IPC-IPU Gap Analysis in West Bengal and the North-East

Final Report

INDIAN INSTITUTE OF MANAGEMENT CALCUTTA

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Executive Summary

IIM Calcutta is tasked to identify the nature of issues related to the gap between Irrigation Potential Created and Irrigation Potential Utilised in West Bengal and the North-Eastern states, and make suggestions aimed at minimisation of the existing gap.

The literature review shows that **systematic development of irrigation with construction of new projects under different five year plans have led to rapid deterioration and ignorance of existing systems with poor management** which increased the gap. There are problems with the **rationing system, water politics, illegal usages, lack of maintenance and a substantive gap in the levels of cognition** between farmers and engineers that lead to disagreement and problems of overall irrigation management.

The literature review and pilot field visits to different states has helped formulating a number of hypotheses which include: **IPC is overstated, IPU is understated, problems in the method of documenting IPC and IPU, and finally, both Sociological and technical factors promoting the gap**. The findings suggest some common issues and some specific/ localised issues. The common issues include the problems of miscalculation, lack of maintenance, socio-political factors, problems of irregular power supply, lack of a proper distribution system, and problems with the institutions.

While calculating IPC on the basis of water requirement of paddy and water availability of the lean season it only assures the irrigation for every season and but does not represent actual IPC. The initial calculation of IPC with no further updates may lead to serious miscalculation because of the expected decrease in IPC due to **lack of maintenance**, **change in cropping pattern with undermining the increased use of HYV,** and c**hange in climatic conditions**. **Non incorporation of privately owned irrigation** facilities creates confusion about the actual gap as it may be filling the existing gap and promoting a double count

of IPC. There are **instances of overstating the IPC** with creation of potential in a less suitable area.

Ten percent of the initial project cost for maintenance is insufficient to meet the present needs which results in degradation of the field channels and pipes due to environmental or other factors ultimately leading to low water discharge and high water loss.

The **increasing demand of urban labour and low profit in agriculture are the factors for non-utilisation of the created potential**. The excess of water reported by farmers in some North Eastern states indicates the underestimation of IPC. **Low water price in major irrigation projects, absence of a proper controlling device at the canal outlet, farmers' tendency of draining off more water because of uncertainties about the future availability, and concealments** promote water loss and lesser utilisation of the IPC.

With the lack of maintenance and substantive development of privately owned tube wells, irrigation is a business, supported by political power and elites. They promote **illegal usage of water, construction of barrier within canal, reluctance in water tax collection**. The tax-free water undervalues the resource and results in water loss.

Outstanding dues to the electricity department frequently interrupt power supply which compels farmers to steal electricity by connecting hooks to naked wires ultimately resulting in transformer breakdown. Once a transformer has broken down, it takes several days to get it repaired or replaced. Throughout this period, the irrigation potential remains unutilised.

Most of the schemes suffer from a **lack of proper distribution systems** especially at the micro-level which upholds **water politics by creating a hierarchy among the farmers on the basis of the location of their land**.

Non formation of WUAs, lack of coordination between the officials and reluctance to collect water tax also increases the gap.

The state specific local issues are important as they have the potential to mislead any grand approach for minimising the gap between the IPC and IPU. Assam and

West Bengal commonly face problems of **non incorporation of the water duty of Boro**, which has water duty three times of Kharif. There are **overlaps in the calculation of IPCs as it is found that minor irrigation projects are in operation within the command area of major or medium irrigation projects**. This adds to potential created without any increase in the potential utilized. West Bengal shows a contradiction as the Irrigation Potential Utilized documented in official data and the irrigation potential utilized by the farmers, which differ considerably.

Assam shows a defunct scheme **being active in the official document, and insufficiency of water in the running schemes**. Issues like lack of maintenance are related to a more local issue like **political unrest**.

Insufficiency in terms of volume of water is one of major problems of the North eastern states. The reasons are state specific. Arunachal Pradesh shows **improper maintenance, and faulty calculation**; for Tripura the problems result from **irregular power supply**, improper maintenance and problems of calculation; Meghalaya has problem of maintenance, calculation and water distribution. Nagaland faces the problem of IPC not being utilized due to **non-agricultural usage of agricultural land, non utilization of water as monsoon water is available, and farmers' reluctance to cultivate in the festive seasons.** Sikkim faces the problem of **possible double counting** of the IPC. Mizoram has **problem with calculation of IPC, lack of proper infrastructure and heavy migration resulting in the non-utilization** of the created potential.

IIM Calcutta Study Team **suggests to include a revision of the IPC and IPU with volumetric calculation by incorporating factors like Boro cultivation, seasonal availability of water, crop specific water duty, and potential of the privately owned MI schemes. Installation of measuring devices at outlets and canal protection force** can increase the IPU. A **reevaluation of the maintenance cost by price indexing** to meet present needs of the entire irrigation system is needed. **Installation of storage tanks, in the stream diversion projects and proper distribution systems at the micro level** in all projects can make proper utilisation of the IPC and minimise water loss. Farmers should be encouraged to continue cultivation with increase in incentives. **Implementation of water tax,**

and awareness generation activities could compel farmers to opt for judicious use of the water. For implementation of any new scheme, **effective coordination between different departments like agriculture, soil, geology**, etc should be made mandatory. WUAs should be promoted. With local and detailed knowledge and motivation about water use, **WUAs can correct most of the existing maladies** through collection of water tax, maintenance of channels, promotion of judicious use of water, conflict-resolution related to the politics of water distribution, improvement of co-operation, and promotion of proper interaction between officials.

1. Introduction

1.1. Background

This report contains details of the issues related to the gap between Irrigation Potential Created and Irrigation Potential Utilised including the nature of the issues and suggestions to minimise the existing gap in West Bengal and the North-Eastern states.

During July 2007, IIM Calcutta had received a request regarding the above mentioned project from the Ministry of Water Resources. After deliberating on the issues and meeting with other IIMs in Delhi, a MoU was signed between the Ministry and IIM Calcutta in August 2007. The work began with a detailed review of the existing literature which addresses the gap as well as larger problems related to irrigation.

1.2. The gap: from literature

Since independence, a high priority has been given to stepping up food production through irrigation (GOI, MOWR 1999 pp.75).[1] In spite of the high priority given to this sector, the agricultural growth rate has remained low, after rising during the nineteen-eighties, and is now being compensated by industrial expansion and rapid growth of the services sector with a modest increase in per capita income. With its growing population, India still faces the daunting task of increasing its food grain production by over 50% in the next two decades (Kumar 1998) and to achieve this, it requires an efficient and extensive irrigation system.

[1] Integrated Water Resource Development a Plan for Action — Report of The National Commission for Integrated Water Resources Development. Vol—1. Government of India, Ministry of Water Resources, New Delhi. Sept. 1999

1.2.1. The substantive lag over time

Although there has been systematic development of irrigation under different five year plans, soon after the initiation of major irrigation projects in the first five year plan there was awareness of a gap between the Irrigation Potential Created (IPC) by the government and Irrigation Potential Utilized (IPU) by farmers. The gap continued to increase and compelled government to initiate the Command Area Development programme (CAD) in the Fifth Plan (1974 – 78) to reduce the lag between the IPC and IPU[2]. The Ninth Plan had recommended Irrigation Management Transfer[3] (GOI, MOWR pp. 80) and yet there was no positive change in the scenario. The gap, as a matter of fact, has been increasing year after year as may be seen from the following figure (see figure 1).[4]

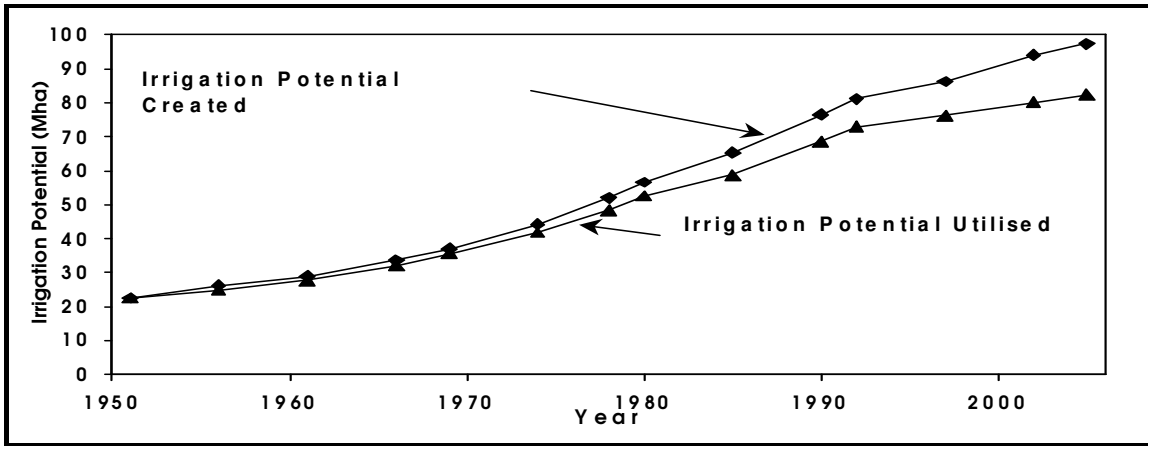

Figure 1 Increasing gap between IPC and IPU

Normally, irrigation potential created during a particular year cannot be fully utilised during that year. The utilisation develops gradually. It attains its full value by the end of about five years. The increasing gap between actual

[2] Final report of the task force for preparing guidelines for reporting the figures of irrigation potential created and utilized in a uniform manner, January 2002. Central Water Commission.
[3] Integrated Water Resource Development a Plan for Action — Report of The National Commission for Integrated Water Resources Development. Vol—1. Government of India, Ministry of Water Resources, New Delhi. Sept. 1999
[4] Taken from The Approach paper for the studies to examine various issues related to gap between irrigation potential created and utilized and for suggesting measures for reducing the gap. Prepared by IIM Calcutta '07.

utilisation and the calculated utilisation requires serious critical examination (GOI, MOWR pp. 87)[5].

The approach paper prepared by the MoWR (2007) suggests the examination of: a) various issues associated with irrigation potential creation and utilisation; b) methodological aspects of data collection; c) identification of created potential that has never been utilised and/or irregularly utilised and/or stopped being utilised for various reasons and finally, d) identification of the reasons for the gap in the Irrigation Potential Created and Irrigation Potential Utilised. [6]

A review of the literature shows that publications addressing the gap between irrigation potential created and what is utilised are limited and fragmented. However, there are plenty of studies addressing the problems associated with effective irrigation. It has been found that different studies have focussed on different facets creating problems with the utilization of irrigation but very little has been written about the possible resolution of these issues.

1.2.2. Early Studies

The larger problems of land and water management as being complex and multilayered have been recognised early (Price 1971). The literature, particularly concerning the detailed case studies (Kaplan and Manners 1972: 97 – 98), is important in addressing issues related to irrigation in general and can help analysing the lag in particular (cf. Millon 1962). Many anthropological and sociological studies have been conducted on issues related to irrigation, for example Conklin (1973), Leach (1961), Hunt and Hunt (1974), Geertz (1973) and Geertz and Geertz (1975) who have studied the problem in depth. However, there exists a gap. It is found that these studies have never incorporated the aspects of land size, amount of irrigation

[5] Integrated Water Resource Development a Plan for Action — Report of The National Commission for Integrated Water Resources Development. Vol—1. Government of India, Ministry of Water Resources, New Delhi. Sept. 1999

[6] Taken from The Approach paper for the studies to examine various issues related to gap between irrigation potential created and utilized and for suggesting measures for reducing the gap. Prepared by IIM Calcutta '07

delivered, length or duration of irrigation and technical devices. Hunt et al. (1976) argue that until complex interactions between these major parameters of irrigation are well understood, getting an aerial view with the help of anthropological fieldwork would be impossible. These studies do, however, help identify different issues related to irrigation. Conklin (1973) has emphasized the physical labour associated with water control and how it can directly influence the whole irrigation process in terms of localised and regular maintenance and fair share of water. The associated environmental factors as one of the determinants of local irrigation have also been emphasised (Conklin 1973, Netting 1974b). The existence of folk knowledge and classification about the physical system, environment and predictive models has been documented by Leach (1961). He has also documented the fact that the irrigation system is embedded in a hierarchically arranged, unified state political system. Hunt and Hunt (1974) have illustrated the problems of documentation, concept formation with field interactions while handling issues like centralization, the relationship between power and water control. Geertz and Geertz (1975) mention the existence of a totally separate organizing mechanism managing the entire irrigation system.

1.2.3. Problems with the existing rationing system

There are various interacting issues addressed by different studies. All these are supposed to be relevant for the present study. Reidinger (1974) has showed that at Hissar district of Haryana the interaction between different levels of the rationing system of irrigation (higher, medium and farming level) has created a substantial degree of uncertainty among farmers. This fact is crucial especially during the winter season as the water becomes scarce. Ansari (1968) has found that the rationing system often represents the disappointing performance of many canal irrigation projects with respect to yields, profits and utilization of irrigation potential. The notorious non presence of data regarding this uncertainty reflects the ignorance of both bureaucrats and researchers. These effects help explain the relatively sudden increase in private tube wells even in

canal-irrigated areas[7]. It severely affects the agronomic, climatic and soil factors. However, it also limits the possible reduction in water-application rates. The farmer may diversify his crop pattern as an additional risk adjustment and can include drought-resistant but low-valued crops such as gram, ultimately leading to a huge loss. With the present system of irrigation each farmer receives a share of the available water supply according to the number of acres he owns. But he has no control over the timing and quantity of his water. Thus with the present system a farmer has virtually no control of how he may, perhaps, match the available water supply to crop needs. Furthermore, he has no prior knowledge of change in the water volume due to climatic variations (Reidinger 1974).

With a strictly administrative rationing system farmer has to pay a fixed water levy per acre irrigated, regardless of the quantity of water applied; the amount paid for water does not reflect its marginal value. A set of institutional rules govern the sharing of the available water supply at all levels within the canal system, and no farmer can legally obtain more than his share (Reidinger 1974). Therefore, there is an urgent need to address the uncertainties at the grassroots level.

1.2.4. Situational politics of water allocation: The interacting agencies

While viewing irrigation as a part of economic development there is a need to understand social relations, gender predispositions, and social positions (Ishikawa 1967, Bolding et al 1995). There is a complex interplay of power, authority and social inequalities determining water distribution to a great extent. Hunt et al (1976) from their Mexican example argue that societies having an irrigation system available have local organization existing at different levels and degrees of social structure. Biggs and Smith (1995) have found this local organization as a coalition, which is a curious and opportunistic grouping, loosely connected through friendship and other ties,

[7] Planning Commission, *Evaluation Study of the High Yielding Varieties.*

reflecting both idealistic and self-interested impulses. It is pervasive enough to pass unnoticed but remains remarkably significant in affecting the outcomes of the irrigation process. An understanding of these coalitions is important as they consist of people from a variety of positions (elected and agency officials, interest groups, leaders, researchers etc.) who share a particular belief system, basic values, causal assumptions and problem perceptions and who show a non trivial degree of coordinated activity over time (Sabater and Jenkins-Smith 1993). There is an urgent need to understand these coalitions and their perceptions and assumptions. Less (1973) has projected a crucial fact that social systems can, to a point, increase the supply of water. Nowadays, it sometimes happens very rapidly. It can be achieved while utilizing the present technology with proper understanding with the users and providers and maintaining a balance between supply and demand. As these organizations are acting as the determining factor for the proper distribution of water, there is need to explore the sources of power, organization, use of power and the relationships between levels of organization in a social system. Millon (1962) has studied along this line by depicting a quite consistent picture of a strong relationship between irrigation and power. It is found that often very higher levels of authority are strongly involved in local affairs. Activities like construction, maintenance, allocation, conflict resolution and the organization of ritual are directly affected. The role of bureaucrats, especially corruption and political issues of irrigation, is also considered to be an important determining factor (Wade 1990). It has been found that there is a conflicting relation and role confusion between irrigation and other more powerful roles. The relationship between irrigation and social stratification is important in differential decision making power over the tasks of the irrigation system. It is found that irrigation tasks are handled by agencies that have other political tasks (see for example Geertz 1959, 1963, 1973, Glick 1970, 1972, Lees 1972, 1973, Beardsleryl 1963, Gray 1963). Millon et al. (1962) go on so far as to argue that any system of irrigation agriculture creates its own distinctive potential for both cohesion and conflict, whatever may be the social system of

the people who practice it. To asses the different issues associated with irrigation, it is necessary to inspect these structures as these can reflect the traditions of different water allocation systems. Gorter (1989) and Jairath (1985, 1986) argue that socio-economic inequalities among the users and political intervention is acting as a determining factor in the inequalities of water distribution. Village level politics and social issues like hierarchies, gender predispositions, power relations and their interactions in the context of irrigation potential utilisation need to be addressed. Additionally, there is a need to understand socio-cultural responses to irrigated agriculture at the local level and their interrelationships with higher levels. Different roles associated with both the irrigation system and other roles in local social organization are also important (Hunt et al. 1976).

1.2.5. Overuse and/or illegal usages

There has been a conflicting situation among the water users who are dependent on the same source when usage increases and/or diminishes (Wood 2007). It happens when people from upstream start to draw off more and more water for their own use (Le Marquand 1977). It is even possible that there is illegal use of water from the mainstream. Motivated by the demands of specific interests or the calculations of electoral gain (or avoidance of electoral loss), politicians may politicise that dispute. The problem is critical when water distribution is an inter-state issue. Political interference in terms of having a majority in the parliament has been noted. The establishment of a tribunal has not been effective owing to the political necessity of heeding to the wishes of interest groups and voters (Wood 2007). It is therefore, important to understand these conflicts and the process of their politicization as a hindering mechanism to irrigation utilization.

1.2.6. Differential cognitive understandings

Bharadwaj (1990: 50 – 51) projects the importance of integrating technological inputs in production together with the context of socio-economic relations of production. There is substantial disagreement and misunderstanding of the

levels of cognition of farmers and engineers (Nadkarni 1979, 1987, George and Raju 1981, Devarajalu Naidu 1987, Kallur 1988). As mentioned, Leach (1961) has depicted the already existing folk models and classifications regarding irrigation and water management; there is a need to complement the folk and the 'scientific' models. Fernea (1963) during his study of American Indian tribes finds it crucial to sense and utilise the existing traditional knowledge for effective developmental initiatives. Development initiatives through the action of all-powerful outside agencies, that force technological and social innovations on the community obliging the members of the community to co-operate in the use of a natural resource for the first time or in a new, "more efficient" way, may be disruptive of community life.

1.2.7. Problems associated with overall irrigation management and lack of maintenance

Sodal (2004) from his observation of the lag in utilisation in Maharashtra argues that complex interactions of social, economic, political and cognitive domains accelerated the gap between Irrigation Potential Created and Utilized. The emphasis has been and continues to be on the construction of new irrigation projects rather than on the management — the operation and maintenance — of the existing system (Wade and Chambers 1980, Palanisami and Easter 1983). The negligence of post construction problems also resulted in the design of new systems with the same defects (David 1981).

The reasons for the lag identified by Sodal (2004) include:

Problem of availability of funds as collection of water charges is irregular.

Funds for maintenance are less than the requirement.

Poor maintenance resulted in consequent deterioration of the irrigation system.

The lack of maintenance promotes water loss. Unlined channels and seepages are reported causing more than 30% water loss.

These cumulative factors justify Irrigation Management Transfer and development of Participatory Irrigation Management (Nikku 2007*, Namboodiri 2006*).

However, the increasing gap between Irrigation Potential Created and Irrigation Potential Utilised despite governmental initiatives like Command Area Development programme and Irrigation Management Transfer, demands urgent attention. The present work has identified and explained the potential problems in a context specific manner and provided suggestions for effective remodelling of the entire irrigation management system.

1.3. The sampling and the methodology

After reviewing the literature and a conducting pilot survey, the research team had an overall understanding of the nature of the field. A two-step sampling procedure was then followed. At first, purposive sampling was done by incorporating factors like distance from the source of water and altitude or the geographical location of the schemes. After making a broad division of the existing users, random sampling was followed for selecting the farmers for detailed interaction.

Three sets of questions were used for the collection of data: one for the end users and two for the officials. Both open-ended and close-ended questions were used to address different issues. The questionnaires are given in the annexure I, II and III. However, for the convenience of understanding the common facts, establishment of friendly, working relationship with the farmers and cross verifying the common facts, the PRA technique was used in each village before conducting the interview. A separate set of questions were used to collect data from PRA. The Questions used for doing PRA is given in annexure IV.

A brainstorming session with the nodal officers to understand the issues and the local factors was conducted in IIM-Calcutta.

1.4. The hypotheses

The literature review and pilot field visits to different states helped formulating a number of hypotheses. These were backed by the initial experiences and were subjected to further testing. The hypotheses include the following:

1. The IPC is over stated.
2. The IPU is under stated.
3. There are problems in the methodology of documenting the IPU and assessing the IPC.
4. Both IPC and IPU are wrongly calculated.
5. There are technical factors leading to the gap that include lack of maintenance, etc.
6. There are socio-political factors leading to the gap including water politics, etc.

These initial hypotheses helped formulating the structured set of questions for the collection of data. Many open-ended questions were kept, as the research team could not afford to miss a single pertinent issue. The field interaction has yielded the data base to formulate different issues and address the mentioned hypotheses.

2. Issues Addressing the Gap

After completion of the fieldwork with farmers and officials, several issues related to the gap between IPC and IPU surfaced. Most of them are qualitative in nature and demand more detailed study in order to provide the necessary quantitative data support. However, looking at the local factors it is useful, first, to state the common issues and then, to state some specific and localised issues which may be a unique combination of the **common issues**. These include miscalculation, lack of maintenance, irregular power supply, lack of proper distribution system, and social-political and institutional problems. All these are discussed in detail.

2.1. THE PROBLEMS OF MISCALCULATION

2.1.1. Calculation of IPC based on the water requirement of paddy and water availability of the lean season

The water requirement of paddy is the highest of all crops in the states under study and water availability in the lean season is the lowest. The calculation of IPC by incorporating these two extreme factors provides assured irrigation but at the same time undermines actual potential. Therefore, this process mystifies actual water requirement, availability and utilisation.

The result of this miscalculation can be one or two or a combination all three of the following factors:

1. The actual utilisation is higher if there are adjacent non irrigated lands. The adjacent lands may enjoy water which may not be reported and recognised as the command area.
2. A considerable amount of water is wasted in the process of irrigation. Since soil has is its own retention capacity, supplying water beyond that level will not serve the purpose.

3. The utilisation will never meet the IPC, since the IPC is set high and the command area does not need that much water especially when farmers cultivate crops other than paddy or the rain fall is good enough. In minor irrigation schemes the water is delivered after being requested to do so. A few farmers may actually ask for the water but the supply can possibly cover the rest. In that case the gap is lesser than what appears, because it is simply the problem of documentation and over statement of the IPC.

One example can be shown to support the third statement. In Mizoram, it is found that, although the potential is created for paddy, winter cultivation is mainly horticulture based. This results in lesser utilisation of the IPC.

Even with the present system of calculation, field intervention in north eastern states like Nagaland, Sikkim and Mizoram shows that a significant number of respondents face a shortage of water. The following table represents the reasons, and farmers' responses.

Reasons	**States (Ranks of the responses)**		
	Nagaland	Sikkim	Mizoram
Lesser rainfall	1	1	1
Insufficient water release	3	3	-
Seepage	3	-	-
No such incidence faced	3	2	3
Lack of proper distribution system	2	-	-
Lack of proper distribution of water	3	-	-
Lack of maintenance	3	-	-
Dried up source	2	-	-
Lack of storage facility	-	3	2
Lack of alternative sources	-	-	2

Table 1 Reasons behind the paucity of water: farmers' version.

It is important to note that despite of the calculation, based on the highest water requirement and the lowest availability, farmers report a paucity of water (see table 1). It indicates the problem of initial calculation and proper assessment. As the villagers relate the paucity of water chiefly with insufficient rainfall and lack of proper infra-structure, there is a need to rethink the method of calculation and the process of developing and maintaining the infrastructure.

2.1.2. No routine updates for the calculated IPC

As the IPC is calculated during the origination of the project and no further calculation is done, it may lead to serious miscalculation, resulting in an increased gap. Regular update is needed for the following reasons:

1. With time and lack of maintenance the created potential is expected to come down.
2. Possible change in the cropping pattern may lead to a serious change in crop water requirement. With the increased use of High Yielding Variety and chemical fertilisers the water requirement has increased.
3. The rainfall, geographical and geological factors may have changed over time, ultimately changing the irrigation potential utilised.

2.1.3. Undermining the increasing demand

In the recent past, India has observed a boost in the use of High Yielding Varieties of crops which have little adaptability with the natural soil. As a result the use of chemical fertilizers has increased[8]. Both the HYV and chemical fertilisers demand a lot of irrigation with a corresponding increase in crop water requirement. This increase ultimately has shrunk the Cultural Command Area. For example a high-yielding corn crop requires about 22 inches of water, with a range of 20 to 25 inches, whereas, the traditional low yield variety demands only 15 – 16 inches of water[9]. Clearly increase in the use of HYV will definitely increase the demand for irrigation water.

2.1.4. Non-incorporation of the privately owned irrigation facilities

There are a number of privately owned and managed shallow pumps, DTWs, etc., whose created potential is not calculated. Though many of the private schemes have been incorporated in the MI census but it is increasing rapidly. Moreover there are instances where people are said to use portable pump sets

[8] www.metafro.be/leisa/1990/6-3-8.pdf retrieved on 13th August 2008.
[9] http://www.extension.org/pages/Corn,_Water_Requirements retrieved on 13th August 2008.

to steal water from the canals. As noted by Le Marquand (1977)[10], Wood (2007)[11], due to non-availability of water from major schemes, people have started creating potential of their own. Such activity:

1. Creates confusion about the actual gap as the gap found in the potential created and utilised may be filled by these privately own and managed pumps. And there is a chance of either missing this privately created potential or double counting the actual IPC. A detailed discussion is given on page no 31 – 37.
2. There are instances where people use high capacity pump sets and as a result, their actual potential may be more than what it appears.

2.1.5. Problems with the initial calculation of the IPC

In many projects, the gap between the IPC and IPU has been found to be existing since the time of its initiation. In West Bengal, for instance, the last twenty years IPC and IPU data show that DVC, Kangasabati and Mayurakshi have always failed to cover the actual CCA. By the mid 1970s, the gap was 1,40,000 ha for DVC and 70,000 ha for Kangsabati[12]. This fact indicates a serious miscalculation of the initial (over) statement of IPC.

A benefit-cost ratio of 1.8 is required to go ahead with a project and have necessary funds from the GoI. In order to meet this requirement, the Department of Irrigation, in several North-Eastern states is showing double cropping. This increases IPC on paper but in many of the north-eastern states double cropping is not practicable. Also because of the Ministry's earlier requirement that the minimum IPC should be 20 hectares for individual schemes and 50 hectares for clusters, the data was often misreported from the departments, where an existing 17 hectares may be reported as 20 hectares.

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[10] Le Marquand (1977) *International Rivers: The Politics of Co – operation.* Vancover: West Water Research Centre, University of British Colombia.

[11] Wood, John R (2007) *The Politics of Water Resource Development in India. The Narmada Dams controversy.* Los Angeles: Sage publications.

[12] GoWB *Annual Report 2003 – 2004* from the Water Investigation and Development Department.

This is common in hilly regions, where meeting the target of a 20 hectare for individual projects was rare, given the altitude and the scarcity of flat land.

Matching funds from the state government is not provided in most instances in the North-Eastern states, therefore, the figure of potential created as reported – although high in black and white – may be actually less because of paucity of funds.

2.1.6. Creation of potential in a less suitable area

Officials from different states have reported that there are projects installed in areas not suitable for doing agriculture. There are at least three reasons:

1. Because of the lack of co-ordination between the line departments, IPC may be created in a less suitable area ultimately resulting in under utilisation.
2. State departments usually insist on a perennial source even in areas where cultivation is not prevalent, but may have future potential. This, in turn, also increases IPC although current utilisation might be low.
3. IPC is often created in the areas of Jhoom cultivation, and therefore utilisation is often low.
4. Many areas enjoy a good amount of rainfall and people simply do not use the irrigation facilities available to them.

2.2. LACK OF MAINTENANCE

Throughout the fieldwork, the lack of maintenance is found to be the second major factor that not only contributes to the gap but also increases the gap over time.

2.2.1. Degradation of the field channels and pipes

One of the major issues encountered is the degradation of field channels resulting in seepage, sedimentation and hence, the wastage of water. As the IPC and IPU is calculated on the basis of the area it irrigates, seepage and silting of the field channels ought to reduce the IPU even if the amount of

water released remains the same over time. This degradation, in turn affects the tailenders.

2.2.2. Insufficient maintenance cost

The available maintenance cost is 10 percent of the total project cost. At present, 10 percent of the initial project cost is too little to meet the needs. Officials argue that the amount they receive for maintenance is too low to meet the salary needs of the maintenance staff.

2.2.3. Environmental hazards

Many North-Eastern states (e.g. Sikkim, Assam) are located at the Himalayan terrain and encounter regular earthquakes, landslides, etc. resulting in severe damage of pipes and channels. Many projects have become permanently defunct due to these environmental hazards. An increment in funding can help reviving these projects.

There are instances of alteration of the topography, which leads to serious damage in the delivery of water as the flow of water depends on gravitation force.[13] A routine update of the IPC is needed to incorporate these changes.

2.2.4. Low water discharge

The obvious result of the lack of maintenance is low water discharge, which creates further problem of water delivery.

2.3. SOCIO-POLITICAL FACTORS

Socio-political factors are more local in nature though there is some commonality in the states under study. These common factors are documented here.

2.3.1. Non-utilisation of the created potential

There is a tendency of not cultivating lands falling within the command area. The increasing demand for labour in the urban centres, less profit in cultivation especially while using age old technologies like shifting cultivation and large

[13] Voice of Nodal Officer, Sikkim.

scale migration of communities are some of the reasons for this reluctance. As a result, the potential created remains unutilised.

2.3.2. IPC is understated

It is found that the North Eastern states have mostly minor irrigation schemes with very small IPC. The sample survey has provided the following data about the IPC and IPU in these states (table no 2).

State	Mouja	Area under IPC (Kharif + Rabi) (in Bigha)	Area getting irrigated (IPU) (Kharif + Rabi) (in Bigha)	Area not getting irrigation (in Bigha)
Assam (RLI)	Kachari Alibari (Rani scheme)	26	26	0
	Rangapara (Rani scheme)	29	29	0
	Maloybari	74	74	0
	Maloybari (NC)	64	64	0
Arunachal Pradesh (DTW)	Emchi	120	120	0
	Tajum (5th mile)	158	158	0
Arunachal Pradesh (Diversion)	Ganga	45	45	0
	Ngorlung	312	312	0
Tripura (DTW)	Kathal Tali	14	14	0
Tripura (Diversion)	Daspara	20	20	0
Meghalaya (DTW)	Pathar kata	135	135	0
Meghalaya (Diversion)	Kyrdem	186	186	0
Nagaland (flow)	Jakoma	46	46	0
	Seithehena	65.35	65.35	0
	Vidima	69	69	0
	Xacovi	48	48	0
Sikkim (flow)	Lower Aho	18.25	60.2	0
	Saurani	18.25	60.2	0
Sikkim (stream)	Rawtey Neopaney	99	99	0
	Timpemmindu	93	93	0
Mizoram (flow)	Theichingbung	89	89	0
	Darlak	98.4	98.4	0
Mizoram (spring)	Sidarh	70.7	70.7	0
	Siphir Kawn	114	114	0

Table 2 IPC and IPU of the sample study from North Eastern states.

At first glance, the results of these small scale irrigation projects from the North-Eastern states appear to be promising. However, it is found that in some states farmers face an excess of water and in some other states there is paucity of water. Excepting the RLI schemes of Kachari Alibari and Rangapara of Assam and states like Nagaland, Sikkim and Mizoram, the rest of the schemes

from states like Assam, Arunachal Pradesh, Tripura and Meghalaya quite often deliver excess water. The following table (table no.3) represents percentage people encountering excess water.

State	Schemes	Percentage of people encounter excess of water
Assam	Maloybari RLI	50
Arunachal Pradesh	DTW	33
	Diversion	87
Tripura	DTW	50
	Diversion	25
Meghalaya	DTW	37.5
	Diversion	50

Table 3 Percentage of respondents experiencing excess water.

It indicates serious miscalculation as the amount of excess water could have been used to irrigate more land with an increase in IPC. However, it is important to note that the gap which is shown in the official data needs to be rechecked. As the sample study suggests, the gap might be overstated to serve some specific interest.

2.3.3. Lack of awareness

This is especially true in case of major irrigation schemes. Since the water price is very low, when available, water costs nothing to the farmers and as a result there is substantive wastage at the head reach. Absence of a proper controlling device at the canal outlet promotes wastage. With substantive wastage at the head reach, people at the tailend suffer from an absence of water which reduces the IPU.

Kanshabati, one of the major irrigation projects can be taken as an example. A sample study was undertaken in six blocks by taking two blocks from head reach, middle reach and tail reach. The summary of the findings (table no.4) is given below .

Reasons	Head Reach				Middle Reach				Tail Reach			
	Baro Goaldanga	**Bekai**	**Total**	**Rank**	**Gangduary**	**Kuldoba**	**Total**	**Rank**	**Soladhar**	**Surirchalk**	**Total**	**Rank**
Do nothing, allow the water to flow over	8	8	**16**	**1**	10	5	**15**	**1**	6	9	**15**	**1**
Build a barrier at the entrance way of the water	0	0	**0**		0	0	**0**	**0**	0	3	**3**	**2**
Apply the water as there is no guarantee that he will have further water	0	0	**0**		0	0	**0**	**0**	0	0	**0**	
Lend the excess amount to somebody else	0	0	**0**		0	0	**0**	**0**	0	0	**0**	
Did nothing, just destroyed the crops	0	0	**0**		0	0	**0**		0	1	**1**	**1**
TOTAL	**8**	**8**			**10**	**5**			**6**	**13**		

Table 4 Farmers lack of awareness leading to the water loss.

Farmers at the head and middle reach did not bother to prevent the excess water from entering their fields. As a consequence, instead of flowing through, the canal water is wasted. Interestingly, people at the tail reach do try to prevent the water from entering their land (see table no. 4). Upon further questioning, the research team was told that tail enders know that by preventing the loss of water, it can be made to reach the furthest point. A similar sample study of the people of the command area of DVC has been done and it was found that they do nothing to prevent the excess water from entering their fields. They were asked whether a barrier would affect the people of the tail reach or not and their response showed the following pattern.

Reasons	**Head Reach**			**Middle Reach**			**Tail reach**		
	Babla	**Paraj**	**Total**	**Ajhapur**	**Mashagram**	**Total**	**Musapur**	**Chak Chandi Nagar**	**Total**
Affected	12	12	**24**	11	12	**23**	11	11	**22**
Not Affected	0	0	**0**	1	0	**1**	1	1	**2**
TOTAL	**12**	**12**	**24**	**12**	**12**	**24**	**12**	**12**	**24**

Table 5 Farmers' awareness about building barrier and its consequences

The response pattern suggests a serious lack of awareness among the farmers about the judicious use of available water resources. As table no 3 suggests many North Eastern states have a high percentage of people who encounter excess water. It is found that no one ever tries to conserve the excess water for future use.

2.3.4. Uncertainties

While probing for the reasons behind drawing off more water than required, it is found that there are uncertainties about the future availability of the water. Some of the major schemes like Kanshabati and Mayurakshi of West Bengal follow a canal rotation procedure. As a result of this uncertainty, when water is available people tend to draw off more water than they actually need by cutting the channels or destroying the controlling device. As a result, the water is

wasted with detrimental effects on the tail reach which promotes the gap between IPC and IPU.

2.3.5. Concealments

People are found to steal water by cutting and lifting water from channels. If a person having land far from the source applies for water, people having land closer to the source illegally drain off water from the channels. As the amount of area irrigated in the case of MI schemes depends on the number of applications, people who irrigate their land by stealing are not incorporated in the calculated IPU. On the other hand, while lifting water from the channels of the major river valley projects, it severely affects the amount of water available at the channels.

2.3.6. Situational politics and coalition

From the works of Ishikawa (1967)[14], Bolding et al (1995)[15], Hunt et al (1976)[16], Biggs and Smith (1995)[17] and from fieldwork, situational politics and curious coalitions are found associated with irrigation. Water politics has a far reaching effect on the gap between IPC and IPU.

1. With the lack of maintenance and substantive development of privately owned tube wells, irrigation is a business, supported by political power and elites. It is even reported that the coalition between people with political position and elite groups is so powerful that sometimes it

[14] Ishikawa, Shingeru (1967). "Economic Development in Asian Perspective", *Economic research series* No.8, The institute of Economic Research, Hitotsubashi University, Kinokuniya Bookstore, Tokyo

[15] Bolding Alex, Peter P Mollinga and Kees Van Straaten (1995) "Modules for Modernisation: Colocial Irrigation in India and the Technological Dimension of Agrarian Change" *The journal of Development Studies,* Vol.31, No.6 pp. 805 – 844 London: Frank Cass.

[16] Hunt, Robert C. Eva Hunt, G. Munir Ahmed, John W. Bennett, Richard K. Cleek, P.E.B. Coy, Thomas F. Glick, Russel E. Lewis, Bruce B. MacLachlan, William P. Mitchell, William L. Partridge, Barbara J. Price, Wolf Roder, Axel Steensberg, Robert Wade, Imre Wellmann (1976) 'Canal Irrigation and Local Social Organization' *Current Anthropology*, Vol. 17, No. 3 pp. 389—411.

[17] Biggs S, Smith G (1998) "Beyond Methodologies: Coalition-Building for Participatory Technology Development" *World Development*, Vol. 26. No. 2, pp. 239-248

interrupts the maintenance process of the government owned projects as that can potentially harm their business.

2. They promote the illegal usage of water.
3. Due to political interest, water tax collection is not done properly in West Bengal and in many North Eastern states there is no concept of water tax. The absence of tax has two dreaded outcomes: first, it hampers the maintenance activities; second, it gives a feeling that water is for free and people tend to undermine its value and that promotes water loss.
4. There are instances of making a barricade at the upstream of a canal, which blocks the water and prevents it from reaching and irrigating the entire CCA.

2.4. PROBLEMS WITH IRREGULAR POWER SUPPLY

There are problems with the irregularity of power supply. The detailed study reveals several factors associated with this irregularity.

1. There are the outstanding dues of the Irrigation Department to the electricity board because of the lack of funds and pending tax, which compels electricity departments to discontinue supply.
2. As running the same capacity pump with diesel is too costly for the farmers, they steal electricity by connecting hooks to the naked wires. While running high capacity pumps with illegally drawn electricity, the transformer breaks down as the load fails. Once the transformer has broken down, it takes several days to get it repaired or replaced. Throughout this period, the irrigation potential remains unutilised.

2.5. LACK OF A PROPER DISTRIBUTION SYSTEM

Apart from the absence of proper maintenance, most of the schemes suffer from a lack of proper distribution systems. The micro-level water distribution

system which connects the individual parcels of land is either not properly cemented or is simply absent and one has to depend on another source for getting the water which is expected to flow through the land. It also promotes water politics and creates a hierarchy among the farmers on the basis of the location of their land.

There are no measuring devices and controlling devices at the farm outlets to control and measure the amount of water delivered. This promotes the overuse of water and substantial wastage.

2.6. PROBLEMS WITH THE INSTITUTIONS

2.6.1. Non formation of the WUAs

Registered Water Users' Associations (WUAs) in most of the North-Eastern states and in West Bengal are yet to be formed. There are many unregistered associations but they are incapable of functioning properly. The formation process of these institutions should be quickened so that maintenance and water distribution could be handed over to them. This would ensure better irrigation management and substantively, the gap between IPC and IPU could be minimised.

2.6.2. Lack of co-ordination between the officials

The lack of coordination between the concerned departments can affect irrigation management from several dimensions:

1. It is reported that the irrigation department sets up projects with out proper needs assessment, soil testing. As a result, the created potential is not properly utilised.
2. The lack of coordination between officials at different levels creates problems of utilisation of the available grants and also delays implementation of the plans.

2.6.3. Reluctance in the collection of water tax

Throughout the project it is found that water tax collection is irregular. Many North-Eastern states lack the concept of a water tax. Apart from promoting the feeling of water as costless, it also creates problems in documentation of the IPU. As the recording of IPU in case of MI schemes in West Bengal depends on the payment of water tax, irregular tax collection will show a reduced IPU.

2.7. Reasons projected by the farmers

It is important to note that the reasons which prevent the water from reaching its intended customers are well known to the customers (see table no. 6). The following table shows the results of a sample survey on the farmers' perceptions of the gap. The respondents are the farmers of the six different blocks which falls within the command area of the DVC project of West Bengal. The open ended question resulted in the following issues which are well known to the farmers.

Reasons	Head Reach				Middle Reach				Tail Reach			
	Babla	Paraj	Total	Rank	Ajhapur	Mashagram	Total	Rank	Musapu	Chak Chandi Nagar	Total	Rank
Sufficient water not released at the time of need	1	0	**1**	**6**	0	0	**0**		0	1	**1**	**5**
Leakage of water	2	0	**2**	**5**	0	2	**2**	**4**	1	0	**1**	**5**
Lifting water from canal by pumps by some farmers	1	0	**1**	**6**	2	2	**4**	**3**	1	5	**6**	**1**
Due to breakdown of the pump	0	0	**0**		0	2	**2**	**4**	1	0	**1**	**5**
Improper maintenance of the source	0	0	**0**		0	0	**0**		1	0	**1**	**5**
Water not released in the canal	4	0	**4**	**3**	0	0	**0**		0	0	**0**	
When water is not supplied through the canal then have to depend on shallow pump/submersible pump	0	1	**1**	**6**	0	1	**1**	**5**	6	0	**6**	**1**
Water carrying capacity of the canal too low than required	0	1	**1**	**6**	1	0	**1**	**5**	1	0	**1**	**5**

Due to not renovating the canal the supply of irrigation water through canal is insufficient than required	5	1	**6**	**2**	2	5	**7**	**2**	4	2	**6**	**1**
Due to non renovation of the channel get less water than required	0	0	**0**		1	3	**4**	**3**	0	4	**4**	**3**
Not releasing water at the time of need	1	2	**3**	**4**	1	0	**1**	**5**	0	2	**2**	**4**
Lack of sufficient water in the canal	1	1	**2**	**5**	7	5	**12**	**1**	2	3	**5**	**2**
Lack of sufficient water in the channel	1	1	**2**	**5**	0	0	**0**		1	5	**6**	**1**
Water is released before cultivation starts hence get insufficient water when needed	0	0	**0**		2	0	**2**	**4**	0	2	**2**	**4**
As the canal is broken in some parts hence water gets wasted	0	0	**0**		0	0	**0**		1	0	**1**	**5**
As the gates of the canal are not repaired hence there is wastage of water	0	0	**0**		0	0	**0**		0	1	**1**	**5**
Water not released according to the need of the crop cultivated	0	0	**0**		0	0	**0**		0	1	**1**	**5**
Without announcing timely water is released leading to wastage of water	0	0	**0**		0	0	**0**		0	2	**2**	**4**
Can't say	4	9	**13**	**1**	0	0	**0**		0	0	**0**	
TOTAL	**20**	**16**			**16**	**20**			**19**	**28**		

Table 6 Issues related to the non-availability of water in the field identified by the farmers from DVC project West Bengal.

3. State Specific Issues

Apart from the issues discussed in Chapter 2, which show a cross-state manifestation, there are several other issues local in nature. These issues have the potential to mislead any grand approach for minimising the gap between the IPC and IPU. Therefore, there is a need to address and carefully understand these more local and region specific issues. The following is a list of state specific issues which are either typical in nature or are a unique combination of the common issues and therefore, demand special attention.

3.1. SEPCIFIC ISSUES IN WEST BENGAL AND ASSAM

3.1.1. Cultivation of Boro (summer paddy)

All major projects in West Bengal and Assam are designed to irrigate Kharif (rainy season paddy) and Rabi (winter paddy), but at present farmers have started cultivating *Boro* with a water duty of 1800 Hec/cumec[18] that is, the water requirement is at least three times of Kharif and seven times of Rabi crops.

It is found that *Boro* is cultivated mostly at the head reach and as a result the tail enders suffer. This lack of incorporation of *boro* leads to miscalculation of both IPC and IPU. Due to the *boro* factor, water rarely reaches the tail end and it ultimately shows the under utilisation of the created potential.

3.1.2. Overlap of IPCs of different projects

This problem mainly concerns areas covered by major and medium projects. It appears that a substantial number of minor irrigation projects are in operation

[18] Voice of Nodal officer, Major Irrigation, West Bengal.

in the command area of major or medium irrigation projects. This adds to potential created without any increase in the potential utilized.

To elucidate the point, let us consider the major irrigation project of Mayurakshi. Due to a limited amount of time, we could do a sample survey of only six blocks out of the 16 blocks in the district of Birbhum that belong to the CCA of Mayurakshi. In each block, we randomly chose one village and conducted PRA among the villagers.

Two of these six villages have additional resources to supplement their water requirement. Villages Nohana and Sarbasidanga of blocks Illambazar and Nalhati-II have one Shallow Pump and one Submersible Pump respectively. It may be recalled that both these blocks are part of the CCA of Mayurakshi. One tends to surmise that the area served by these additional resources add to the potential created, thus double counting the area under the CCA.

The PRA sample data from the present study within the command area of the DVC project suggest a number of alternative sources of water (see table no. 7).

Mouza	**Sources of irrigation available as per PRA**
Babla (Head reach)	Canal, Shallow pump (Private)
Paraj (Head reach)	Canal, Shallow pump (Private)
Ajhapur (Middle reach)	Canal, Shallow pump (Private), Pond (Private)
Mashagram (Middle reach)	Canal, Shallow pump (Private)
Musapur (Tail reach)	Canal, Submersible pump (Private), Pond (Private)
Chak Chandi Nagar (Tail reach)	Canal, Submersible pump (Private), Pond (Private)

Table 7 Alternative sources of irrigation under the DVC command area.

Interestingly, there are privately owned minor irrigation schemes in operation even in the head reach, where it is expected that water should have been available. These findings can be substantiated from farmers' adjustments when they encounter scarcity of water (Table no. 8). The following table shows farmers' adjustments.

Reasons	Head Reach				Middle Reach				Tail Reach			
	Babla	**Paraj**	**Total**	**Rank**	**Ajhapur**	**Mashagram**	**Total**	**Rank**	**Musapur**	**Chak Chandi Nagar**	**Total**	**Rank**
Borrow water from somebody else	0	0	**0**		0	0	**0**		0	0	**0**	
Buy water from somebody else	8	4	**12**	**1**	0	8	**8**	**1**	9	3	**12**	**1**
Change my cropping pattern	0	0	**0**		2	0	**2**	**5**	0	2	**2**	**3**
Had to loan some amount	0	0	**0**		5	1	**6**	**2**	1	0	**1**	**4**
Had to buy seeds/fertilisers at higher price in lieu of water	0	0	**0**		0	0	**0**		0	0	**0**	
Do nothing, crops get destroyed/lost in the field	4	8	**12**	**1**	2	1	**3**	**4**	0	7	**7**	**2**
Never faced such kind of problem	0	0	**0**		3	2	**5**	**3**	2	0	**2**	**3**
TOATL	**12**	**12**			**12**	**12**						

Table 8 Farmers' adjustments with the paucity of water from DVC.

The table shows an adequate development of a water market as one always has the option to purchase water. The numbers of the cases where people are left with no choices is high in the head reach and significantly low in the middle and tail reach (see table no. 8). It indicates the fact that, as the middle and tail reach people who often face the problem of lack of sufficient water, they already have a better alternative infrastructure.

In a similar way, six villages under Kangsabati CCA were also surveyed. Out of these six villages, the villagers of Surirchalk in Goghat block use one Shallow Pump and one Submersible Pump, in addition to the usual source of water from the canal.

To substantiate the argument one might like to see the adjustment people make when there is scantiness of water in the command area. The following table (table no. 9) represents the various possible means of adjustments followed by the farmers within the command area of Kanshabati, West Bengal.

Reasons	Head Reach				Middle Reach				Tail Reach			
	Baro Goaldanga	Bekai	Total	Rank	Gangduary	Kuldoba	Total	Rank	Soladhar	Surirchalk	Total	Rank
Borrow water from somebody else	0	0	**0**		0	0	**0**		0	0	**0**	
Buy water from somebody else	2	1	**4**	**2**	0	0	**0**		0	6	**6**	**2**
Change my cropping pattern	0	0	**0**		2	0	**2**	**3**	0	0	**0**	
Had to loan some amount	0	0	**0**		0	0	**0**		0	0	**0**	
Had to buy seeds/fertilisers at higher price in lieu of water	0	0	**0**		0	0	**0**		0	0	**0**	
Do nothing, crops get destroyed/lost in the field	2	1	**3**	**3**	0	12	**12**	**1**	8	1	**9**	**1**
Lift water by pump	2	9	**11**	**1**	10	0	**10**	**2**	2	0	**2**	**4**
Never faced such kind of problem	4	0	**4**	**2**	0	0	**0**		1	4	**5**	**3**
Never took any steps	1	0	**1**	**4**	0	0	**0**		1	1	**2**	**4**
Having stopped farming	0	1	**1**	**4**	0	0	**0**		0	0	**0**	
TOTAL	**12**	**12**			**12**	**12**			**12**	**12**		

Table 9 Farmers' adjustment to cope with the paucity of water from Kansabati Project, West Bengal.

It is quite clear that people have alternative potential (see table 8 and 9) within the command area. They manage to irrigate their land by lifting water or by purchasing water. Four out of twelve farmers at the head and tail reach reported that they never faced a paucity of water. It is understandable that people at the head reach almost always get water to irrigate their land and it is well documented that the tailenders suffer the most. The present data do not contradict the fact but rather add another important dimension that people at the tail reach have already developed an alternative mechanism to continue irrigation and that prevents their land getting desiccated

The picture becomes clearer with the data collected through PRA. The following is a table (table no. 10) shows the sources of water people use for irrigation within the command area.

Mouza	**Sources of irrigation available as per PRA**
Baro Goaldanga (Head reach)	Canal, Pond (Private)
Bekai (Head reach)	Canal, Pond (1 Private & 1 Irrigation Department)
Gangduary (Middle reach)	Canal, Well (Private)
Kuldoba (Middle reach)	Canal, Pond (Private)
Soladhar (Tail reach)	Canal, Pond (2 Private & 1 Irrigation Department)
Surirchalk (Tail reach)	Canal, Shallow pump (Private), Submersible pump (Private), Pond (Private)

Table 10 Alternative sources of irrigation under the Kansabati command area

The number of ponds at the head reach presents the possibility that these ponds might be used to store water from the canal to meet further needs (see table no. 10). However, while superimposing the data about farmers' encounter with excess water, it can be argued that farmers rather drain off more water which gets stored at those ponds. This storage might lead to the lesser utilisation of the created potential.

The Annual Report 2005-06 of Kangsabati Command Area Development Authority (KCADA) mentions that it provides "technical help, advice and guidance free of cost implementing such [RLI etc] irrigation schemes that are patronized by it within its command area." Under KCADA, "up to 2003-2004 a total area of 10,212 ha has been covered and brought under

irrigation" through installation of STWs, LDTW, DTW, Dugwell, RLI etc at a cost of Rs. 2.26 crores. However, the irrigation potential shown in the same annual report is fixed at 3,18,400 ha for Kharif and 60,629 ha for Rabi since 1988-89. As reported, the irrigation potential utilized, on the whole however, has been on the decline over years. It is not clear where exactly this additional 10,212 ha brought under irrigation has been accounted for.

During interactions, it appeared that many other villages in the CCAs of DVC, Mayurakshi and Kangsabati have similar additional minor irrigation facilities, though no exact figure could be obtained. Needless to mention that, these minor irrigation facilities in a CCA of a major irrigation project may create an inflated figure for the irrigation potential created without any addition to the irrigation potential utilized. Non-availability of appropriate field channels, and uncertainty about the amount of water made available have been cited as the main reasons for these minor irrigation projects. Requirement of 'excessive' amount of water during boro cultivation, in addition to water available from usual sources during summer, may be one of the other reasons. It may also be noted that the two blocks of the Mayurakshi CCA discussed belong to the eastern and south-western fringes of the CCA.

A clear picture about this overlap between major/medium and minor projects can only emerge if during MI census, one looks into this aspect, and collects and collates the relevant data regarding overlap.

However, it is important to note that similar condition prevails in Assam, as the research team was informed by the officials.

3.2. OTHER ISSUES IN WEST BENGAL

3.2.1. Contradiction between records and reality

The Irrigation Potential Utilized as documented in official data and the irrigation potential utilized by the farmers differ substantially.

We use the major project in Mayurakshi as an example. For the purpose of our discussion, we concentrate only on the blocks in the Birbhum district

covered by the project, since our field studies covered some of these blocks. During our field survey, we collected data from villagers of two Mouzas each from Head Reach, Middle Reach, and Tail Reach parts. In addition to conducting PRA in each of these six Mouzas, 12 villagers in each Mouza were individually interacted with to ascertain the efficacy of irrigation as experienced by them. Following is a summary of the data collected (see table no 11). The table covers irrigation facilities used only during Kharif season, since the official data, discussed later, is also on the basis of Kharif. The data related to 2007-2008.

Mouza	**Total sample**	**Total land (including all type of land)** (in bigha)	**Total cultivatable land** (in bigha)	**Total land irrigated (only Kharif)** (in bigha)	**Land irrigated thru major (only Kharif)** (in bigha)	**Land irrigated thru medium (only Kharif)** (in bigha)	**Land irrigated thru minor (only Kharif)** (in bigha)
Kulara	12	43.45	40.4	6.25	6.25	0	0
Giripur	12	115.8	113	98	98	0	0
Total of Head Reach	**24**	**159.25**	**153.4**	**104.25**	**104.25**	**0**	**0**
Mirzapur	12	62.6	57.65	57.25	0	0	57.25
Bhaddapur	12	45	42.75	8.5	0	0	8.5
Total of Middle Reach	**24**	**107.6**	**100.4**	**65.75**	**0**	**0**	**65.75**
Fatehpur	12	49.6	46.5	43.5	0	0	43.5
Sarbasidanga	12	34.5	32	32	32	0	0
Total of Tail Reach	**24**	**84.1**	**78.5**	**75.5**	**32**	**0**	**43.5**
Total of all reaches	**72**	**350.95**	**332.3**	**245.5**	**136.25**	**0**	**109.25**
Percentage			**100**	**73.9**	**41.00**	**0**	**32.88**

Table 11 Substantive development of minor irrigation schemes within the command area of Mayurakshi, Major Irrigation project.

Thus a total of 73.9% of land is irrigated during Kharif, of which 41% is fed by water from the major project. The two mouzas in the Head Reach and one in the Tail Reach benefit most from the Major project during the Kharif season. (It may be worth pointing out that the average distances of the mouzas in the

Head, Middle and Tail reaches are 0.82 km, 1.67 km and 1.6 km respectively, with the Sarbasidanga mouza in the Tail reach being at a distance of 0.52 km.)

However, as per data made available from official sources, the CCA and IPC for the 16 blocks in Birbhum are the same and quoted as 3,97,550 acre. Out of this IPC, 3,92,846 acre is claimed under IPU. Thus the official IPU is about 98.8% of IPC, whereas only 41% of the cultivable land of the sampled villagers covered by the IPC actually benefit from the major project. Our sample study shows **there is a gap of 57.8% between what is reported as IPU, and the irrigation potential utilized by the villagers**.

A similar situation is also encountered in the case of the Kangsabati project. There are discrepancies between the official data and the survey data. The following table (table no. 12) shows the amount of land in our sample that actually gets the benefit of the project.

Mouza	**Total sample**	**Total land (including all land)** (in bigha)	**Total cultivatable land** (in bigha)	**Total land irrigated (only Kharif)** (in bigha)	**Land irrigated thru major (only Kharif)** (in bigha)	**Land irrigated thru minor (only Kharif)** (in bigha)
Baro Goaldanga	12	51.1	47.55	46.55	46.55	0
Bekai	12	14.55	11.15	10.65	10.65	0
Total of Head Reach	**24**	**65.65**	**58.7**	**57.2**	**57.2**	**0**
Gangduary	12	41.85	37.5	20	20	0
Kuldoba	12	74.85	61.6	7	5	2
Total of Middle Reach	**24**	**116.7**	**99.1**	**27**	**25**	**2**
Soladhar	12	16	11.9	8	8	0
Surirchalk	12	51.8	48.3	43.3	0	43.3
Total of Tail Reach	**24**	**67.8**	**60.2**	**51.3**	**8**	**43.3**
TOTAL	**72**	**250.15**	**218**	**135.5**	**90.2**	**45.3**
Percentage			**100**	**62.16**	**41.38**	**20.78**

Table 12 Actual amount of land getting irrigation from Kansabati Project.

It is important to note that as the distance from the source increases, the project loses its effectiveness and the gap is filled up by the minor schemes. While comparing with the official data in terms of percentage equation (see table no. 13 and figure 2) the data shows the following discrepancies.

	CCA (acre)	IPC (acre)	IPU (acre)
Percentage equation of Official Data	8,42,000	6.70.000	6.70.000
	100%	**79.57%**	**79.57%**
Percentage equation of sample survey	**100%**	**62.16%**	**41.38%**
		-17.41%	**-38.19%**

Table 13 Percentile difference between the official data and survey data.

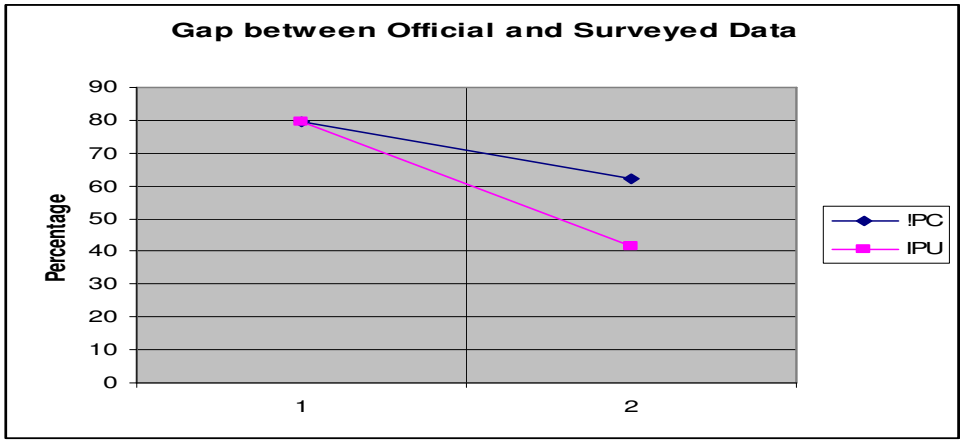

Figure 2 Percentile difference between the official data and survey data

Another well known major project in West Bengal, the DVC, shows discrepancies between the official and the survey data. Following is a table (table no. 14) which shows the actual amount of land getting the irrigation facilities.

Mouza	**Total sample**	**Total land (including all land)** (in bigha)	**Total cultivatable land** (in bigha)	**Total land irrigated (only Kharif)** (in bigha)	**Land irrigated thru major (only Kharif)** (in bigha)	**Land irrigated thru minor (only Kharif)** (in bigha)
Babla	12	138.75	116	115	115	0
Paraj	12	159	137	130	130	0
Total of Head Reach	**24**	**297.75**	**253**	**245**	**245**	**0**
Ajhapur	12	165	197	157	157	0
Mashagram	12	116	137	115	115	0
Total of Middle Reach	**24**	**281**	**334**	**272**	**272**	**0**
Musapur	12	174	154	96	80	16
Chak Chandi Nagar	12	126.5	111	111	111	0
Total of Tail Reach	**24**	**300.5**	**265**	**207**	**191**	**16**
TOTAL	**72**	**879.25**	**852**	**724**	**708**	**16**
Percentage			**100**	**84.98**	**83.10**	**1.88**

Table 14. Actual amount of land getting water in DVC project.

The increasing use of minor irrigation schemes indicates the failure of DVC to provide adequate water to the middle and tail reach of its command area.

The percentile equation of the official data and the survey data shows the following differences (table no 15 and figure 3).

	CCA (acre)	IPC (acre)	IPU (acre)
Percentage equation of Official Data	9,73,000	8,31,496	8,21,547
	100%	**85.46%**	**84.43%**
Percentage equation of sample survey	**100%**	**84.98%**	**83.10%**
		-0.48%	**-1.33%**

Table 15 Percentile difference between the official data and survey data

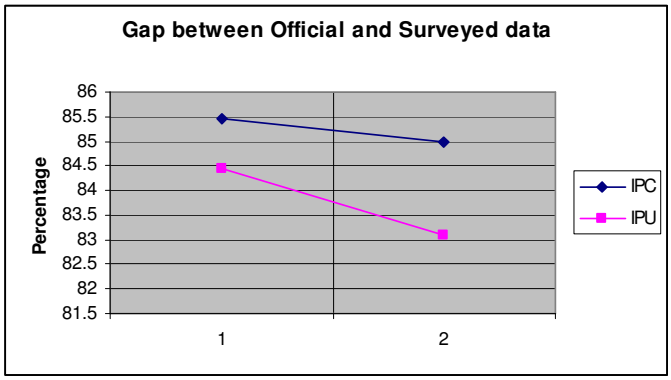

Figure 3 Percentile difference between the official data and survey data

We came across similar discrepancies in medium projects as well. For example, consider the Kumari (see table no. 16). As per the A.E. of the Project, the following is the official data about the project for the year 2007-08

Total no. of Mouzas	CCA in acre			IPC in acre			IPU in acre		
	Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
11	9000	1500	10500	9000	1500	10500	6500	1500	8000
IPC is 100% of CCA; Officially, IPU is about 76% of CCA/IPC									

Table 16 CCA, IPC and IPU of the Kumari Project, West Bengal.

However, when we interacted with 12 villagers each from three Mouzas in the CCA, we get a different picture for 2007-08, as summarized below (see table no.17).

Mouza	**Total land (including all land)** (in bigha)	**Total land cultivated** (in bigha)			**Land irrigated thru medium** (in bigha)			**Land irrigated thru minor** (in bigha)		
		Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
Ada-bona	41.15	25	0.65	25.65	17	0.65	17.65	8	0	8
Bamu-ndiha	103.05	57	0.2	57.2	0	0	0	57	0.2	57.2
Khari-pahari	78.95	61	1.55	62.55	39	0.7	39.7	22	0.85	22.85
Total	223.15	143	2.4	145.4	56	1.35	57.35	87	1.05	88.05
%age				100			39.4			60.6

Table 17. Area getting benefit from the Kumari Project.

Thus only 39.4% of the cultivated land in these three mouzas get the benefit of the Kumari project, while, overall, 76% of IPC has been utilized as per official data.

From the discussions above, it is clear that cultivable lands in mouzas officially covered under major and medium projects are not getting the water they were supposed to receive. Land which does not get the expected support from the project either fully depends on rain water, or supplements the availability through minor projects, most of which are under private operators. The discrepancies actually indicate serious miscalculation and possible overstatement of the potential utilized. The potential reasons for the non availability of the water which came out of our continuous field interaction, have already been discussed.

3.3. OTHER ISSUES IN ASSAM

3.3.1. Defunct in reality but alive on paper

An interesting finding, worth mentioning is the medium project Sukla. The sample survey was done by incorporating one mouzas each from the head reach, middle reach and tail reach to understand the situation. The findings are given in the form of a table (table no. 18).

Mouza	**Total Sample**	**Total land** (in bigha)	**Total land cultivated** (in bigha)			**Total land irrigated (only Kharif & Rabi)** (in bigha)			**Land irrigated thru Sukla (only Kharif & Rabi)** (in bigha)			**Land irrigated thru minor (only Kharif & Rabi)** (in bigha)		
			Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
Pachim Naokata (Head reach)	6	38.35	30	0	30	30	0	30	0	0		30	0	30
Ramchaghar (Middle reach)	6	48.4	38	0	38	38	0	38	0	0	0	38	0	38
Pubpar Joytia Vangra (Tail reach)	6	37.5	37.15	27	64.15	37.15	27	64.15	0	0	0	37.15	27	64.15
Total	**18**	**124.25**	**105.15**	**27**	**132.15**	**105.15**	**27**	**132.15**	**0**	**0**	**0**	**105.15**	**27**	**132.15**

Table 18 Shukla: a non functioning scheme.

Farmers use rain water during Kharif season and for Rabi they depend on the privately owned Deep Tube Wells. Local people indicated that the situation is a mixed outcome of the above mentioned reasons. Whereas official data[19] shows Sukla is a completed and functional scheme, the present data shows just the reverse.

3.3.2. Insufficiency of water

From table no. 2 it appears that in Assam the water need is satisfied. However, with further probing, it is found that almost exclusively the amount of water received is not satisfactory. The following table (Table no 19) represents farmers' adjustment to the situation of scarceness of water in the Rani Scheme, Assam.

Adjustments made	**Kachari Alibari**		**Rangapara**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		0	
Had to loan some amount	1	**2**	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Never took any steps	7	**1**	8	**1**
TOTAL	**8**		**8**	

Table 19 Farmers' adjustment with the paucity of water, Rani Scheme Assam.

The reasons that farmers pointed out include the following:

Reasons	**Kachari Alibari**		**Rangapara**	
	No. of responses	Rank	No. of responses	Rank
Lack of sufficient water in the river	7	**1**	8	**1**
Don't know	1	**2**	0	
TOTAL	**8**		**8**	

Table 20 Possible reasons for the paucity of water at Rani Scheme.

[19] Pleas see http://irrigassam.nic.in/achievement.htm\Major & Medium Projects-1.mht

Similarly the Maloy Bari scheme shows that the water is made available to the entire command area (see table 2), but farmers quite often face a paucity of water in terms of volume. Their patterns of adjustment are given in the following table (table 21).

Adjustments made	**Maloybari**		**Maloybari NC**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		0	
Had to loan some amount	2	**2**	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Never took any steps	6	**1**	8	**1**
TOTAL	**8**		**8**	

Table 21 Farmers' adjustment with the paucity of water, Maloybari scheme Assam.

The reasons Maloybari Farmers put forth are given in the table no.22.

Reasons	**Maloybari**		**Maloybari NC**	
	No. of responses	Rank	No. of responses	Rank
Lack of sufficient water in the river	8	**1**	7	**1**
No such incidence faced	0		1	**2**
Don't know	0		0	
TOTAL	**8**		**8**	

Table 22 Possible reasons for the paucity of water at Maloybari Scheme.

As the response patterns reflect (see table 19, 20, 21 and 22), farmers' are left with no choice or alternative when they face the problem of the water availability. The principal reason behind the scarcity is the paucity of water in the river. It indicates that the non-availability of water can be the result of factors like problems of calculation, and maintenance (please see issue no. 2.1 and 2.2). However, issues like maintenance are related to a more local issue such a political unrest.

3.3.3. Political Unrest

Assam reports that political unrest and increasing militant activities in rural areas forced people not to cultivate. There are areas where militants compel people to avoid utilizing government provided incentives and irrigation facility is one of them. Moreover, they halt any progress of a new project or repairing of an ongoing project by threatening the government officials and engineers. The political unrest delays progress in the projects and also increases the gap between the IPC and IPU.

3.4. SPECIFIC ISSUES IN ARUNACHAL PRADESH

As table no 2 suggests, water in the present sample study in Arunachal Pradesh irrigates the entire command area. Like Assam, Arunachal Pradesh also faces a problem with water volume. Farmers report that they are to make certain adjustments. In Emchi and Tajum, under the DTW scheme, farmers make the following adjustments (see table no 23).

Adjustments made	**Emchi**		**Tajum (5th mile)**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		0	
Had to loan some amount	0		0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Do nothing, crops get destroyed/lost in the field	1	**2**	5	**1**
Never faced such kind of problem	7	**1**	2	**2**
Buy fuel for the pump out of our pocket	0		1	**3**
TOTAL	**8**		**8**	

Table 23 Farmers' adjustment with the paucity of water, in DTW scheme at Emchi and Tajum, Arunachal Pradesh.

Table no 23 shows that the problem increases as the distance from the source increases. Scarcity quite often leads to a dreaded situation where the crop gets destroyed.

The reasons according to farmers are the following (see table no 24).

Reasons	**Emchi**		**Tajum (5th mile)**	
	No. of responses	Rank	No. of responses	Rank
Negligence in the works of the authorities	0		1	**2**
No such incidence faced	7	**1**		
Improper maintenance of the source	0		8	**1**
Due to less rainfall	1	**2**	0	
No alternate source of irrigation	1	**2**	0	
TOTAL	**9**		**9**	

Table 24 Possible reasons for the paucity of water in DTW scheme at Emchi and Tajum, Arunachal Pradesh.

Living with the prolonged uncertainty of the water availability, farmers indicate the need for an alternative source of irrigation, and not mere repairing. Farmers from the tail reach argued that the improper maintenance (please see issue no. 2.2 for a detailed discussion) is the main reason for the paucity of water.

Similar data came up with the diversion scheme studied. Due to the scantiness of water farmers regularly make the following adjustments.

Adjustments made	**Ganga**		**Ngorlung**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		1	**3**
Had to loan some amount	1	**3**	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Do nothing, crops get destroyed/lost in the field	2	**2**	3	**2**
Never faced such kind of problem	5	**1**	4	**1**
TOTAL	**8**		**8**	

Table 25 Farmers' adjustment with the paucity of water, in diversion scheme at Ganga and Ngorlung Arunachal Pradesh.

Though the number of respondent who faced a problem with the paucity of water is low but whenever they faced such a problem, either their crop was destroyed or they had to go for loan at a very high interest to reinvest (please

see table no. 25). They exclusively reported that the possible reason is the lack of adequate rainfall. As they quite frequently face a paucity of water, it demands attention for a proper calculation of the IPC (please see issue no. 2.1 for detail).

3.5. SPECIFIC ISSUES IN TRIPURA

Table 26 shows the problem with the amount of water in Tripura, which is not sufficient.

The minor DTW scheme at Kathal tali, shows that the farmers make the following adjustments to cope with the scarceness of water (table 26).

Adjustments made	**Kathal Tali**	
	No. of responses	Rank
Borrow water from somebody else	0	
Buy water from somebody else	0	
Change my cropping pattern	1	**2**
Had to loan some amount	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0	
Do nothing, crops get destroyed/lost in the field	6	**1**
Never faced such kind of problem	1	**2**
TOTAL	**8**	

Table 26 Farmers' adjustment with the paucity of water, in DTW scheme at Kathal Tali, Tripura.

Table no. 26 shows that as scarceness of water is a frequent phenomena, people have decided to change the cropping pattern, most likely by switching over to a draught resistant crop. Still a large number of farmers in the sample report that their crop gets destroyed. The reasons for the non-availability of water, according to the farmers are as follows (see table no. 27).

Reasons	Kathal Tali	
	No. of responses	Rank
Sufficient water not released at the time of need	1	**2**
No such incidence faced	1	**2**
Unsatisfactory supply of electricity	1	**2**
Due to breakdown of the pump	1	**2**
Improper maintenance of the source	4	**1**
Due to fall in the level of the water	4	**1**
Installed capacity of the pump insufficient to supply sufficient water to all lands	1	**2**
TOTAL	**13**	

Table 27. Possible reasons for the paucity of water in DTW scheme at Kathal Tali, Tripura.

As table no 27 indicates, the possible reasons are a combination of the problem of calculation (please see issue no. 2.1), problems with the power supply (please see issue no. 2.4) and lack of proper maintenance (see issue no. 2.2).

A sample study at the Daspara diversion scheme has shown the following adjustments made by the farmers to cope with the scarcity of available water.

Adjustments made	Daspara	
	No. of responses	Rank
Borrow water from somebody else	0	
Buy water from somebody else	0	
Change my cropping pattern	0	
Had to loan some amount	0	
Had to buy seeds/fertilisers at higher price in lieu of water	1	**3**
Do nothing, crops get destroyed/lost in the field	5	**1**
Never faced such kind of problem	2	**2**
TOTAL	**8**	

Table 28 Farmers' adjustment with the paucity of water, in diversion scheme at Daspara, Tripura.

Important to note is that in a draught situation, farmers are left with no choice and in a few cases they re-start the process of cultivation (see table no 28). The reasons, which farmers feel are important are the following.

Reasons	Daspara	
	No. of responses	Rank
Due to less rainfall	4	**2**
Land is at a higher level than the source	1	**3**
Lack of alternate source of irrigation	4	**2**
Improper infrastructure for irrigation like lack of channels	1	**3**
Lack of sufficient water in the Jhora	5	**1**
Due to fall in the level of the water	1	**3**
TOTAL	**16**	

Table 29 Possible reasons for the paucity of water in diversion scheme at Daspara, Tripura.

Table no 29 indicates that factors like miscalculation (see issue no. 2.1), lack of regular update of the IPC (see issue no. 2.1.2), and lack of a proper distribution system (see issue no. 2.5) are the prime reasons for the lack of water availability.

3.6. SPECIFIC ISSUES IN MEGHALAYA

Meghalaya's minor irrigation schemes in the present sample study reflect that the water sufficiently irrigates the command area (please see table no. 2), but the amount of water received does not meet the need. As the following table shows, at Pathar Kata, under the DTW scheme farmers are compelled to make the following adjustments.

Adjustments made	Pathar Kata	
	No. of responses	Rank
Borrow water from somebody else	1	**2**
Buy water from somebody else	0	
Change my cropping pattern	0	
Had to loan some amount	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0	
Do nothing, crops get destroyed/lost in the field	1	**2**
Never took any steps	6	**1**
TOTAL	**8**	

Table 30 Farmers' adjustment with the paucity of water, in DTW scheme of Pathar Kata, Meghalaya.

As the table shows (table no 30), mostly, farmers do nothing, as they have no alternative means to save their investment. The reasons, they feel, that lead to the situation at Pathar Kata, are the following.

Reasons	Pathar Kata	
	No. of responses	Rank
Due to less rainfall	1	**3**
No such incidence faced	5	**1**
Unsatisfactory supply of electricity	2	**2**
Due to breakdown of the pump	1	**3**
Improper infrastructure for irrigation like lack of channels	1	**3**
Installed capacity of the pump insufficient to supply sufficient water to all lands	1	**3**
Lack of any system of storing excess water	1	**3**
TOTAL	**12**	

Table 31 Possible reasons for the paucity of water in DTW scheme of Pathar Kata, Meghalaya.

The reasons are the combined outcome of the problems of proper calculation (please see issue no. 2.1), lack of maintenance (please see issue no. 2.2), and lack of proper distributive system (please see issue no. 2.5) & other infrastructure facilities.

3.7. SPECIFIC ISSUES IN NAGALAND

Nagaland faces the problem of adequate supply of water, though the schemes studied irrigates the entire command area (please see table no. 2). The following table (Table 32) represents farmers' adjustments with the scantiness of water.

Adjustments made	**Jakoma**		**Seithehena**		**Vidima**		**Xacovi**	
	No. of responses	Rank	No. of responses	Rank	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0		0		0	
Buy water from somebody else	0		0		0		0	
Change my cropping pattern	0		0		0		0	
Had to loan some amount	0		0		0		0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0		0		0	
Never took any steps	8	**1**	8	**1**	8	**1**	8	**1**
TOTAL	**8**		**8**		**8**		**8**	

Table 32 Farmers' adjustment with the paucity of water, in different flow irrigation schemes at Nagaland.

Table no. 32 suggests it is highly likely that people have no alternative to cope with the problem of water availability. The reasons of the paucity of water are the following.

Reasons	**Jakoma**		**Seithehena**		**Vidima**		**Xacovi**	
	No. of responses	Rank	No. of responses	Rank	No. of responses	Rank	No. of responses	Rank
Due to less rainfall	4	**1**	6	**1**	8	**1**	8	**1**
Sufficient water not released at the time of need	0		1	**3**	0		0	
Leakage of water	0		1	**3**	0		0	
No such incidence faced	1	**3**	0		0		0	
Improper infrastructure for irrigation like lack of channels	0		2	**2**	0		0	
Improper distribution of water	0		1	**3**	0		0	
Improper maintenance of the source	0		1	3	0		0	
No cultivation done	2	**2**	0		0		0	
Drying up of the source of irrigation water	1	**3**	0		0		0	
TOTAL	**8**		**12**		**8**		**8**	

Table 33 Possible reasons for the paucity of water in different flow irrigation schemes at Nagaland.

The multiplicity of reasons (see table no. 33) indicates the problems of calculation (see issue no. 2.1) and improper distributive system (see issue no. 2.5).

Non agricultural uses of the agricultural land:

There is a significant amount of land within the command area being used for non-agriculture purposes. Though it is contestable whether this non-agriculture

use will significantly contribute to the gap, but it is important to note that Nagaland is very mountainous and has small irrigation schemes that can get severely affected by any large scale construction activities.

Heavy monsoon and non utilisation of the IPC

Nagaland experiences heavy monsoon for 4 – 5 months in a year and most of the farmers effectively use the rain water and avoid taking irrigation water.

Festive season and reluctance to cultivate: a shift in occupation

During the winter season most of the land within the command area remains barren as villagers show a reluctance to cultivate. They consider the winter season a festive season and they prefer to do animal grazing. During that period they use their land for animal grazing and not for agriculture.

3.8. SPECIFIC ISSUES IN SIKKIM

The sample study of Sikkim shows that the schemes are capable of irrigating the entire command area (see table no. 2) but the problem lies in the amount or the volume of water being delivered. With frequent incidence of insufficiency of water, farmers report that they make the following adjustments to cope with the situation.

Adjustments made	**Lower Aho**		**Saurani**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	4	**1**	0	
Change my cropping pattern	0		0	
Had to loan some amount	0		0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Do nothing, crops get destroyed/lost in the field	1	**3**	1	**2**
Never faced such kind of problem	3	**2**	7	**1**
TOTAL	**8**		**8**	

Table 34 Farmers' adjustment with the paucity of water, in different flow irrigation schemes at Sikkim.

It is worth noticing that a considerable number of farmers in the sample study has an alternative source of water from where they can borrow (see table no. 34). A chance of double counting o the IPC is highly likely. According to the farmers, the following reasons are responsible for the paucity of water (table no. 35).

Reasons	**Lower Aho**		**Saurani**	
	No. of responses	Rank	No. of responses	Rank
Due to less rainfall	8	**1**	5	**1**
Sufficient water not released at the time of need	0		2	**3**
No such incidence faced	0		3	**2**
TOTAL	**8**		**10**	

Table 35 Possible reasons for the paucity of water in different flow irrigation schemes at Sikkim.

The reasons indicate the serious miscalculation (please see issue no. 2.1).

Stream irrigation scheme of Rawtey Neopaney and Timpemmindu in Sikkim reflects the same situation. The farmers' adjustments are given in the following table.

Adjustments made	**Rawtey Neopaney**		**Timpemmindu**	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		0	
Had to loan some amount	0		0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Never faced such kind of problem	8	**1**	8	**1**
TOTAL	**8**		**8**	

Table 36 Farmers' adjustment with the paucity of water in Rawtey Neopaney and Timpemmindu stream irrigation schemes at Sikkim.

As the table 36 suggests the paucity of water never compelled farmers to take a serious step or to make adjustments but they reported the following reasons for the paucity of water.

Reasons	Rawtey Neopaney		Timpemmindu	
	No. of responses	Rank	No. of responses	Rank
Due to less rainfall	8	**1**	1	**2**
No such incidence faced	0		7	**1**
Drying up of the source of irrigation water	1	**3**	0	
Lack of any system of storing excess water	2	**2**	0	
TOTAL	**11**		**8**	

Table 37 Possible reasons for the paucity of water in Rawtey Neopaney and Timpemmindu stream irrigation schemes at Sikkim.

3.9. SPECIFIC ISSUES IN MIZORAM:

In Mizoram, the irrigation water covers the entire command area. However, like other North Eastern states, farmers from Mizoram report a scarcity of water.

The sample study on the flow and perennial source irrigation at Theichingbung shows that farmers face a paucity of water.

Adjustments made	Theichingbung	
	No. of responses	Rank
Borrow water from somebody else	0	
Buy water from somebody else	0	
Change my cropping pattern	0	
Had to loan some amount	0	
Had to buy seeds/fertilisers at higher price in lieu of water	0	
Never took any steps	8	**1**
TOTAL	**8**	

Table 38 Farmers' adjustment with the paucity of water in Theichingbung scheme in Mizoram.

Table 38 shows that farmers never took steps to adjust with the situation of insufficiency of water. However they have identified the following reasons.

Reasons	Theichingbung	
	No. of responses	Rank
Due to less rainfall	6	**2**
Lack of alternate source of irrigation	1	**1**
No such incidence faced	1	**1**
Number of tanks fewer than needed	1	**1**
TOTAL	**9**	

Table 39 Possible reasons for the paucity of water in Theichingbung scheme in Mizoram.

It is needless to mention that the paucity of rainfall should not be a problem for a perennial irrigation scheme. The problem lies in the calculation of IPC as discussed in 2.1.

Similarly Darlak Scheme of Mizoram shows that farmers are left with no alternative when the water is not sufficient, however the problem is with the calculation.

Another stream diversion scheme of Sidarh and Siphir Kawn, shows that farmers are bound to make adjustments when the water is not sufficiently available.

Adjustments made	Sidhar		Siphir Kawn	
	No. of responses	Rank	No. of responses	Rank
Borrow water from somebody else	0		0	
Buy water from somebody else	0		0	
Change my cropping pattern	0		0	
Had to loan some amount	0		0	
Had to buy seeds/fertilisers at higher price in lieu of water	0		0	
Never faced such kind of problem	8	**1**	6	**1**
Do nothing, crops get destroyed/lost in the field	0		2	**2**
TOTAL	**8**		**8**	

Table 40 Farmers' adjustment with the paucity of water in Sidhar and Siphir Kawn scheme in Mizoram

Quite clearly, the paucity of water is not a regular issue, but whenever it happens, farmers are left with no choice (see table no 40).

Farmers from the Sidhar and Siphir Kawn have reflected upon certain reasons which create the problem of water availability. The following table reflects the reasons behind the paucity of water.

Reasons	Sihdarh		Siphir Kawn	
	No. of responses	Rank	No. of responses	Rank
Due to less rainfall 1	7	**1**	5	**1**
Insufficient water reserve in the reservoir 11	0		3	**2**
Alternate source of irrigation fewer than needed 15	2	**2**	0	
Drying up of the source of irrigation water 37	0		1	**3**
Number of tanks fewer than needed 46	2	**2**	0	
TOTAL	**11**		**9**	

Table 41 Possible reasons for the paucity of water in Sidhar and Siphir Kawn scheme in Mizoram

The reasons (see table no. 41), reflect the problems of calculation (please see issue no. 2.1), and problems with the infrastructure (please see issue no. 2.5). However, there are some other localised problems which contribute to the gap between IPC and IPU at Mizoram. The following is a list of those problems:

Wrong estimation of crop water requirement

Mizoram reports that the IPC is based on the water requirement of paddy, but for a considerable amount of area, farmers perform horticulture and the crop is not paddy and requires lesser water ultimately leading to the underutilisation of the created potential.

Migration

A significant number of people have stopped cultivation and many more have left their original place. As the labour demand and payment is much higher in urban sectors it is not easy to get suitable labour to continue agriculture. However, the flow of unskilled labourers from Assam is common. They share $1/3^{rd}$ of Kharif and $2/3^{rd}$ of the Rabi crop with the landlords. Even then, a vast area within command remains barren.

4. Relative inputs of the factors contributing to the gap:

Common factors (discussed in section. 2) in different states have their varying contributions to the evidential gap. Following is a table (table 42) representing the common issues and sub issues with their relative impact on the gap in different states.

Factors		WB		Assam		Sikkim		Ar P		Tripura		Meghalaya		Mizoram		Nagaland	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Problems with miss calculation.	2.1.1 IPC calculation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2.1.2 Updates		3		2		2		2		2		2		2		2
	2.1.3 Undermining demand		4		5						3				4		3
	2.1.4. Non incorporation of Pvt. Facilities		2		6						6				6		4
	2.1.5 Initial calculation of IPC		5		3		4		3		5		4		3		6
	2.1.6. Potential in less suitable area		6		4		3		4		4		3		5		5
Maintenance	2.2. lack of maintenance	2		2		2		2		2		2		2		2	
Socio-political factors.	2.3.1 Non utilisation	3	5	3	5	3	3	3	1	3	1	3	1	3	1	3	1
	2.3.2. IPC understated		6		6		1		6		6		2		6		3
	2.3.3. lack of awareness		1		1		2		2		2		3		2		2
	2.3.4. uncertainties		3		3		6		5		3		5		3		4
	2.3.5 Concealments		4		4		5		4		4		6		5		5
	2.3.5. situational politics and coalition		2		2		4		3		5		4		4		6
Power	2.4. Power problems	5		5		6		5		6		5		6		6	
Distribution	2.5. Distribution system	6		6		5		6		5		6		5		5	
Institutional problems	2.6.1. WUA non formation	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1
	2.6.2. non co-ordination		2		3		2		3		3		3		3		3
	2.6.3 water tax collection		3		2		3		2		2		2		2		2

Table 42 various factors and their relative contribution in different states.

It is important to note that their relative contribution has been assessed on the basis of the field data generated through the interactions with officials and

beneficiaries. The nature of the issues and their relative contribution came up through PRA and intensive village ethnography. These findings were verified with officials to make objective assessment of the relative contribution of these factors. The state specific issues being unique cannot be ranked, but demand effective and special care to minimize their impact on the existing gap.

5. Conclusion and Suggestions

It is important to mention that most of the issues discussed in the report are qualitative in nature. It will be empirically exhaustive if one tries to support all these qualitative arguments with numbers. Though possible with much detailed work in each sector, it cannot be done in the limited time period and with limited secondary resources. However, the team feels that it is more pertinent to understand the issues and suggest measures for reducing the gap and at the same time to point out areas for further study which may present a clearer and unambiguous picture. A list is provided below with suggestions for addressing the gap properly and for the correction of the gap.

5.1. Recommendations:

5.1.1. Suggestions for proper calculation and measurement:

1. There is a need to update the calculated IPC by incorporating factors like Boro cultivation, seasonal availability of water, crop specific water duty, and potential of the privately owned MI schemes. It is important to crosscheck the storage capacity at the reservoir and the area it can irrigate by incorporating the geographical and silting factors of the channels. A routine inspection and substantive update of the silting factors that might affect the storage and delivery capacity of the irrigation channels is required to calculate the seepage and wastage of water. The increasing deposit of the silt at the tail end uplifts the channel bed resulting in water wastage at the head reach. The wastage ultimately shrunk the command area.
2. For the calculation of the IPC and IPU, the research team suggest MoWR to go for a volumetric measurement instead of doing measurement based on the area. With the installation of measuring devices at every possible outlet and a canal protection force, the utilisation can be increased and the gap can be minimised.

3. This volumetric measurement should redefine the Irrigation Potential Created, Irrigation Potential Utilised, Gross Irrigation and Net Irrigation. It is important to note that none of the states satisfied the team about actual process of reporting the IPU. Therefore a uniform reporting practice and calculation of IPC and IPU is suggested.
4. IPC should include the capacity to deliver the volume of water and the estimation of the area that can be ultimately irrigated with the given volume considering soil, terrain, drainage and allied factors. If an area observes multiple cropping then the amount of water and the area can be multiplied on the basis of number of cropping.
5. **Definition of IPC:** IPC is the calculation of possible area to be irrigated by a unit volume of water considering the crop specific water requirement, soil type, nature of distribution system, topography and existing socio-political structure that might halt the free flow of the water. These factors should be assessed and addressed properly. The area proposed to be irrigated under more than one crop during the same year is counted as many times as the number of crops grown and irrigated. The definition should be flexible so that with change in the volume of water, crop pattern, topography and distribution system IPC gets revised.

   Therefore, the IPC should include the following:

   - Assessment of the natural and social factors.
   - Definition based on interaction between the volume of water available and climatic and socio-political factors.
   - Routine updates would be possible through repeated assessment of the factors mentioned in the definition.
   - As the volume of water increases and other disturbing factors are minimised, IPC increases.

- If the socio-political factors are found disturbing an immediate revision of IPC and necessary action should be taken to resolve the conflict, for which a separate policy should be initiated.

6. **Determination of IPC:** For estimating IPC of an area, a multidisciplinary team of researchers is needed. Assessment of Soil type, water retention capacity, topography affecting surface flow and socio-political factors is important. Based on these factors, determination of the possible irrigable area will be the IPC.
7. IPU should be recorded on the basis of actual amount of water been delivered and the area that has been irrigated with that amount considering factors mentioned in the definition of IPC.
8. **Definition of IPU:** IPU is the area sufficiently irrigated with the volume of water been delivered in a particular season.
9. **Reporting practice of IPU:** IPU is to be recorded by calculating the amount of water released and the type of crops cultivated. Changes of topography, distribution system should be properly monitored so that time to time both IPC and IPU get revised. However, IIMC recommends for appointment of permanent field officers preferably from social science background (Anthropology, sociology, political science, MSW) to do continuous assessment of water politics and generate awareness about the co-operative movement for effective and judicious use of water through Water Users Associations. A joint effort from department of Agriculture and Irrigation is needed to mobilise people for cultivation of scientifically desirable crops and removal of water politics.
10. **Gross Irrigated Area:** Once the IPU is determined, GIA can be determined by multiplying the IPU by the number of times the area irrigated with multiple cropping in that year.

5.1.2. Suggestions for maintenance and proper distribution:

1. It is important to pay attention to the maintenance immediately with increase in the grant to meet the present needs of the entire irrigation system. A revaluation of the maintenance cost by price indexing is needed. During fieldwork, it was found that there are command areas where people are not getting any irrigation facility for the last twenty years. It is important therefore, either to amputate those areas from the calculated IPC or to rebuild the channels.
2. It is important to create a proper distribution system to avoid water loss due to seepage. The distribution of water through pipes and concrete drains should be opted.
3. In the North-Eastern states, a majority of the schemes are formed by diverting the existing streams. It is important to make storage tanks so that the water can be effectively used even in the lean season when the streams are dried up.

5.1.3. Suggestions to cope with urban encroachment:

1. A major threat agriculture at large is facing is the increasing attraction of the urban centres and less profit in agriculture. It is important to encourage farmers to cultivate their lands. A policy level change is needed. Farmers should be given more incentives so that they find agriculture profitable.
2. Need to segregate cultivable lands and lands for other purposes so that IPC gets revised. It is important not to undermine the increasing urbanization and urban encroachment of the hinterlands. The newer construction of roadways, railways, factory and other buildings needs to be amputated from the calculated IPC.

5.1.4. Suggestions for proper management:

1. WUAs should be formed so that maintenance and distribution can be well managed. Creating WUAs would definitely create a sense of

belonging and hence proper maintenance, fund raising, proper distribution and conflict resolution.

2. Privately owned schemes should be properly monitored so that water business and irrigation politics can be minimised if not prevented.
3. With the implementation of a water tax and awareness generating activities, the importance and value of water should be promoted. Agriculture depends on seeds, fertilisers, land, labour and water, so water should be given the value it deserves. This awareness generating activity might coerce farmers towards the judicious use of water so that wastage can be minimised.
4. Collection of water tax is important as it would not only affect the proper documentation of the IPU but also help maintaining the existing schemes.
5. Before the commencement of any scheme, effective interaction between different departments like agriculture, soil, geology etc should be made mandatory. A good deal of interaction with officials from all levels should continue for the effective management of irrigation and positive contribution to the effective utilisation of the water resources.

5.1.5. Suggestions for decentralisation: an urgent step

It is important to discuss the role water users' associations, which can correct most of the existing maladies. A detailed study of the literature suggests that despite the numerous success stories of decentralised management (Vermillion 1997, Groenfiedt et al. 1998, Obilitas et al. 1999), the emphasis on irrigation management has been secondary to the main concern of constructing new projects (World Bank 1994, Vermillion 2004) that lead to the rapid deterioration and neglect of existing systems (World Bank 1994). Mollinga (1999) identified that Irrigation Management Transfer can address a "three fold crisis": Financial crisis, technical crisis and public image crisis. It is found that as most of the state agencies lack the capacity to deliver adequate operation and maintenance, farmers' involvement especially at the lowest levels of the

distributive system can be an alternative (Gulati et al 2005). The situation is almost the same throughout the country which provokes considerable controversies (Narayanmoorthy and Despande 2005). Clearly, a Government managed resource system is not always the best option (Tyler 1994). The common optimistic views for promoting farmers participation are:

1. Users have more local information for monitoring the physical system and developing the system rules governing its use.
2. Users can be more efficient in managing because they are not encumbered by bureaucratic procedures.
3. Users are motivated to manage the irrigation because their livelihoods depend on it. (c.f. Gulati et al. 2005)

It is important to mention that the World Bank recommends farmers' involvement in every possible aspect of irrigation management[20] and the present findings regarding farmers' consciousness about the problems (see table no.7) supports farmers' involvement for better management. India has seen largely unsuccessful attempts to promote farmers participation through CAD schemes by creating the Indian Network of Participatory Irrigation Management (Hooja 2002). However, the initiatives excepting Andhra Pradesh are hardly successful due to institutional constrains (Subramanian et al. 1997, Calatrava and Garrido 2006), opportunistic behaviours (Theesfeld and Boevsky 2005, Theesfeld 2004), lack of farmers interest (CADA 1997, Bora 1989, Parikh and Shah 1994, Chandran and Chackacherry 2004) and lack of political will (vermillion 2004).

As the success stories suggest, participatory irrigation management can improve the irrigation system without burdening the concerned departments by:

1. Collection of water tax.
2. Operation and maintenance.
3. Proper distribution of the water.

[20] World Bank. Electronic Learning Guidebook on Participatory Irrigation Management. Retrieved from http://www.worldbank.org/wbi/pimelg/index.htm on 21st July 2008.

4. Judicious and rational use of the water with little wastage.
5. Stop the illegal usage of the water.
6. Better conflict resolution.
7. Minimise the water politics.
8. Improve the co-operation and interaction between the officials.

It is therefore, clear that implementing 'effective' water users' association would be advantageous for most, if not all the stakeholders. Farmers would enjoy increase in crop yield (Bandyapadhyay and Priya 2007); with better conflict resolution, irrigation officers and agency would enjoy improved relationship with users; and finally with irrigation efficiency and effective utilisation of water, our nation would have best utilisation of a scarce resource like water together with high crop yields (Maloney and Raju 1994). Sadly, until now West Bengal and the North-Eastern states have not successfully implemented the decentralisation of water resource management.

5.2. Prioritisation of the suggestions:

Because of the local and particular nature of the problems related to the gap the team feels the importance of prioritising the suggestions according to the local nature of the different states under examination.

The decentralisation (suggestion no. 4.5) should be given high priority uniformly for each of the states.

For the major and minor schemes of West Bengal and Assam the suggestion no. 4.1 should be given highest priority. With proper calculation the picture will be clearer. The care for maintenance (suggestion no. 4.2) should be given the second most importance. Suggestion no. 4.4 comes third and then the rest.

North eastern states like Arunachal Pradesh, Meghalaya, Sikkim and Tripura demand priority on maintenance i.e. suggestion no. 4.2. The problems of calculation (suggestion no. 4.1) come second, since there are more serious problems with the irregularity of water supply due to frequent damages of the distribution system. After that suggestion no. 4.3 and 4.4 should be given priority accordingly.

In Nagaland and Mizoram highest priority should be given to the suggestion no. 4.2 to address the problems of inadequate water supply. The second priority should be given to suggestion no. 4.3. The problems of calculation (Suggestion no. 4.1) come next because continuity of water supply and proper usages of the command area is more necessary. Suggestion no. 4.4 comes next.

The following is a tabular representation of the relative priority to be given to the different suggestions in different states.

States / **Suggestions**	**Prioritisation of suggestions according to field data**		
	Assam and West Bengal	**Arunachal Pradesh, Meghalaya, Sikkim and Tripura**	**Nagaland and Mizoram**
4.1 (Calculation and measurement)	2	3	4
4.2 (maintenance and distribution)	3	2	2
4.3 (Coping with urban encroachment)	5	4	3
4.4 (For proper management)	4	5	5
4.5 (Decentralisation and formation of WUAs)	1	1	1

Table 43 represents the priority to be given to the different suggestions in different states.

The issues and their prioritisation are based on the fieldwork with the officials and users. The team has prioritised on the basis of three interrelated factors, these are:

a. Steps that can repair the maladies and reduce burdens from the ministry are considered primary. To address this, the research team feels decentralisation should be a major step as it can reduce the work load in terms of distribution and maintenance (see suggestion no. 5.1.5).

b. The assessment of local factors through PRA and village ethnography was undertaken. The specific demands for specific states came up through the study itself which helped prioritising.

c. A great deal of discussion with the officials from all levels, cross matching of secondary data with primary data also helped prioritising. The report, including the common and state specific issues manifest grounded demand according to which prioritisations are made.

It is important to note, that with decentralisation of water management and correction of several methodological problems, it is expected that the gap between IPC and IPU will be minimised. Lastly, it should be remembered that the approach which promotes the concept “one size fits all” should be avoided and further initiatives should incorporate the local and more particular factors with a careful look at the existing literature and promote more research work to reveal those local factors. The research team suggests MoWR to incorporate the issues and qualitative arguments generated through the study and collect quantitative data. A detailed data may be collected through irrigation census which might give a comprehensive picture.

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6. Annexure

6.1. ANNEXURE I - Questionnaire for end users.

Identification No.: _____

Date of survey:_____
Name of the investigator:_____
State : _____ (Code): _____ District : _____
(Code): _____
Block : _____(Code); _____Panchayat : _____
(Code): _____
Village : _____(Code): _____

1. **Name of the head of the household:**
   _____
2. **Name of the Respondent :**
   _____
3. **Relation of the Respondent with the Head of the Household :**
   _____
4. **Address :**
   _____
5. **Age of the Respondent : _____ yrs.**
6. **Sex of the Respondent : Male…….. 1 Female……2**
7. **Community/Hamlet : General…1 OBC…2 ST…3 SC…4**
   Minority…5 Others (Specify)…888 **_____**
8. **Occupation of Respondent : Primary _____**
   Secondary _____
9. **Amount of land owns for : Agriculture _____ Vested land**
   _____ Dwelling land _____
10. **Main source of income of the Household : _____**

SECTION I: CROPPING AND IRRIGATIONAL PATTERN (For the period January, 2007 to December, 2007):

1. **Landholding details**

Details	**Area (Acres)**		
Non-Agricultural land			
Barren			
Agricultural land	**Irrigated**	**Non Irrigated**	**Fallow**
Owned			
Leased-in			
Leased-out			

2. **What are the reasons for cultivated area remaining un-irrigated (completely or partially)?**

	Reason	**Area**	**No. of parcels**
1.	Unlevelled land		
2.	Absence of irrigation channels		
3.	Scarcity of water		
4.	Uncertainty about supply		
5.	Unresolved conflicts with fellow farmers		
6.	Bleak prospects of remunerative returns		
7.	Financial incapability		
8.	Other reasons		

3. **What are the different crops/vegetables you grow in summer, rainy and winter season? What is their time period? On how much land do you grow those crops/vegetables? What is the total yield of the crop/vegetable? What is the source of water you use for irrigation for cultivating the crop/vegetable?**

A.1 CROPPING IN SUMMER SEASON

Crops/Vegetables grown	Time period	Amount of land used for growing this crop/vegetable	Total yield for the period	Source of water for irrigation purpose (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)	Whether own source or payable source (Code: Own source…1, Payable source…2, Natural source…3)

A.2 What is your main source of water for irrigation in summer season (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)?_____

B.1 CROPPING IN RAINY SEASON

Crops/Vegetables grown	Time period	Amount of land used for growing this crop/vegetable	Total yield for the period	Source of water for irrigation purpose (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)	Whether own source or payable source (Code: Own source…1, Payable source…2, Natural source…3)

B.2 What is your main source of water for irrigation in rainy season (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)?_____

C.1 CROPPING IN WINTER SEASON

Crops/Vegetables grown	Time period	Amount of land used for growing this crop/vegetable	Total yield for the period	Source of water for irrigation purpose (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)	Whether own source or payable source (Code: Own source…1, Payable source…2, Natural source…3)

C.2 What is your main source of water for irrigation in winter season (Code: Shallow pump…1, Channel…2, Submercible pump…3, Deep tubewell…4, Canal…5, Rain water…6, Pond-7, River-8, Others (Specify)…888)?_____

4. **How far is your agricultural land from the source of water for irrigation whichever you enjoy? _____**
5. **How far is your agricultural land from the main canal? _____**
6. **Within this distance how many users enjoy the irrigation?**
7. **What is the type of irrigation you enjoyed in the entire year?**
    A. Minor irrigation
    B. Medium irrigation
    C. Major irrigation
    D. None of these
8. **Do you have to pay for using of water for irrigation? Yes…..1 No……2**

9. **For what purposes you have to pay? (Tick whichever is applicable)**

Purpose	Summer	Rainy	Winter
Hiring of pump			
If YES, amount (in Rs.)			
If YES, type of source			
If YES, frequency of payment			
Hiring labour			
If YES, amount (in Rs.)			
If YES, type of source			
If YES, frequency of payment			
Hiring of pipe for bringing water from source			
If YES, amount (in Rs.)			
If YES, type of source			
If YES, frequency of payment			
For irrigational water (private source)			
If YES, amount (in Rs.)			
If YES, type of source			
If YES, frequency of payment			
For irrigational water (government source)			
If YES, amount (in Rs.)			
If YES, type of source			
If YES, frequency of payment			

Frequency of payment ; 1. Daily 2. Weekly 3. Fortnight 4. Monthly 5. Quarterly 6.Half yearly 7. Yearly
8. When you procure the water 9. No such system
10. Season basis
11. Others(specify)_____

10. **Do you pay the money in advance usually?** Always…1 Sometime…2 Never…3
11. **Did any instance happened that you did not get water but you paid in advance?** Yes…1 No…2 →**Q.13**
12. **If Yes, What are the reasons showed by authority?** Non availability 1 Needed permission of local leader 2 Unavailability of higher officials 3 Others(specify)__4
13. **Are you aware of any water tax for irrigation? Yes…..1 No…….2 →Q.21**
14. **If YES, then do you pay the water tax? Yes…..1 No…….2 →Q.21**
15. **To whom you paid the water tax?** _____
16. **Do you get any receipt for the water tax you paid? Yes…..1 No…….2**
17. **Does anybody come to you to collect the water tax? Yes…..1 No……2**
18. **Is this amount fixed or depends on the amount of water that you used?**

Fixed→ Q. 20

Depends on the amount of water used→ Q. 19

19. **If depends on the amount of water used, then what amount of money you had to pay for what quantity of water? Rs. _____ for the quantity of water _____ (specify the unit also)**
20. **What is the process of water tax payment?**

_____
_____
_____
_____
_____
_____
_____
_____
_____

21. **Amount paid for the water in the past three years:**

Years	**Amount (Rs.)**
2005	
2006	
2007— Till now	

22. **Reasons for non payment (If any)**
23. **Are you willing to pay extra for assured water supply? Yes…..1**

    No…….2 →Q.25
24. **If yes How much?**

    A) More than 100% [ ] B) 50 to 100% [ ]

    C) less than 50% [ ]

25. **When the water availability is not satisfactory what do you do to adjust?**

    I borrow water from somebody else.

    I buy water from somebody else.

    I change my cropping pattern. (Please mention the name of the crop) _____

    I had to loan some amount.

    I had to buy seeds/fertilisers at higher price in lieu of water.

    Others (specify)_____

26. **With that adjustment what amount of loss usually do you have to receive?** Rs. _____

27. **If you get lesser amount of water then mention the major three reasons known to you.**

    i._____

    ii._____
    _____

    iii._____
    _____

28. **What are the official formalities you have to perform before getting water? Please provide details**

i._____
_____

ii._____
_____

iii._____
_____

29. **How do you assess the amount of water that you require for irrigation?**
Based on quantity of crop yields last year.
Present monetary support
Climatic condition.
Type of crop to be cultivated.
Advice from other farmers
Others (please mention) _____

30. **Is there any system of measuring the quantity of water being supplied to you?** Yes…..1No…..2→**Q.32**
31. **If yes what is it?**

32. **What amount of water you have used in the last year (From January, 2007 to December, 2007)**

Season	Quantity of water used (Specify the unit also)
Summer	
Rainy	
Winter	
Total	

33. **A Do you encounter excess of water?** Yes…..1 No…..2 →**Q.34**

B If YES, what do you do to manage the situation?

Nothing, allow the water to flow over
Build a barrier at the entranceway of the water.
Apply the water as there is no guarantee that will have further water
I lend the excess amount to somebody else.
Others (Specify)_____

34. **If you have build a barrier then is there any other farmer affected for this?** Yes…..1 No…..2

SECTION II GUIDELINES & INSTRUCTIONS ABOUT CROPPING PATTERN AND SHIFTS FROM IT

1. **Do you know about any formal guideline from the irrigation department about the cropping pattern?**
   Yes…..1 No…..2→ **Section III**

2. **Please tell us the crops/vegetables you cultivated in the last 3 years?**

Year	Season	Crops/vegetables		Amount of water used	Reason(S) for this shift
		Recommended	Actually cultivated		
2007	**Summer**				
	Rainy				
	Winter				
2006	**Summer**				
	Rainy				
	Winter				
2005	**Summer**				
	Rainy				
	Winter				

SECTION III ROLE OF PANCHAYAT AND POLITICIANS

1. **Does your Panchayat play any role in the process of irrigation?**
   Yes…..1 No…..2 →**Q. 5**
2. **What role does the Panchayat play in the process of irrigation?**
   A._____
   _____
   B._____
   _____
   C._____
   _____
   D._____
   _____

3. **Do you think that it should play a BETTER role than at present in the process of irrigation?**
   Yes…1 No…2 →**Q. 5**

4. **If YES, What roles do you think it should play in addition to the current ones?**

A._____
_____
B._____
_____
C._____
_____
D._____
_____

5. **Views on roles of the following:**
   Political parties _____
   Panchayat _____
   Other state government bodies_____
   Other central government bodies_____
   NGOs_____
   Local influential people_____
6. **Who are these local influential people?**
   Relatively high caste people.
   Relatively economically powerful people.
   People who have better positioned lands.
   Local power groups.
   Others (Specify) _____

7. **A. Does the Panchayat (including the Panchayat member) help you in the following matters:**
   i. Cropping pattern Yes….1 No….2
   ii. Crop variations Yes….1 No….2

B. Does any politician (other than the Panchayat Member) help you in the following matters:
   i. Cropping pattern Yes….1 No….2
   ii. Crop variations Yes….1 No….2

8. **A. How far do you think direct involvement of the Panchayat is effective?**
   € Very much effective
   € Somewhat effective
   € Effective to a little extent
   € Not effective at all

B. How far do you think direct involvement of the politicians is effective?
   € Very much effective
   € Somewhat effective
   € Effective to a little extent
   € Not effective at all→**Section IV**

9. **Please cite five reasons for the importance of their involvement**
   1._____
   _____

2._____
_____

3._____
_____

4._____
_____

5._____
_____

SECTION IV MAINTENANCE OF THE LOCAL CHANNELS

1. **Do you have any local channel for irrigation?** Yes….1 No….2 → **Section V**
2. **Do you have any indigenous way of maintaining the local channels?**
   Yes….1 No…2 → **Q.4**
3. **How frequently do you maintain the channels?**
   € Once in a year
   € Twice in a year
   € Thrice in a year
   € Others (Specify) _____
4. **B. How frequently do you maintain your portion of the drain?**
   € Once in a year
   € Twice in a year
   € Thrice in a year
   € Others (Specify) _____

SECTION V ROLE OF WATER USER ASSOCIATION

1. **Do you have any Organization in your village?** Yes….1 No….2 → **Section VI**
2. **What type of Organization exists in your village?**
   Water User Association [ ] NGO based [ ]
   Panchayat controlled [ ]

3. **What is the role(s) of the existing Organization**
   Distribution of water [ ] Collection of water charges [ ]

   Advising farmers for cultivation [ ] Maintenance of the field channels [ ]
   Conflict resolution [ ] Others (specify)_____

4. **Are you member of the organization?**
   Yes….1 No….2 → **Section VI**

If No, What is the reason for not becoming a member?

If yes, did you get any benefit so far as a member and please mention what type benefit?

5. **How do you rate/view the functioning of the organization in terms of its effectiveness?**
   Very good [ ] Good [ ] Not sure [ ] Poor [ ] Very Poor [ ]

6. **How often the meetings are conducted?**
   Monthly [ ] Quarterly [ ] Yearly [ ] Need Based [ ]
   season wise [ ]

7. **Whether discussions on members' issues take place in orderly manner?**
   Always [ ] Very often [ ] Often [ ] Occasionally [ ]
   Rarely [ ]

8. **Whether timely elections of the organization take place?**
   Yes [ ] No [ ]

9. **When did the last election held?**

10. **Do you feel that the organization is dominated by a certain groups of members only?**

11. **How do you rate your Water User Organization as compared to others in the same distributory/ panchayat/ block?**

    Very Useful [ ] Useful [ ] No Difference [ ] Not useful [ ] Very harmful [ ]

12. **Did you attend to any of the meeting in the past 12 months**

    Yes….1 No….2 → **Section VI**

13. **Issues raised by the farmers in the meeting and the extent of their resolution**

No.	Issues raised in the meetings by the farmer	Solutions provided
1		
2		
3		
4		
5		

SECTION VI CONFLICT AND CONFLICT RESOLUTION

1. **How frequent conflict occurs with other landholders for water?**
   Once in every season
   Twice in every season
   Thrice in every season
   More than thrice (please mention the number)
   Never

2. **Typically what are the reasons for these conflicts?**
   i._____
   _____

   ii._____
   _____

   iii._____
   _____

   iv._____
   _____

3. **What you usually do to resolve these problems?**
   Resolve it with mutual understanding
   Involve elders.
   Involve the Panchayat members.
   Involve Panchayat.
   Involve the Politically influential people.
   Others (specify) _____

4. **What are the factors that influence the availability of water for irrigation?**
   Environment.
   € Officials involved.
   € Political parties.
   € Panchayat members.
   € Local influential people.
   € Water reserve at the reservoir

5. **Who influences your cropping pattern?**
   Irrigation department.
   Agriculture department.
   Irrigation society
   Other farmers
   Purchasers of the produce (Sugar mills, oil mills, etc)
   Any other (Specify)_____

SECTION VII INFRASTRUCTURE

1. **Who has made the different channels and canal?**

2. **Who are responsible for the maintenance of different components of irrigation available to you?**

SECTION VIII INTERACTION WITH IRRIGATION DEPARTMENT

1. **How do you communicate to the Irrigation department the problems you face and the facilities you need?**

Individually or Collectively	[ ]
Through a letter	[ ]
Oral compliant to the official	[ ]
Complaining in local society meetings	[ ]
Through elected representatives	[ ]
Any other	
(specify)_____	

2. **Are you satisfied with the cooperation and advice from the irrigation department?**

Extremely dissatisfied	[ ]
Somewhat dissatisfied	[ ]
No opinion	[ ]
Partly satisfied	[ ]
Extremely satisfied	[ ]

3. **What kind of help do you expect from the department in future?**
   1.
   2.
   3.
   4.
   5.

In the last two years, did you raise issues with the department (individually or collectively)?

No.	Issues raised	Issues resolved	Issues not resolved
1.			
2			
3.			
4.			
5			

THANK RESPONDENT AND TERMINATE

6.2. ANNEXURE II — Questionnaire for the Officials.1

Identification No.: _____

Date of survey:_____ Name of the investigator: _____

State : _____ (Code): _____ District : _____ (Code): _____

Block : _____ (Code); _____ Panchayat : _____ (Code): _____

1. Name of the respondent:
_____

2. Designation : _____

3. Office Address:
_____
_____

4. Phone/Fax :
_____

SECTION I: BASIC UNDERSTANDING OF IRRIGATION POTENTIAL CREATED

1. How many projects do you currently have?

3. What do you understand by the term Irrigation Potential Created ? How do you calculate it?

_____
_____
_____
_____
_____
_____
_____

3. Please provide the following information about your current projects.

SL.	Amount of Cultural Command Area (CCA)	Irrigation Potential Created (IPC)

SECTION II : WATER TAX COLLECTION

1. What is the present water rate?

2. Is there any system of water/ irrigation tax/ revenue collection?
3. If so, What is the system of tax collection being followed?
_____
4. Do you collect tax regularly? Yes…1 No…2
5. Do you have separate personnel for collecting the tax? Yes…1 No…2

6. Are you able to collect the total amount of the tax? Yes…1 No…2

7. Please provide the total due and actually collected amount of the tax for the last 3 years, including the due and collection till date for this year

Year	Total Due (Rs.)	Collection (Rs.)	Percentage remain uncollected	Provide office data or approximation
2004 – 2005				
2005 – 2006				
2006 – 2007				
2007 – 2008 (Till date)				

8. What is the procedure you follow to collect any outstanding tax?
i._____
_____
ii._____
_____
iii._____
_____

SECTION III : REQUIREMENT AND DELIVERY OF IRRIGATIONAL WATER

1. Do you assess the seasonal requirement of water? In every season…1 Half yearly…2 Annually…3 Only once (mention the year)…4 Never…3

2.A. Do you have any internal assessment of water requirement? Yes…1
No…2

B. Do you have any case-specific assessment (crop, area) of water requirement? Yes…1 No…2

3. (If YES to any of Q.2.A. or Q.2.B. or both) Please describe the procedure you follow for this?

i._____
_____
ii._____
_____
iii._____
_____

4.A. At the end of a season do you evaluate the amount of water delivered for irrigation?
Yes…1
No…2

B. If yes please describe the procedure
i._____
_____
ii._____
_____
iii._____
_____

C. At the end of a season do you relate crop yields with the amount of water delivered for irrigation? Yes…1
No.…2

D. If yes please describe the procedure
i._____
_____
ii._____
_____
iii._____
_____

5.A. Do you have any system of documentation of water delivered in a season?
Yes…1
No.…2

B. Do you have any system of documentation of water delivered per day?
Yes…1
No.…2

6.A Please provide details of how you document the amount of water delivered? (Also Probe on Data Collecting Procedure for Irrigation Potential Created)
i._____
_____
ii._____
_____

iii._____
_____

B. Please provide details of how you document the amount of area irrigated?

i._____
_____

ii._____
_____

iii._____
_____

iv._____
_____

v._____
_____

vi._____
_____

C. What do you understand by the term Irrigation Potential Utilised? (Definition)

_____
_____
_____
_____
_____
_____
_____

D. what is the difference between Net irrigated area and gross irrigated area?

_____
_____
_____
_____
_____
_____

E Please provide the following information

SL.	Amount of Cultural Command Area (CCA)	Irrigation Potential Utilised (IPU)

F. How do you calculate IPU?

_____
_____
_____
_____
_____
_____
_____
_____

G. Is there any way of calculating unauthorized use of irrigation water?
Yes…1 No…2

H If yes please describe the procedure:

i._____
_____

ii._____
_____

iii._____
_____

I. What are the factors that affect the irrigation potential utilised?

i._____
_____

ii._____
_____

iii._____
_____

iv._____
_____

v._____
_____

vi._____
_____

J. Do you incorporate these factors in calculation of IPU? Yes…1
No…2

a) If yes please describe the procedure

_____
_____
_____
_____
_____
_____

K. Please provide details of how you document the amount of agricultural produce at the end of the year?

i._____
_____

ii._____
_____
iii._____
_____

7. **Do you estimate the availability of water in a season?** In every season…1 Half yearly…2 Annually…3 Only once (mention the year)…4 Never…3

8. **Does any other authority estimate the availability of water in a season?** Yes…1 No…2

9.A. **Do you incorporate the factors of water requirement of particular crops?**
Yes…1 → **Collect a copy of it**
No…2

B. **Do you incorporate the factors of soil type?**
Yes…1 → **Collect a copy of it**
No…2

C. **Do you incorporate annual rainfall as a factor?**
Yes…1 → **Collect a copy of it**
No…2

D. **Do you incorporate factor of seepage?**
Yes…1 → **Collect a copy of it**
No…2

10. **Over time how does the cropping pattern is changed?**
A) **Do you have report of these changes?** Yes…1**(collect a copy)**
No…2

11. **What are the procedures followed for delivering water? (Note down the entire procedure)**

1.
_____
_____

2.
_____
_____

3.
_____
_____

4.
_____
_____

12. **What amount of water was released for command areas of particular projects? _____ (Specify the unit, If available collect the copy)**

13. **Do you think the amount of water delivered was/ is enough for the command area?**
Yes…1 No…2

14. **If NO, How was this need met? Please tell the details of last three years.**

_____
_____
_____
_____
_____
_____
_____
_____

15. Are you aware about how farmers adjust to the deficiency in supply of water? Yes…1 No…2

16. If YES, what are adjustments they follow?

1.

_____
_____

2.

_____
_____

3.

_____
_____

17. Do you ever interact with the farmers? Yes…1 No…2

18. If YES, how frequently? 1. Daily 2. Weekly 3. Fortnightly 4. Monthly 5. Quarterly 6.Half yearly

7. Yearly 8. When they procure the water 9. No such system 10. Others(specify)_____

Also specify *who* interacts from the Department:

19.A. Is there a responsibility that you have to perform other than irrigation? Yes…1 No…2→ **Section III**

B. If YES, what are those responsibilities?

1.

_____
_____

2.

_____
_____

3.

_____
_____

SECTION IV : INTERACTION WITH OTHER DEPARTMENTS

1. Is there any collaboration with any Government or non-government department? Yes…1 No…2

2. If YES, please name those departments

Government	Issues been discussed	Non-Government	Issues been discussed

3. **If YES, then how frequently do you interact with them?** 1. Daily 2. Weekly 3. Fortnightly 4. Monthly 5. Quarterly 6.Half yearly 7. Yearly 8. When needed 9. No such system 10. Others (specify) _____

4. **Do you share information with these departments?** Yes…1 No…2

5. **If YES, what kind of information do you share?**

a.

_____
_____

b.

_____
_____

c.

_____
_____

d.

_____
_____

e.

_____
_____

f.

_____
_____

SECTION V : IRRIGATION MANAGEMENT TRANSFER

1. **Are you aware of the Irrigation Management Transfer?** Yes…1 No…2

Has it happened in your State? Yes…1 No…2 If No, go to Q. No. 5.

If so,

2. **Do you think it has been effective?** Yes…1 No…2

3. **If YES. To what extent?**

- € **Excellent**
- € **Good**
- € **Average**

€ **Poor**
€ **Very poor**

4. Please cite five major reasons for your answer?
1.
_____
_____
2.
_____
_____
3.
_____
_____
4.
_____
_____
5.
_____
_____

5. Does the Panchayat (including the Panchayat member) play a role in water delivery?
Yes…1 No…2 → **Section VI**

6. If YES, what are the roles played by the Panchayat?
i.
_____
_____
ii.
_____
_____
iii.
_____
_____

7. Who are involved? (Clearly note down their designations)
1. _____ **2.** _____
3. _____
4. _____ **5.** _____
6. _____

SECTION VI : MAINTENANCE

1. Do you maintain different channels and sub channels? Yes…1 No…2

2. If yes, how frequent?
€ **Once in a year.**
€ **Twice in a year.**

- € **Thrice in a year.**
- € **More than that (please mention the frequency).**
- € **Others(Mention)_____**

3. Are there separate people involved for the maintenance? Yes…1 No…2

4. If no, why not?

- € **Lack of funds.**
- € **Lack of people available for maintenance.**
- € **There is no need for regular maintenance.**
- € **Other reasons (specify) _____**

6.3. ANNEXURE III— Questionnaire for the officials 2 (operators)

1. **Source available in the mouza**::

Medium		**Minor**	
Source	**No. of source**	**Source**	**No. of source**
Canal		**RLI**	
		DTW	
		Shallow pump	
		Submersible pump	
		Flow irrigation (Diversion system)	
		Spring irrigation	

2. **State: _____**
3. **District: _____**
4. **Block : _____**
5. **Panchayat : _____**
6. **Mouza : _____**
7. **J.L. No. : _____**

8. **Type of source : _____**
9. **Name of the operator:**
   _____
10. **Sex :** € Male € Female
11. **Age : _____ years**
12. **Years of service as an operator: _____**
13. **When was this source set up? _____**
14. **Who had set up this source? _____**
15. **What is the command area (CCA) of the source? _____**
16. **For how many hours in a day the source is operated?**
    _____
17. **For how many days in a year the source is operated?**
    _____
18. **Does the source provide water to lands outside the village?** € Yes € No
19. **If YES, then to how many villages does this source provide water?**
    _____
20. **Is this source being able to provide water as per demand within its command area (CCA)?** € Yes € No
21. **To what amount of land is this source providing water fully meeting the demand? ____**

22. Does anyone come for inspection? €Yes €No

23. If YES, then how frequently they come for inspection?

_____

FOR RLI, DTW, SHALLOW PUMP and SUBMERSIBLE PUMP ONLY ask questions 23 to 26:

24. What is the power of the motor? _____

25. Do you think the power of the motor is sufficient to fully meet the irrigational water requirement within its CCA? €Yes € No

26. If NO, then what motor power is required to fully meet the requirement for irrigational water within its CCA?

_____

27. What is the discharge capacity of the pump? _____

28. What is the source of power of the pump? €Electricity € Diesel

29. If run by electricity, what is the average monthly charge paid for the electricity consumed by the pump? Rs. _____ per month

30. How do you calculate what amount of water is to be released?

i.

_____

ii.

_____

iii.

_____

31. How many times do you release water in a season?

Summer : _____ Rainy : _____

Winter: _____

30. What are the major problems you have to face operating the source:

i.

_____

ii.

_____

iii.

_____

6.4. ANNEXURE IV — Questionnaire for conducting PRA.

IDENTIFICATION

1a. State : _____b. State code: _____
2a. District: _____ b. District code: _____
3a. Block : _____ b. Block code: _____
4a. Panchayat: _____b. Panchayat code:_____
5a. Village : _____ b. Village code:_____
6. J.L. No. : _____

7a. Total number of households in the village: _____
b. No. of ST households : _____
c. No. of SC households : _____
d. No. of General Caste households : _____
e. No. of Minority Households :_____
f. No. of Hamlets : _____

8. Considering the total land in the village, what percentage of land is cultivated?

_____

9. Electrification of village :

i) Fully
ii) Partly
iii) No where in the village

10. What are the irrigation facilities available in the village? (Tick whichever applicable)

- € Canal
- € Shallow pump
- € Submersible pump
- € Deep tubewell
- € Well
- € Pond
- € River
- € Others (Specify)

  _____
- € No irrigation facility available

11. OPERATING STATUS OF THE IRRIGATION FACILITIES

Type of facility	Total no. in the village	No. operated by private	No. operated by society	No. operated by Panchayat	No. operated by Irrigation Department
Canal					
Shallow					

Pump					
Submersible pump					
Deep tubewell					
Well					
Pond					
River					
Others (Specify)					

12.Whether any Organization in the village who are working particularly on irrigation?

Yes=1 No=2>>18

13.If Yes Name of the Organization

14.Who are in the local body?(Put multiple tick which one are applicable)

i) Villagers
ii) Political party Member
iii) Officials
iv) Booth Member
v) Pradhan

15. Frequency of meeting of Organization

i) Monthly
ii) Quarterly
iii) Half-Yearly
iv) Annually
v) When require
vi) No such meeting

16. Whether timely election of the organization take place?

Yes=1 No=2

17. When where the last election held? _____

_____

18. If any villager face any kind of problem related irrigational water what kind of steps normally they taken?

i) Logged their complaint to the Organization
ii) Logged complaint to Irrigation department
iii) Logged complaint to Booth Member
iv) Logged complaint to Pradhan

19. As per your experience major five problems related with irrigational water that you face normally:

i)

_____

ii)

_____

iii)

_____

iv)

_____

v)

_____

20. WATER CHARGES(This block is applicable for those sources which are available in the village)

Type of facility	Do you pay water charges	If Yes water Charges		Is the charge fixed through out the year? Yes=1 Seasonal=2	Who determined the water charges(Put code stated as under)
		Rs	Unit		
Canal	Y=1,N=2				
Shallow Pump	Y=1,N=2				
Submersible pump	Y=1,N=2				
Deep tubewell	Y=1,N=2				
Well	Y=1,N=2				
Pond	Y=1,N=2				
River	Y=1,N=2				
Others (Specify)	Y=1,N=2				

Determination of water charges : Irrigation Department=1, Panchayat=2, Local Bodies=3, Owner=4, Others(Specify)=5.

21. IF THE CHARGES DEPENDS ON SEASONAL BASIS THEN

Type of facility	Summer Season		Rainy Season		Winter Season	
	Rs.	Unit	Rs.	Unit	Rs.	Unit
Canal						
Shallow Pump						
Submersible pump						
Deep tubewell						
Well						
Pond						
River						
Others (Specify)						

22. Do you get any formal guideline from Irrigation or Agriculture Department?

Yes=1 No=2

- € Irrigation Department
- € Agriculture Department

23. How do you rate/view the functioning of the organization in terms of its effectiveness? (If Q 12 answer is YES, then asked this question)

i) Very good
ii) Good
iii) Not sure
iv) Poor
v) Very poor

MAINTAINANCE

24. Is any co-operative management exist in the village for maintaining the public source & channels?

Yes=1 No=2>>32

25. If Yes name of the co-operative management group

_____

26. When this co-operative is formed?

_____

27. Is it a temporary or permanent formation?

i) Temporary
ii) Permanent

28. How this co-operative is formed?

_____

29. Frequency of maintenance of sources & channels by the co-operative groups :

i) Monthly
ii) Quarterly
iii) Half-Yearly
iv) Annualy
v) When require
vi) Never

30. Whether any charges is paid to concern authority for operation & maintenance?

Yes=1 No=2>>32

31. If Yes, charges: Rs._____ Unit _____

32. In last three years is any cannel/branch cannel/sub cannel/water course newly constructed in the village periphery?

Yes=1 No=2>>38

33. If Yes, time of construction _____

34. Type of construction

- € Cannel
- € Branch cannel
- € Sub cannel
- € Water course

35. Length of construction _____ K.M.

36. Did you pay any money for the construction?

Yes=1 No=2>>38

37. If Yes, how much money per household Rs._____

38. In last three years is any cannel/branch cannel/sub cannel/water course repaired?

Yes=1 No=2>>42

39. If Yes, when it repaired _____

40. Did you pay any money for the repaired job ?

Yes=1 No=2

41. If Yes, how much money per household Rs._____

MONITORING OF LOCAL CHANNELS BY GOVERNMENT OFFICIALS

42. Is there any monitoring of the local channels by the government officials?

Yes=1 No=2>>48

43. If Yes, how frequently?

- € Once in a year
- € Twice in a year
- € Thrice in a year
- € Others(Specify)

44. What actually they do monitoring the channels?

i)

_____

ii)

_____

iii)

_____

iv)

_____

45. A. Do they communicate with you?

Yes=1 No=2

B. How well they communicate with you?

Excellent…..1
Good…….2
Average……3
Below average….4
Poor……...5

Very poor…..6

46. Do you understand their way of explanation?

Yes=1 No=2

47. How do you think this communication can be made more effective?

i.

_____

ii.

_____

iii.

_____

iv.

_____

ROLE OF PANCHAYAT

48. Does your Panchayat play any role in the process of irrigation?

Yes=1 No=2>>54

49. What role does Panchayat play in the process of irrigation?

A.

_____

B.

_____

C.

_____

D.

_____

50. Do you think that should play a BETTER role than at present in the process irrigation? Yes=1 No=2

51. IF YES, What role do you think it should play in addition to the current ones?

A.

_____

B.

_____

C.

_____

D.

_____

52. Does the Panchayat (including the Panchayat member) help you in the following matters : i. Cropping pattern Yes=1 No=2

ii. Crop variations Yes=1 No=2

53. How far do you think direct involvement of the Panchayat is effective?

- € Very much effective
- € Somewhat effective
- € Effective to a little extent
- € Not effective at all

COGNITIVE ASPECTS

54. Can you classified the different type of lands ? Yes-1 No-2

55. If Yes, Please give the details of this classification

_____
_____
_____

56. On what basis these classification have been made?_____

_____
_____
_____
_____

57. What type of water for irrigation is available for these different types of lands?

_____
_____
_____
_____
_____

Name of the Head of Household	Reputed figure of HH	Slab according to land holding	Hamlet

6.5. Annexure V : Names of Projects Studied

State: WEST BENGAL
Major: Kangsabati, DVC, Mayirakshi
Medium: Ramchandrapur, Kumari, Hanumata, Birai Canal
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
DTW	Shakpura	Uttar Dinajpur	Hemtabad	Hemtabad-IV	Shakpura
DTW	Salinda	Murshidabad	Bharatpur-II	Maliahati	Salinda
DTW	Dharmabarikuti	Coochbehar	Coochbehar-II	Dhaniguri	Dharmabarikuti
DTW	Sashpur BN 402	Burdwan	Kalna-II	Satgachiya	Sashpur
DTW	Nohana	Birbhum	Illambazar	Ghurisa	Nohana
DTW	Rangna	Birbhum	Duburajpur	Jashpur	Rangna
DTW	Udaynarayanpur	Howarh	Udaynarayanpur	Harali Udaynarayanpur	Udaynarayanpur
DTW	Bhagabanpur	Nadia	Chapra	Mahatpur	Bhagabanpur
DTW	Khurigachi MDTW	South 24 Parganas	Sonarpur	Kalikapur	Khurigachi
RLI	Frejarnagar-II	Murshidabad	Raghunathgunge-II	Lakshijola	Frejarnagar
RLI	Arasol	Burdwan	Jamalpur	Jamalpur-II	Kelera
RLI	Chapair	Uttar Dinajpur	Kaliagunge	Radhikapur	Chapair
RLI	East Falimari	Coochbehar	Coochbehar-I	Dawaguri	East Falimari
RLI	Kurchi	Howrah	Udaynarayanpur	Kurchishibpur	Kurchi

State: SIKKIM
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
Stream Irrigation	Timpem Mindu	East-I	Reymindu	Timpem Mindu	Timpem Mindu
Stream Irrigation	Rawtey Neopani	East-I	Rawtey Rumtek	Rawtey Rumtek	Rawtey Neopani
Flow Irrigation	Saurani	East-II	Assam-Lingzey	Assam-Lingzey	Saurani
Flow Irrigation	Lower Aho	East-II	Loweraho	Lower Aho	Lower Aho

State: MEGHALAYA
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
DTW	Paham	West Garo Hills	Shelshila	Shelshila	Pathorkata
Lift & Flow Irrigation	Nongbh	Toani	Thadlaskien	Thadlaskien	Nongbh
Diversion (Checkdam)	Kyrdem	Ribhai	Umsning	Kyrdem	Kyrdem

State: ARUNACHAL PRADESH
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
DTW	Tazung	East Siang	Pasighat	Barung	Tazung
Diversion	Ngorlung	East Siang	Ruksin		Ngorlung
Diversion	Ganga	Pakumpare	Daimukh	Ganga	Ganga
DTW	Inchi	Pakumpare	Daimukh	Inchi	Inchi

State: ASSAM
Medium: Shukla
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
Sukla	Sukla	Baksa	Goreswar	BTC 6th Schedule	Paschim Naokata
Sukla	Sukla	Baksa	Goreswar	BTC 6th Schedule	Ramchaghar
Sukla	Sukla	Kamrup Rural	Bindia-Zazikona	Muktapur	Pubpar Joytia Vangra
RLI	Maloybari	Kamrup Metro	Dimuria	Moloybari	Moloybari N.C.
RLI	Maloybari	Kamrup Metro	Dimuria	Moloybari	Moloybari
River Flow	Rani	Kamrup Rural	Rani Development	Rani	Kachari Alibari
River Flow	Rani	Kamrup Rural	Rani Development	Rangapara	Rangapara

State: MIZORAM
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
Spring & Perinneal Source Irrigation	Dakla	Aizwal	Thangniean	Sihphir V.C.	Siphir Kawn
Spring & Perinneal Source Irrigation	Sihdarh	Kolasib	Thingdawl	Sihdarh V.C.	Sihdarh
Flow Irrigation	Darlak	Mamit	Jawlnuam	Khananigthanza V.P.C.	Darlak
Flow & Perinneal Source Irrigation	Theichingbung	Kolasib	Thingdawl	Theichingbung	Theichingbung

State: NAGALAND
Minor:

Project	Name of scheme	District	Block	Panchayat	Mouza
Flow Irrigation	Jakoma	Kohima	Jakoma	Jakoma V.C.	Jakoma
Flow Irrigation	Khavho	Dimapur	Dhansiripar	Shoxuvi V.C	Shoxuvi
Flow Irrigation	Jakoma	Dimapur	Mediziphema	Vidima V.C.	Vidima
Flow Irrigation	Chate	Dimapur	Mediziphema	Seithehena Old V.C.	Seithehena

State: TRIPURA
Minor:

Project	**Name of scheme**	**District**	**Block**	**Panchayat**	**Mouza**
Lift irrigation	Kala Chora	West Tripura	Mohanpur	Kala Chorra	Kalagachia Uttarpara
DTW	Kathal Tali	West Tripura	Mohanpur	Paschim Taranagar	Kathaltali
Diversion	Akhalia Chora	West Tripura	Mohanpur	Issanpur	Daspara