of seriousness on part of government towards Irrigation Panchayats is reflected in the fact that till 1982 rules for the formation and election of these panchayats had not been framed. In 1982 with the framing of election rules, orders were issued for the election and formation of Irrigation Panchayats in the state. By 1984-85, a number of Irrigation Panchayats were constituted but soon there arose confusion regarding their functions, roles, duties and powers. The powers to the Irrigation Panchayats were notional as the operative phrase was '*to assist the irrigation department*'. This implied that the decision making was in the hands of the department with Panchayats playing a subservient role to the department. In addition, the revenue collected was to be remitted to the department with no control of the Panchayat over the use of these funds. Even in cases where the Panchayat could have collected the penalty the use of such funds was subject to the control of the Collector. Thus, in the absence of a real or even virtual space for the functioning, the members lost interest and soon the Panchayats became non-functional and defunct bodies.

At Tawa the Irrigation Panchayats were constituted in mid 1980s but were soon dissolved. During the course of our exploratory visits in the command area we were unable to find and talk to persons who had been members of these irrigation panchayats. The critique of the system in the above paragraph is based on the discussions with the persons in the Water Resource department who were involved in the process of formation of Irrigation Panchayats in the state.

**MP PIM Act, 1999:** The preamble of the act states that this is an act *to provide for Farmer's participation in the Management of Irrigation System and for matters connected therewith or incidental thereto*. The act provides for the formation of a three-tier system of farmer's organization within the command area to create institutional space and mechanism for farmer's participation in irrigation management. In addition the act also provides for the formation of Apex Committee at the state level for framing and recommending policy related issues on irrigation water management in the state.

The command area of the irrigation system is delineated on a hydraulic basis in to water user's area which is further divided in to territorial constituencies (between 4 to 10) comprising of: the water user's who are landholders in the area so delineated; all other water users; and three ex-officio members- Amin, Sub Engineer, and Agriculture department as adviser. In addition to the Water User's Association at the farmer level; Distributory Committee at the distributory level and Project Committee at the project level are also formed within the irrigation system. The act lays down detailed provisions that state the functions of each of the three tiers of the farmer's organization.

**(i) Coordination between the two Acts:** The two acts that govern the functioning of the irrigation system in the state and hence play a decisive role in laying down the law for water governance are closely linked in their operation. The PIM Act states that the terms that are used or have not been used will have the meaning as attributed to them in the Irrigation Act, 1931. However, the provision for the formation of the Irrigation Panchayat under the Irrigation Act,



1931 has neither been deleted nor made non-functional by the PIM Act of 1999. As a result theoretically there is possibility for the formation of both WUA and Irrigation Panchayat in the same area. This is a techno legal anomaly that needs to be corrected.

**(ii) Job Description:** The Job Description as listed in the Madhya Pradesh Works Departmental Manual in Appendix 1.27 and 1.28 for SDO in-charge of field formation and Sub Engineer titled Functions, Duties and Responsibilities do not mention the duties of either of these functionaries with respect to Water User's Association. It does **not** mention that the Sub Engineer will be the Secretary of the WUA and the different functions that he will have to undertake in this capacity.

**(iii) Interlocking of Institutions:** There are other institutions at the village, block and district level whose decisions may affect the functioning of the WUA or the irrigation system. However no inter-institutional linkages have been created by way of cross membership or representation in these institutions. For example, the decisions of Zila Panchayat or the Zila Yojana Samiti related to planning in the district can influence the manner in which the irrigation system functions and hence the members of these institutions need to be represented in these decision making bodies. Even at the village level the Gram Panchayat has the funds under MGNREGS that can be used for the upkeep and maintenance of the canal system. For this it requires legal space that allows such inter institutional collaborations. In its absence all such decisions are taken by the Water Resource department and implemented by them without any significant consultation with either the WUAs or the Panchayat bodies. In fact in Madhya Pradesh the functioning of the Water Resource department has been kept outside the Panchayat sector as a result of which at the formal level the department operates in isolation with Panchayat bodies though in practice and at an informal level the departmental functionaries are dependent on Panchayat representatives for most of the works at the field level, especially related to collection of revenue.

### *3.2 Institutional Issues*

The present study interacted with the **members** of four WUAs, namely, Sontalai, Ganora and Gurdiya (Gogiya and Nandra). In addition the study also held workshops with **Presidents** of WUA in the Harda, and Itarsi sub divisions and with Ameens in Itarsi and Suparly sub divisions. There were interactions with the staff of Water Resources department at all levels Superintending Engineer, Executive Engineer, SDO and Sub Engineers. Meetings with PIM Directorate at the state level, Chief Engineer O&M, Command Area Development in-charge, SWARDAC were also held. The aim of these meetings was to understand the issues related to water distribution and management within the framework of water governance given the legal mandate as defined by the Irrigation Act and the PIM Act in the state. The issues identified during these interactions and also during field visits in the selected areas of Tawa Irrigation system are given in the following paragraphs.

**(i) Functioning of WUA as per PIM Act:** The PIM Act of the state lists the functions that are to be performed by the Water Users Association. These include functions that are related to planning (O&M Plan), implementation (of warabandi schedule), monitoring (flow of irrigation), regulating (use of water), raising resources, maintaining records, conducting audit, and promoting

efficiency in water usage. During interactions with the members and office bearers of the WUA and in interactions with the department officials the extent to which these functions were being performed in the four WUAs visited is given in the following table.

| Functions of WUA as per the PIM Act   | 4 WUA: Sontalai, Ganora and Gogoya and Nandra   |
|---|---|
| Prepare and implement a <i>warabandi</i> schedule for each irrigation season, consistent with the operational plan based upon the entitlement, area, soil and cropping pattern as approved by the Distributory committee or the Project Committee   | <ul style="list-style-type: none"> <li>In the absence of DC and PC the <i>warabandi</i> schedule was prepared by the Water Resources department.</li> <li>Implementation of <i>warabandi</i> schedule is done by the department by opening and closing of gates. WUA does monitoring and places its demand to the department for release of water</li> </ul>  |
| Prepare a plan for the maintenance of irrigation system and carry out the maintenance works of both distributory system and minor and field drains with the funds of the association from time to time and to provide funds for the maintenance of staff including such persons who are placed by the State Government with the Water Users' Association for the purpose of regulation and maintenance of irrigation system | <ul style="list-style-type: none"> <li>Main maintenance work is related to cleaning of canals and whenever there is specific problem in the distributory (e.g. deepening of canal) are carried out by WUA. There is no formal plan for O&amp;M, but each year the WUA and the Sub Engineer decides works to be taken and these are then projectised and implemented.</li> <li>WUA gets Rs 60 per ha per year to carry out maintenance works. This amount is received in the account of the WUA before the rabi season.</li> </ul> |
| Regulate the use of water among the various pipe outlet under its area of operation according to the <i>warabandi</i> schedule of the system  | <ul style="list-style-type: none"> <li>WUA comes in to picture only when there is a specific complaint by a farmer related to a particular outlet or a minor.</li> </ul>  |
| Promote economy in the use of water allocated   | <ul style="list-style-type: none"> <li>Water budgeting as an exercise is not carried out as a result there are no notions of economic use of water. Neither does the WUA discuss or promotes economy in the use of water allocation or use (by promoting efficient irrigation systems e.g. drip, sprinkler etc).</li> </ul>   |
| Maintain a register of land holders as published by the revenue department  | <ul style="list-style-type: none"> <li>B1 is maintained and updated by Ameen</li> </ul>   |
| Prepare and maintain a register of co-opted members   | <ul style="list-style-type: none"> <li>Register maintained and updated by Ameen</li> </ul>  |
| Prepare and maintain an inventory of the irrigation system within the area of operation   | <ul style="list-style-type: none"> <li>Maintained by Ameen</li> </ul>   |
| Monitor flow of water for irrigation  | <ul style="list-style-type: none"> <li>WUA monitors the opening and closing of gates either at the distributory gate. The monitoring is with respect to the number of threads that the gate is opened.</li> <li>Cross regulator is also monitored by the members of the WUA and in case they have any issue they contact the department.</li> </ul>   |
| Resolve the disputes, if any between the members and water users in its area of operation   | <ul style="list-style-type: none"> <li>WUA undertakes this task on a regular basis but these disputes are neither recorded anywhere nor reported to the formal system. Extreme cases of violence are reported to the police for subsequent action.</li> </ul>   |
| Raise resources   | <ul style="list-style-type: none"> <li>None of the WUAs were engaged in raising resources</li> </ul>  |
| Maintain accounts   | <ul style="list-style-type: none"> <li>Ameen is maintaining accounts of the WUA</li> </ul>  |
| Cause annual audit of its accounts  | <ul style="list-style-type: none"> <li>Accounts are being audited</li> </ul>  |

|   |   |
|---|---|
| Assist in the conduct of elections to the managing committee  | <ul style="list-style-type: none"> <li>• Not undertaken during the course of the study</li> </ul>   |
| Maintain other records in such manner as may be prescribed  | <ul style="list-style-type: none"> <li>• Undertaken by Ameen</li> </ul>   |
| Abide by the decisions of the distributory and project committees   | <ul style="list-style-type: none"> <li>• No Distributory or Project Committee formed</li> </ul>   |
| Conduct general body meetings in such manner as may be prescribed   | <ul style="list-style-type: none"> <li>• Meetings are poorly attended. In none of the meetings attended by the study team was a person from Agriculture department present</li> </ul> |
| Conduct regular water budgeting and also to conduct periodical social audit in such manner as may be prescribed | <ul style="list-style-type: none"> <li>• No water budgeting or social audit is being conducted</li> </ul>   |

Thus by and large it is the department that is managing the distribution and allocation of water. The role of WUA is negligible and comes in to play largely for addressing disputes and in execution of works prepared by the Sub Engineer

**(ii) Absence of Distributory and Project Committee:** Gurdiya is a large distributory which has two WUAs: one at the head called Ghogiya and one at tail called Nandra WUA. The tail end villages of Nandra were not getting adequate water during the rabi season of 2008-09 mainly because the farmers at Ghogiya were drawing water and not allowing the tail end farmers to access water. This issue could have been resolved had there been a Distributory Committee, which the farmers reported existed between 2000 and 2005 and had resolved such issues earlier. In its absence the farmers were forced to report to the SDO of Itarsi sub division. The SDO intervened and ensured that the farmers at the head did not draw access water by resorting to his authority under the Irrigation Act, 1931.

The Water Resource department did not have particular reason for not forming the DC &/or PC at Tawa. Neither the department had any specific plan or time schedule by which the DC or the PCs would be formed.

**(iii) Staffing:** The cutting edge staff for the distribution of water are Chowkidaars, Time keepers and Gate man posted at cross regulators, at the gate of and along the distributories. The water is to be distributed as per the agreements finalized by the Ameen and endorsed by the SDO. At no place the study team was able to find any written guidelines on the staffing pattern of these basic functions. During discussions with the department functionaries at Tawa, it was stated that one Ameen is responsible for 1000 hectares and that every gate should have a Gateman and every distributory should have atleast one Chowkidaar. The Sub Engineer as Secretary of the WUA is responsible for a TC area of 2000 hectares.

There was the stated norm for the formation of Irrigation Panchayats under the 1931 Act, namely 1000 acres of irrigated area in a village or group of village would define one Panchayat. Preceding the PIM Act the state also underwent formation of Farmer's Management Committee. A brochure of Water Resource department released in 1995 specifies distributories having water flow of 15 cusec would be handed over to water management committees formed by farmers. As per these guidelines 15 cusec would irrigate 3000 acres (approx. 1400 hectares) of land.

### Box 3 Farmer's Management Committee

The second attempt at user's involvement in irrigation management in Madhya Pradesh took place in the early nineties. At the initiative of some Collectors and Engineer's of the Irrigation Department, Farmers Management Committee under the Command Area Development programme was formed on a pilot basis under the Madhya Pradesh Cooperative Society Act. In all 65 such Committees were formed in the state and some of them were able to raise resources from the farmers by way of contribution to undertake repair and maintenance of distributaries and water courses. Again the contribution made by the farmers and the revenue collected was under the control of the department. The planning for the rehabilitation of the canal, the award of contracts for repair and maintenance remained within the departmental domain, with Committees being given the role of dispute resolution and helping the department in revenue collection. In the absence of any substantive role to influence water distribution the Committees soon became inoperative as the members and the farmer lost interest in them.

However no specific guidelines are in place for the basis of formation of Water User Associations under the PIM Act except that it enjoins the *District Collector to delineate every command area under each irrigation system on a hydraulic basis which may be administratively viable and declare it to be a water user's area for the purpose of this Act.* This lack of norm for the appointment of the cutting edge staff reflects the casualness with which the state government has approached the issue of the formation of WUA areas. It implies that Sub Engineers and Ameens in different Irrigation Schemes would be in charge of different area in terms of size; and secondly, by not defining the norm the state has also not formalized the role of these functionaries with respect to the WUAs either in the Act or through any government order.

With respect to the staffing at Tawa irrigation system the study observed that:

- Ameen and Sub Engineers are responsible for more than one WUA
- Very few Chowkidaars are regular employees
- The Chowkidaars are responsible for more than one gate.
- Chowkidaars and Gateman are also hired on daily wage on the need-to-hire basis
- None of these employees are under the control of WUA. They are appointed, controlled, managed and report to department functionaries.



Photo 5 Natural drain receiving excess water of the Tawa system





**Photo 6 Farmers lifting water from the above natural drain**

The shortage of staff affects the functioning of the distribution system in the following ways: the Sub Engineer and the Ameen are unable to physically manage the system as their 'beat' has doubled. This results in dilution of their role and authority among the farmers who resort to drawing more water at the cost of the tail end farmers or draw water out of turn. Similarly, the absence of Chowkidaar and the Gateman creates space for the powerful to dictate how the water distribution system will be managed and operated. The fact that many a times the Chowkidaar are hired on a daily wage basis further dilute their authority to control and regulate water distribution in the peak season.

Inability to define any norm for the operational size of the Sub Engineer, Ameen, Chowkidaar and Gateman leads to ambiguity in articulation of their performance level indicators, that is, it is not possible for the WUA or the farmer or the department to assess the whether these functionaries are operating efficiently and effectively. At different stages of the irrigation cycle different parameters are used for the assessment of their performance. For example, at the beginning of the irrigation season the parameter used is: *have the maintenance plans been made and implemented?*; during the peak irrigation stage the performance indicator often used is: *how many complaints are coming from the area?*; after irrigation the main indicator is: *how much revenue has been collected?*. Once the performance indicators are missing it becomes even more difficult to define service level indicators for the irrigation system, which are the foundation on which the governance of any system is measured.

**(iv) Secretary of WUA:** In the early stage of the formation of the PIM Act in the state it was decided to make Ameen the Secretary of the WUA. The argument for this was that since he is the person who maintains and updates all records he is best placed to act as the office and secretariat of the Association. However when the act was finalized the Sub Engineer was made



the Secretary of the WUA. This is still a topic of debate among the stakeholders of the irrigation system at Tawa and encompasses the following issues:

- Ameens are trained in measurement of land and in the maintenance of land records. Planning related to water budgeting and water distribution are essentially land based. Thus Ameens are best placed to provide data to the members of the WUA to plan and operate their system more systematically once this data is made available to them.
- Ameens are repository of the land and crop record of all the member farmers of the WUA. Ameen also record the agreement signed by the farmer and undertake field verification of these agreements during the irrigation season. Again Ameens are best placed to provide individual and record of *chak* that plays critical role in rational decision making in any system.
- Ameen collect irrigation revenue from farmers. They have the record of defaulters, information that assumes importance at the time of drawing agreement for the next irrigation cycle.
- With data at their disposal Ameens can represent the WUA in official meeting of the Revenue, Agriculture and Water Resource department.
- Ameens can also keep record of meetings and maintain accounts of the WUA.
- Sub Engineer is in charge of a Section which is defined (in terms of size and location) by the Executive Engineer. As in-charge of the Section he is responsible for *the management and execution of works*. As such a Sub Engineer is the department's man-on-site and depending on the location and pace of work his physical presence also keeps changing.
- Sub Engineers are trained technically to design, plan, guide, and implement physical and civil works related to the irrigation system. They are in the best position to provide technical facilitation to the WUA in preparation of their O&M plan for the system under the managerial control of the WUA. In this role the Sub Engineer can be a technical adviser to more than one WUA.
- The persons from Agriculture and Horticulture department are advisers to the WUA. Similarly, the Sub Engineer can also be the adviser to the WUA and not dissipate his energies in routine official functioning of the WUA (writing minutes, maintaining accounts, as custodian of all records of WUA etc).

#### **Records that are maintained by Ameens**

1. Outlet wise Irrigation Register
2. Villagewise *Paanchsala*
3. Outletwise *Shudhkaar*
4. Cashbook
5. Ledger
6. Bill Book
7. Village Map
8. MR Book
9. Agreement Forms

As stated in the definition of water governance it includes *range of ...administrative systems...that are in place to develop and manage water resource and the delivery of water services...* The issue of who should be the Secretary of WUA needs to be viewed from the perspective of whether the ex officio appointment of the secretary (be it Sub Engineer or the Ameen) will strengthen the processes of water governance of the irrigation system.



**Photo 7 Multi stakeholder meeting with Engineers, Ameen and WUA members**

**(v) Office of WUA:** The administrative requirement of any organization is the need for a permanent office and a secretariat that gives it identity and an address to its client. The office also becomes the place where the meeting of the organization and its members takes place and also where the records are kept and updated. At present none of the WUAs visited in the Tawa Irrigation system during the course of the study had their own permanent office space. The house of the President is the unofficial headquarter of the WUA though all records pertaining to the WUA are kept at the AE office.

**(vi) Budgeting:** Each of the three tier of the farmer's organization are allocated budget by the Water Resource department every year for O&M works. For the large irrigation system, like that of Tawa, the amount for O&M is Rs 60 per hectare for the WUA and Rs 20 per hectare for DC and Rs 10 per hectare to PC and Rs 10 per hectare to the department for head works. However, the budget heads under which the allocation is budgeted has not been transferred either to the WUA or DC/PC by any of the government orders. In the absence of transferring of the budget head the allocation first goes to the department and then it is transferred to the WUA account by the SDO. This causes delays and erodes the autonomy of the WUA as it increases the control of SDO over the WUA functioning.

Secondly, neither the act and rules nor the government order mentions the agency that will hold and spent the budget in case of non formation of DC and PC in an irrigation system or the fact that no fund will be allocated if no such committees are formed.

As the Distributory and Project committee have not been formed at Tawa the funds Rs. 30 per hectare that are allocated to these Committees is spent by the Department.

This lack of transparency in budget heads leads to a situation where the WUA members are not aware of the budget allocated to them and neither are they aware when the amount is credited to

their account. This becomes an impediment in the identification and scheduling of maintenance works by the WUA.

The second factor is that the department and the WUA finds that the norm of Rs 60 per hectare for undertaking O&M is quite less as approx Rs 1.50 lakhs is available to a WUA every year. Given this amount the only works that can be undertaken are related to cleaning and deepening. If the need is to repair the outlets, the falls and the flumes there is not enough money with the WUA.

**(viii) Reliability of Data:** Effective water governance necessitates availability of verified, consistent and reliable data so that planning, monitoring, and performance appraisal can take place. The present study made an attempt to collect data for appraising equity in the process of water distribution at Tawa. This attempt is documented in Box 4.

#### **Box 4 Data to Track Irrigation at the Village Level**

The study had aimed to track the watering of fields of individual farmers in an irrigation season to document and assess whether the water distribution system is equitable in its functioning. This required that the study uses the land related data of the farmers of selected villages. For this purpose 17 villages in Itarsi and Harda Division were selected and the data from B1 format of Land Records was collected for these villages. This data was digitized and was to be superimposed on the digitized village maps that were procured from respective Ameens. The study had also aimed to undertake a similar exercise in Hoshangabad division but the maps had deteriorated to such a state that it was even difficult to read what was written on them.

For Mapping the WUA maps were collected but the specific village boundaries were not legible and hence these maps were not used. In the second instance village maps, based on revenue data were used. However the study found out that it is not possible to superimpose the B1 data on to the digitized village maps because the maps had not been updated. For example, if a portion of the land has been divided among the family members or sold it was recorded in the B1 data but had not been updated in the maps. The Ameen of Harda updated the maps and the maps were redrawn to include updated data and digitized by the study.

Simultaneously, the study decided to do a sample check of the data collected in one of the selected villages. A village meeting at Ghodakund (Harda) was convened and the attendance of the revenue Patwari and the Ameen were also ensured. The village map, the WUA map as well as the B1 data was placed in the meeting for verification. The meeting led to the conclusion that there is a difference of 3.08 hectares in different records that could not be accounted for. The only way the data could have been made consistent was by physically land measurement exercise in the village which was outside the scope of the study.

The experience of the failed attempt of the present study to track and assess irrigation at Ghodakund further raised the question that if there is a difference of 3 hac in the area of one village how does the irrigation system assesses whether it is working to its full potential and is able to provide water to the designed area. There are two data sets that provide information on irrigated area for a village that can be then aggregated at different levels. One is the revenue record which is available in public domain through Census Village Handbook that provides information on the land use pattern of the village. The second data set is related to the *Elan*

book of the Water Resource department that is released every year before the *rabi* irrigation season and contains information distributor and WUA wise.

The study compared the Census (2001) and record of *Elan* 2007-08 for Ghodakund village. The Census records state that the irrigation from government canal in the village is 139 ha and with river irrigation 11 ha. Thus in all 150 ha is irrigated area in the village. However as per the *Elan* data the designed irrigated area is 208 ha in Godakund village and for the *rabi* season the target was to irrigate 192 ha. Another similar exercise was conducted at Sontalai village in Panvarrhi distributary. The Census record states that 441 ha is irrigated by canal and 12 ha by river, that is a total of 453 ha. The data from *Elan* states that canal irrigates 457 ha and lift irrigates 43 ha which together irrigate 445 ha out of the designed area of 457 ha of the village. A transect walk of the village revealed that the all the fields of the village are irrigated which include 200 ha of unirrigated land and 29 ha of cultivable wasteland. This implies that the data is under reporting irrigation to the tune of 229 ha at Sontalai. During the village meeting it further transpired that the data related to irrigation on encroached land is not stated in either of the two data sets and by that amount the data on irrigated area is underreported.

**(viii) Training of WUA:** At the time the present study was carried out the WUAs had been constituted in 2005-06. The first round of training for the Presidents and other office bearers of the WUA was carried out in June 2008. Since the training was held at Bhopal it required that the trainees be in Bhopal for five days a huge expectation given the fact that the training coincided with the sowing schedule of the farmers. Consequently in the June 2008 training, out of four only one President went to Bhopal to attend the training.

The training was focused on the provisions of the PIM Act and the roles and responsibilities of the WUA under the act. In addition the training also included the information related to basic structure and vocabulary of the irrigation system, e.g. warabandi, canal, distributor, outlets etc.

The discussions with the office bearers of the WUA and the department's officials it was apparent that there is a dissonance between the content of the training and the expectations from training. The training design is biased in favour of knowledge enhancement related to the legal framework for Participatory Irrigation and technical aspects of an irrigation system. The expectation is that the office bearers will implement the *warabandi* and the *osrabandi* schedule and also address the complaints and disputes between the farmers related to irrigation scheduling (e.g. drawing water out of turn, using motor to draw water and so on). This requires inputs in interpersonal skills and skills for mediation, leadership and communication skills, and skills related to management of community based organization. The need is not only to impart these skills but also provide handholding support to enable the trainees to practice them on the field and gain expertise and competence.

**(ix) Role Clarity:** The membership of WUA comprise of the farmers, Sub Engineer, Ameen and the representative of the Agriculture department. The Sub Engineer is the Secretary of the WUA and the representative of the Agriculture department is in the Adviser's capacity. The government order (ref) had clarified the roles of the Water Resource department and the Agriculture department as follows:



| Water Resources department  | Agriculture Staff department                                 |
|---|--|
| Upgrading the selected distributories involving bed cutting, bank raising, construction of <i>pucca</i> outlets, drainage etc | Arrange meeting of the farmers and discussion with them      |
| Construction of field channels as per requirement   | Formations of <i>Thoks</i> and selection of <i>thokdaars</i> |
| Preparation of <i>warabandi</i> papers  | Formation of <i>kolaba</i> samiti and election of leader     |
| Preparation of <i>warabandi</i> final programme   | Trial run and training of farmers in water distribution.     |
| Display of boards at the head of the <i>kolaba</i>  |  |

During interactions with representatives of the Water Resource department, the Agriculture department and the WUA members none of them were aware of the above division of work between the representatives of the two departments. It was assumed by all that it is the responsibility of the department of Water Resources to conduct farmer's meeting and at no place was *kolba samiti* has been formed. Interactions with the members of the Agriculture department also revealed that they have information about the PIM Act and the formation of WUA but no knowledge of the act, rules and the government orders passed under the programme.

### 3.3 Water Distribution

The central issue of water governance is the efficiency and effectiveness with which the water is distributed to the farmers. Efficiency implies in ensuring that the water reaches the farmer when he requires it and effectiveness lie in ensuring that farmer gets adequate water for each cycle of watering. The study focused on documenting the water distribution system and the issues the issues of governance that emerge from it.

#### (i) Warabandi & Osrabandi

*Osrabandi* is a rotation of distributaries and minors on full discharge; and *Warabandi* is a system of equitable distribution of water by turns according to a pre determined schedule specifying date, time and duration of supply to each cultivator in proportion to his area in an outlet command. In Tawa irrigation system the schedule of Osrabandi is announced through a notification of the Water Resource department called Elan (ऐलान or announcement) of the *Osrabandi* schedule. The time schedule for Osrabandi at Tawa includes (a) Meeting at the District level between 16 to 20<sup>th</sup> September that finalises the proposals for consideration at the divisional level; (b) Divisional Level Water Utilization Committee by 20<sup>th</sup> September; (c) Elan released by the department by 30<sup>th</sup> September. Based on this schedule the WUAs are expected to draw their *Warabandi* schedule. None of the WUAs that the study team interacted had drawn up any schedule of *warabandi*. At best a *dakhila patra* is filled in by the farmer that states his *chak* and the *kolaba* no. and the area that he intends to irrigate. This is sort of license that the farmer is eligible to draw water. It does not state nor refers to any warabandi schedule and the format comes in to picture at the time of assessment of irrigation revenue.

#### (ii) Agreement

Once the *Elan* is released the Ameens conduct meetings in the villages so that the farmers can state their water requirement and enter in to agreement through a format know as *Alpa Awadhi Kara Ka Praroop*. This format is signed by the Sub Engineer and the Executive Engineer on behalf



of the department. The agreement states the location of farmer's field, the area and the crop that he intends sowing. The latter two are critical to calculate water charges and also to assess the water requirement. However in practice the farmers do state the crop but not the crop variety. It is the latter that decides the number of water and the volume of water that will be required. The agreement at best mentions the crop but not the variety.

The actual variety sown and harvested is known to the system only at the end of the agriculture season and is noted by the Ameen for the calculation of water charges. However from the point of view of water distribution the actual water requirement is not known either to the WUA or to the department so as to determine the volume of water and also to determine the duration for which water needs to be released which in itself becomes a lacunae in water governance.

### **(iii) Agreement and Defaulters**

The Water Resource department does not enter in to agreement with the farmers who have defaulted in the payment of water charges for the previous rabi season. Survey of 7 villages located in the head region of the Gurdiya distributary revealed that out of 1503 of area irrigated the agreement was for 1801 ha implying that 28% of the irrigated ara was not under irrigation agreement. Similarly there are 7 villages in the tail region of the Gurdiya distributary in which 1596 ha was irrigated. However only 315 ha was under agreement implying that 80% of the area under irrigation was not covered by the current year's agreement.

This practice has the following drawbacks:

- Not entering in to agreement does not mean that water is not being drawn by the farmer.
- Water is a livelihood issue and the system cannot stop a farmer from taking water. At best the system imposes penalty for taking water without an agreement. Depending on the outstanding amount socio-administrative pressure is brought upon the famer for making payments. In such cases the farmer generally makes part payment to ward off the current pressure and continues to draw water.
- The list of defaulting farmer has increased over the years implying that more and more farmers are drawing water without entering in to agreement.
- Though the irrigation system knows the extent of default it is never tabulated and put in to public domain for monitoring and auditing purposes.

From the point of view of water governance agreements are losing their sanctity as planning cannot be done on the basis of these agreements, e.g. 80% of irrigated area in Gurdiya tail is not covered by agreements.

### **(iv) Irrigation scheduling**

The farmer's willingness to enter in to agreement is based on whether he will get water at the time he wants it and whether he will get in adequate volumes. The farmers are more willing to enter in to agreements if the agreements ensure this to him. Unfortunately such an assurance is not forthcoming from the system which dissuades him to enter in to agreement. For example, Panvarrhi is the first distributary of the LBC. The farmers in the head region of the distributary had completed their sowing of wheat by the beginning of the first week of November 2008 and the farmers till the last week of November 2008 in the tail region had not even started their

sowing. Consequently the farmers in the tail region of the distributary are less inclined to enter in to irrigation agreements.

#### **(v) Private Wells**

The experience of canal areas is that the irrigation system leads to increase in water table of the command area as a result of which farmers often make private investments to have their own dug wells that are used for irrigation purposes. Though there is no temporal data to compare the number of dug wells in the command area of Tawa but the farmers and the members of WUA were of the view that the number of private wells have increased in the region in the past four five years. The main reason for this is being attributed to the inability of the Tawa system to provide water at the time it is demanded by the farmer and also to serve as the source of protective irrigation of paddy during kharif that is being preferred over soybean by farmers in the region.

#### **(vi) Illegal Outlets**

There is no control over the number of outlets that are made by farmers in the region. The farmers follow the policy of each-one-to-himself and create their own opening in the distributaries. For example at Pahanvarri the design states 22 outlets where as in practice more than 100 outlets were found to be in operation during the irrigation season. The department has a knee jerk reaction to the number of outlets. If the number increases to an uncomfortable level (undefined) the department functionaries physically check and close some of these outlets.



**Photo 8 Illegal outlet catering to 10-15 farmers**

#### *3.4 Measurement of Water*

The measurement systems at Tawa comprise of standing wave flumes, sump wells and scale at regular intervals especially after cross regulators. In addition there are markings on different structures. However, the study found that the sump wells were filled with mud indicating that these are not used at all. The condition of flumes is broken and cannot be used as a water measurement point. The flumes were found to be used by the community for washing and bathing purposes.



The study team was informed that there are charts which enumerate the gate opening and the water flowing within the system at every distributary. The study team did not observe any such chart and were told that since these charts did not have the trust of the Water User Association they were flung into the canals by the farmers.

Measurement of water and the data related to it is extremely important for the health of both the irrigation system and the Agriculture. In the absence of an effective water measurement system the system operators, namely the Sub Engineers, Gateman, Time keeper and Chowkidaar keep turning the threads of the gate and the farmers keep increasing it. The Chowkidaars maintain a record of the height of gate opening but its authenticity is seriously under doubt.

The availability of water at the tail end is dependent upon the height at which the gate is opened. The decision on the height at which it is to be opened is based on the volume of water that is required by the famers. Whether this amount is being released and flowing through the irrigation system is based can only be ascertained when data related to measurement of water is accurate.



**Photo 9 Sump Well, Scale on the Distributary, Scale at the Cross Regulator and Scale at Gate**

### 3.5 Cropping Pattern

The approved cropping pattern for the Tawa irrigation system was as follows:

| <b>Tawa System</b> | <b>Kharif</b>  | <b>Rabi</b>   | <b>Summer</b>                                   |
|--------------------|--|---|---|
| Left Bank Canal    | - Intensity: 67%<br>- Paddy, Cotton, Jowar, Maize, Groundnut, Pulses, Vegetables, Perennial and Fodder | - Intensity: 67%<br>- Wheat, Vegetable, Peas, Linseed, Gram | - Intensity: 4%<br>- Fodder, Pulses, Vegetables |
| Right Bank Canal   | - Intensity: 58%<br>- Paddy, Cotton, Jowar, Maize, Groundnut, Pulses, Vegetables, Perennial and Fodder | - Intensity: 67%<br>- Wheat, Vegetable, Peas, Linseed, Gram |   |

However Soybean has become the major crop of *kharif* and *rabi* is largely wheat with gram around 5% and no other crops. This has significantly changed the water requirement of the farmers for the rabi season. However the issue in reference to governance has been the non release of water during the kharif season. The farmers demand that they be provided with protective irrigation that would allow them to take paddy during kharif season. The department takes the position that since the canal is not lined they will not be able to transport water within the system. But his argument is not tenable given the fact that paddy is one of the approved crops for the system for the kharif season. The fact is s that in the absence of an appropriate plan for O&M the system has deteriorated and has reached a stage where it cannot transport water during kharif.

### 3.6 Changes in Land Use Patterns

The land use pattern changes continuously in the command region of an irrigation system. The same is observable in Tawa. Increase in size of settlements, rampant encroachment and conversion of fallow land to agriculture, widening of roads and laying down of new roads, construction of warehouses has led to changes in the command area. It was beyond the scope of the present study to collect and compare the land use pattern across different time periods especially since the record of encroachment is not put in to public domain. However, the changes in the land use pattern directly affect the capacity of the system and thus have an impact on the quality of governance- revenue collection is decreasing, area under irrigation is increasing, water distribution is increasingly being dependent through illegal outlets, and lifting directly from the canal.





**Photo 10 State of Crop in Head (above) and Tail (below) Pahanvarri distributary - 22 Dec 2008**



## 4. Conclusion

The present study on the Tawa System gave us an opportunity to interact with farmers, members of WUA, department functionaries on various aspects related to water governance. These interactions repeatedly led us to the argument put forward by Lucas Horst, of Wageningen Agricultural University in his book *The Dilemmas of Water Division, Considerations and Criteria for Irrigation System Design* that advocates the need to include the human and institutional aspects along with technical requirements while designing of irrigation systems.

For example the present system of taking water from the canal involves an outlet constructed on the distributory that serves as the source of water for field channel to take water to the field of the farmer. The need of the farmer is to irrigate his fields in one installment. With 6 inches of outlet (Kolaba) it will take him 2-3 days to irrigate his field. He has two choices: one, to increase the size of outlet from 6 inch to 12 inch, and second, to add more pipes in the outlet to get more water in short time. Thus design and location of outlets needs to conform as close to the need of the farmers (water in one installment) a fact that seems to have been missed out while designing the distributory system at Tawa. In its absence the farmers have resorted to: increase in the size of designed outlets; increase in number of pipes; increase in number of outlets; cutting of water course and lifting of water. These actions fall within the regime of irrigation crimes there by creating conflict and disputes that could have been avoided.

There are 71 drainage siphons, 47 drainage culverts and 8 aqueducts along the length of the LBC up to 4032 chainage. This is indicative of the type of terrain that existed or still exists in the region. There were, and still are, a number of small rivulets criss-crossing the region that acted as a natural drainage in the area. It is common observation that during the period the Tawa Canal system is in operation the water level in the rivulets and natural drains is more than what is observed during monsoon. During this period the level of Narmada river also rises. This implies that a substantial water still flows from the irrigation system to Narmada river. From the point of view of engineering design had this natural drainage been used in conjunction with the constructed canal and distributory system it would have been an engineering marvel that would have created decentralized smaller storage structures. Such smaller systems would have been easier to manage through community based institutions and mechanisms.

The proposal for strengthening of Handia branch canal states the design duty at the outlet level, after considering all losses, at 166 acres per cusec. Given that the average flow at LBC in Tawa is 4100 cusec which implies that it can irrigate up to 697200 acres or 316909 hac. At present the LBC is providing irrigation to 149782 ha. However it needs to be pointed out that since 4100 cusec water has been released but its utilization seems to be unaccounted for. This further reiterates the need for reliable water measurement systems from the point of view of cost efficiency of managing the canal system as well as the efficiency of the ecology of water.

The irrigation system is already taking more water than it is designed for (4100 is 6% more than the designed figure of 3865 cusec) and hence is being subjected to stress. The field observations recorded that free board is not available in many distributoary, a fact that was accepted by the

department functionaries also. Since the people's participation is designed for downstream of gate there is no space for civil society that monitors and asks questions on the health of the system and prudent use of natural resource.

The dominant view of the Water Resource Department is that since the canal at Tawa is not lined it has leads to substantial transmission losses that also include loss on account of illegal withdrawals of water. Similarly the department favours installation of automated gates which will give the entire control to the department. The present study is not in the position to take a view of the departmental contention but it definitely believes that there is urgent need to set service level performance indicators for the irrigation system and then analyse to assess which system is best suited that will lead to higher levels of satisfaction from the service.

An issue that was constantly raised during the study was does WUA has the capacity and the inclination to perform as an effective the agency for water distribution and management. The views on both sides are contentious and based more on impressions rather than on hard facts. The study though agrees with the President of one of the WUAs who stated that the question of *our capacity to manage is relevant provided we are handed over a perfect or a near perfect system. Dulhan de rabe hain to dulhan ko pura saja ke to dein (if you are giving us the bride then at least adorn her as befitting a bride).*

Political patronage and leadership finds opportunity and space to interfere and secure water for its constituency mainly because neither the administrative system nor the people's organization have developed themselves in to institutions that are critical in the decision making process related to water management and distribution. Till then there will be stories and media coverage of how the local political leadership had intervened to open/close gate so that water can be made available to their constituency. Such popular politics not only erodes the authority of the existing institutions but also plays havoc in terms of water use as it takes a very short term view of the situation. The net result is that not only such political forays lead to inequities in distribution of benefits but it is also leading to a situation where the tail end villages are gradually getting cut off from the Tawa irrigation system.