



Improving water use for dry season agriculture by marginal and tenant farmers in the Eastern Gangetic Plains

# Socio-economic context and institutional constraints to sustainable water use in Eastern Gangetic Plains

*Working Paper 2017*

**Authors: Ram C Bastakoti**



**Australian Government**

**Australian Centre for  
International Agricultural Research**

## **Executive Summary**

ACIAR LWR/2012/079 envisaged to determine socio-economic, structural and institutional constraints to sustainable water use. This report presents the key findings in three different aspects: economic context and agricultural trends; existing formal and informal water management institutions; and policies on irrigation and ongoing government programmes and initiatives on agricultural development. Information was collected from both secondary and primary sources. Data on economic and agricultural trends were collected from government reports. Key policies were reviewed from government publications and other related literature. Literature also provided supportive evidences on key trends and policies. Primary information was collected from focus group discussions, informal qualitative interviews, and dialogue with national, state, district level irrigation and agriculture officials.

Result revealed that policy and institutional framework for water management exist at national, state and district level. Such policies include provision for subsidies and other supports, but it was found that national policies do not trickle down to the local level in effective way. On the other hand, findings showed inadequate institutional development at local level, which varied across the study villages. High energy cost, land tenancy and poor water infrastructure were found was major constraints of water management mainly resulting due to poor institutional environment at local level. However, findings reveal that local institutions are important and could play crucial roles in water management.

# Table of Contents

<b>Executive Summary</b> .....	<b>ii</b>
<b>1. Introduction</b> .....	<b>1</b>
<b>2. Economic contexts and agricultural trends</b> .....	<b>1</b>
2.1. Population trend.....	1
2.2. Agricultural trend .....	2
<b>3. Water management policies</b> .....	<b>5</b>
3.1 Water management policies and institutional framework in Nepal .....	7
3.2 Water management policies and institutional framework in Bihar .....	12
3.3 Water management policies and institutional framework in West Bengal .....	17
<b>4. Water management institutions at local level</b> .....	<b>22</b>
4.1 Local context.....	22
4.2 Institutional Mapping .....	24
4.3 Irrigation water access and groundwater market .....	30
4.4 Access to government support services .....	36
4.5 Institutional constraints and potentials.....	37
<b>5. Institutional interventions and key learnings</b> .....	<b>37</b>
<b>References</b> .....	<b>40</b>
<b>Annex 1. Checklists used for the collection of primary data</b> .....	<b>41</b>

## **1. Introduction**

The Eastern Gangetic Plains, which include the Nepal Terai, Bihar and West Bengal regions, is one of the most densely populated, poverty stricken belts in South Asia. The region is characterised by deeply entrenched social structures of class and caste, high incidence of inequitable landlord-tenant relations, poor access to irrigation water in the dry season, limited irrigation capacity and low agricultural innovation. Earlier research in the Indo-Gangetic basin established the interactions between poverty and access to water. At present technical, social and economic constraints have limited the effective use of groundwater and ponds for irrigation, and large areas of land remain fallow during the dry months. Access to year round water for irrigation would significantly promote the productivity of agriculture, improving incomes and food security. Marginal and tenant farmers, youth and women are the target set of farmers who could benefit from a new approach to irrigation provision. In this context, a 4-year project was designed with funding support of ACIAR titled “Improving water use for dry season agriculture by marginal and tenant farmers in the Eastern Gangetic Plains’ (referred as ACIAR LWR/2012/079). The overall aim of the project is to improve the livelihood of woman, marginal and tenant farmers in the Eastern Gangetic Plains, through improved water use and increased dry season agricultural production.

In addition to other objectives, ACIAR LWR/2012/079 envisaged to determine socio-economic, structural and institutional constraints to sustainable water use. The major objectives of this report include: analysis of broader economic context and ongoing agricultural trends; analysis of water management institutions; and identify policy context, including existing irrigation initiatives by government and non-government actors. Information was collected from both secondary and primary sources. Data on economic and agricultural trends were collected from government reports. Population and cropping trends were collected for last 30 years or more based on data availability. These trends were collected mainly for three districts covered by the project, namely, Saptari in Nepal, Madhubani in Bihar and Cooch Behar in West Bengal. Please note currently we are working in 4 districts, but the 4<sup>th</sup> project district ‘Alipur Duar’ is the newly created district (Bifurcation from Cooch Behar and Jalpaiguri districts of West Bengal). Key policies were reviewed from government publications and other related literature. Literature also provided supportive evidences on key trends and policies. Primary information was collected from focus group discussions, informal qualitative interviews, and dialogue with national, state, district level irrigation and agriculture officials. Checklists were used to focus group discussions and dialogue with officials (see Annex 1).

## **2. Economic contexts and agricultural trends**

This section presents key economic and agricultural trends but focusing mainly at the project districts.

### **2.1. Population trend**

All three project districts show increasing population trend, which is in fact an obvious trend for this region. Figure 2.1 below shows that Madhubani district has the largest population among them. Add some trend at state and country level.

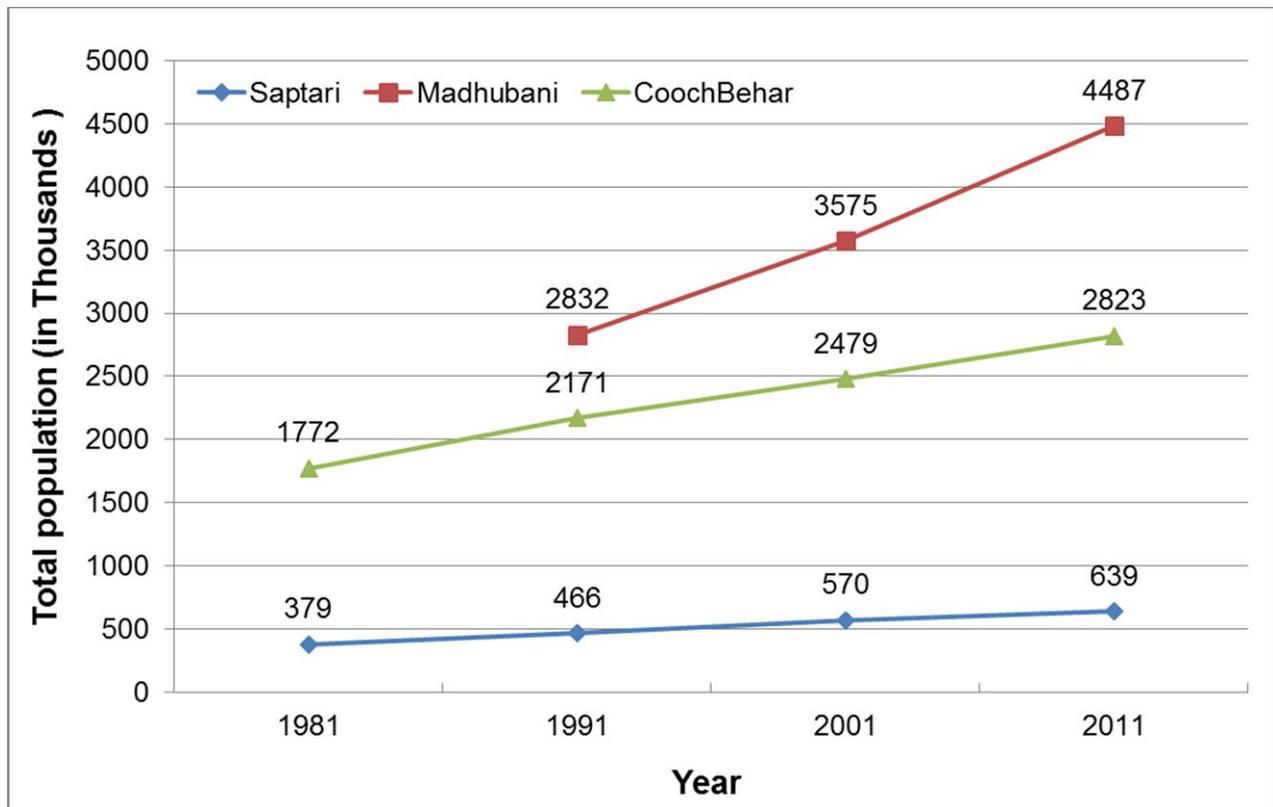


Figure 2.1 Population trend in project districts

## 2.2. Agricultural trend

Secondary data shows that Cooch Behar district has the largest cultivated area followed by Madhubani and Saptari districts. Trends show that the total cultivated area is increasing in Cooch Behar and Madhubani districts, while it is declining in Saptari district (Figure 2.2).

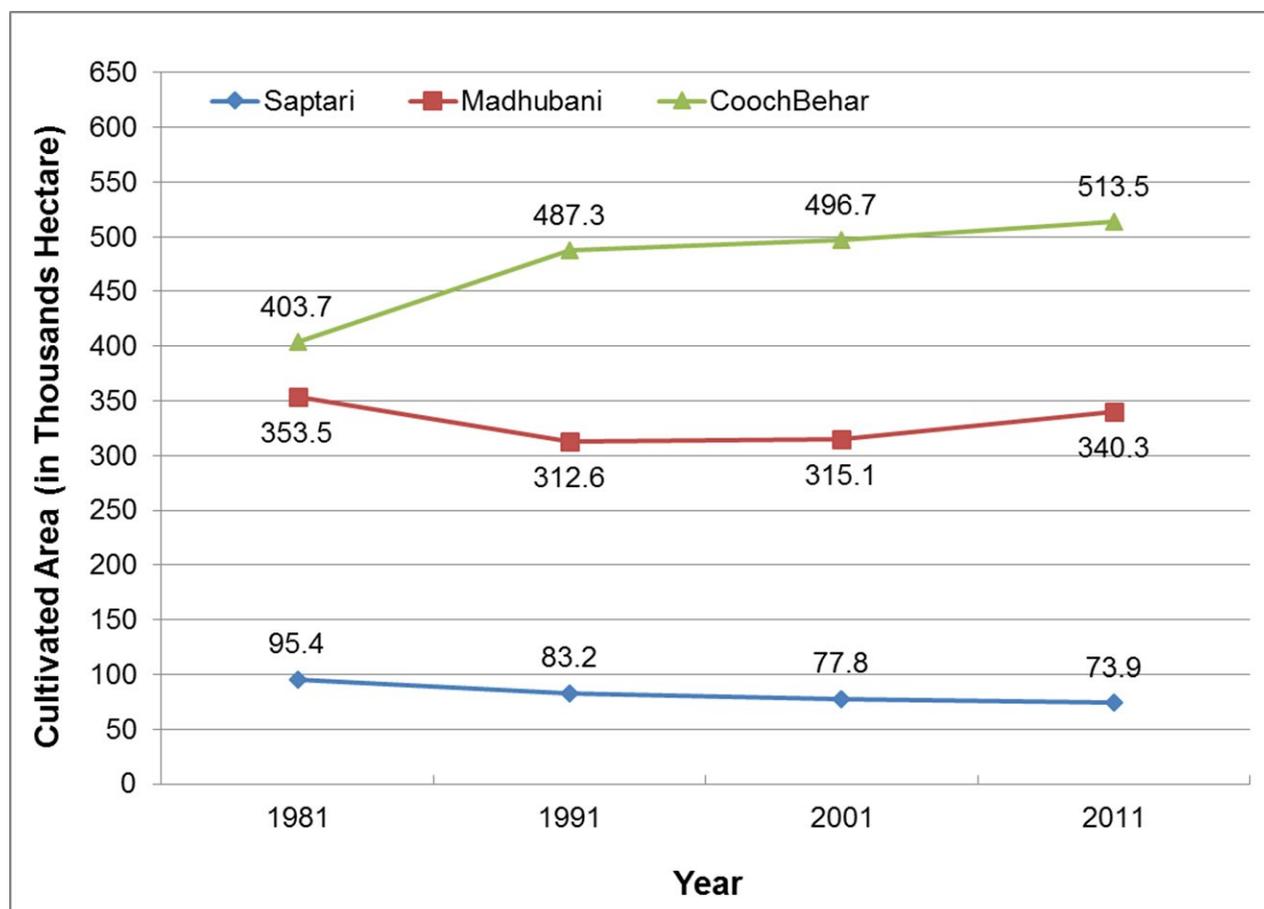


Figure 2.2 Trend of total cultivated area in project districts

The trend shows that in Cooch Behar the total cultivated area is constantly increasing in last 30 years period. Likewise, Madhubani district showed the decline in cultivated area during 1981 to 1991, whereas it is increasing steadily after 1991. But in case of Saptari district the total cultivated area is declining rapidly since 1981.

Main causes of declining cultivated in Nepal Terai included migration (feminization of agriculture – labor shortage, lack of gender friendly technology), lack of irrigation facilities, and impacts of climatic variability. Likewise, absentee land ownership resulted in no investment in irrigation and inputs, which ultimately has forced changing in cropping pattern such as to the perennial plantation crops. Lack of modern agricultural technology can also be considered another cause. Likewise, as a result of rapid urbanization in many areas agricultural areas have been converted into townships.

In monsoon season, paddy is the main crop cultivated in all three project districts. Cooch Behar district has the largest area under paddy cultivation followed by Madhubani and Saptari. Figure 2.3 shows the trends of paddy area in these districts. All three districts showed declining trend in paddy area, among

them Saptari district showed sharpest decline in area under paddy cultivation during the last 30 years period (1981-2011).

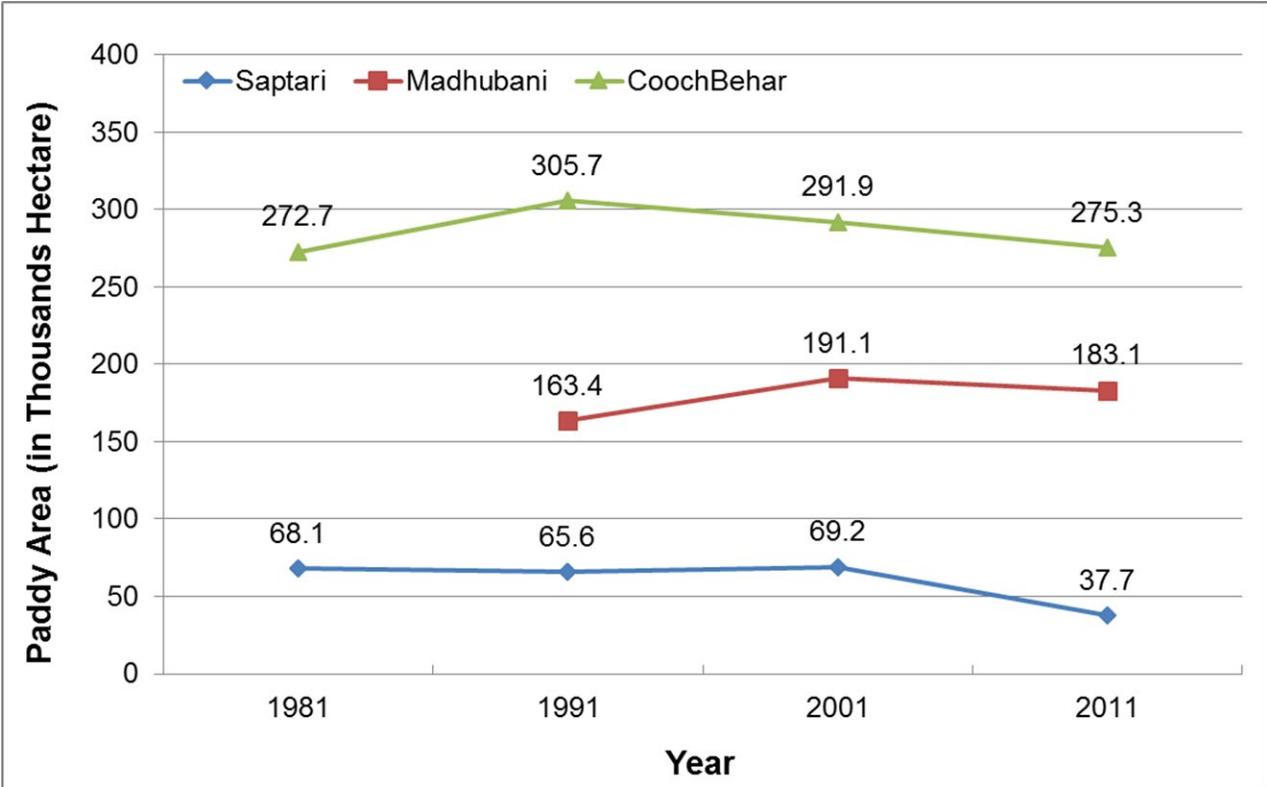


Figure 2.3 Trend of paddy area in project districts

In winter season, wheat is the main crop cultivated in all three project districts. Madhubani district has the largest area under wheat cultivation followed by Saptari and Cooch Behar. Figure 2.4 shows the trends of wheat area in these districts. Madhubani and Cooch Behar districts showed increasing trend in wheat area during the last 30 years period (1981-2011). Whereas Cooch Behar district had very small area under wheat and showed decline in area in recent decade.

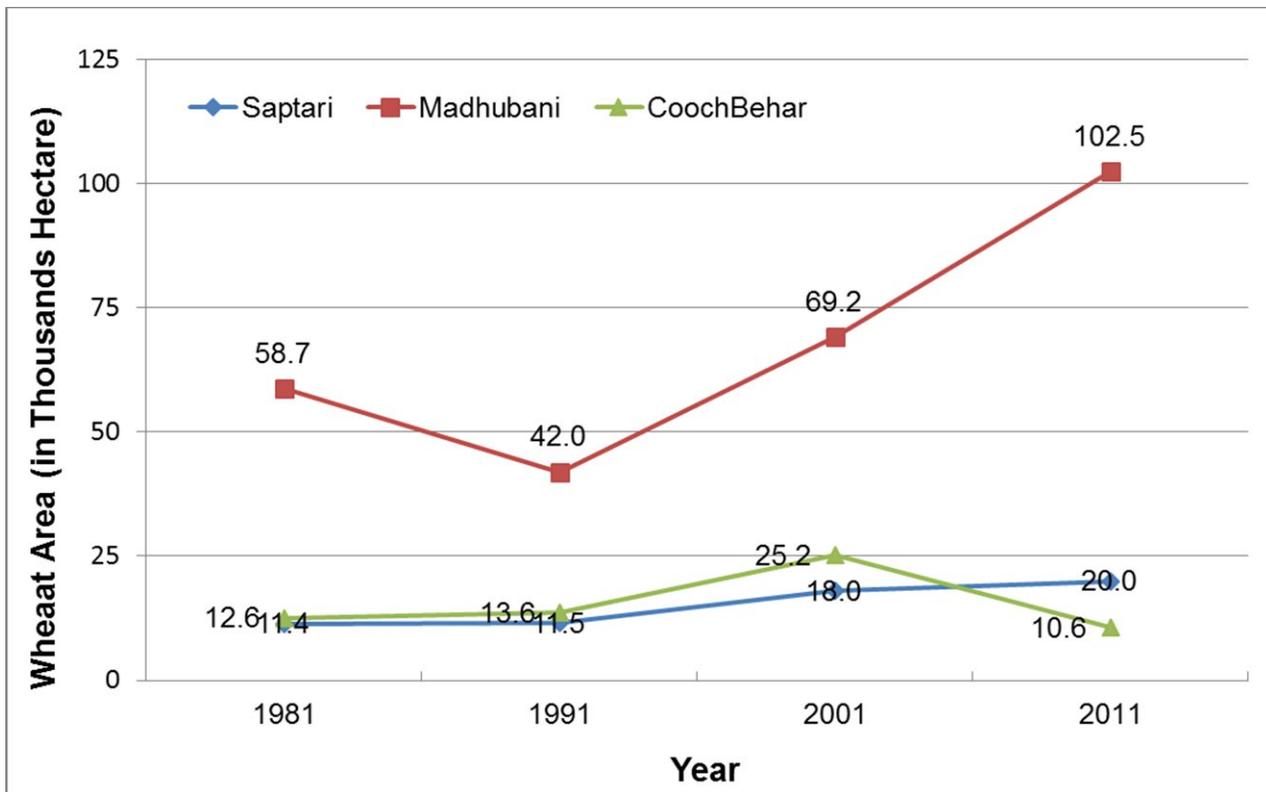


Figure 2.4 Trend of wheat area in project districts

### 3. Water management policies

We analysed policies and institutional framework for water management, with specific focus on irrigation water management, both for surface and groundwater management. Table 3.1 summarizes key policies that addresses both surface and groundwater, main focus of such policies and organizational structure. Review of policies revealed that a range of policies are formulated at state/national level that addresses key issues of irrigation water management. Those policies have been the key guiding framework for irrigation development and management. Further those policies have gone through necessary revisions to accommodate the broader socio-economic, political and other macro-meso level changes at state and national levels. Details of those selected policies are discussed in separate sections after we quickly summarize the key focus on surface and groundwater management.

Table 3.1 Water management policies and institutional framework at State/National level

Features	Nepal	Bihar	West Bengal
Surface water			

Key policies	Irrigation Policy, Water Resources Act and Regulations	National Water Policy, Bihar State Water Policy, Irrigation Act & Rules	National Water Policy, West Bengal State Water Policy
Main focus	<ul style="list-style-type: none"> <li>-Provide year-round irrigation</li> <li>-Small-scale irrigation infrastructure</li> <li>-<u>Participatory irrigation management (PIM)- WUAs</u></li> <li>-Guidelines for WUA formation &amp; registration</li> <li>-Operation &amp; maintenance</li> </ul>	<ul style="list-style-type: none"> <li>-Priorities for sectoral allocation – ensure equity in use</li> <li>-Increase irrigation efficiency</li> <li>-Local community-based water management solutions</li> <li>-Promote community based institutions –IMT to WUAs</li> </ul>	<ul style="list-style-type: none"> <li>-Priorities for water allocation – irrigation gets priority after drinking water</li> <li>-Expand irrigated areas with focus on minor irrigation schemes</li> <li>-Role of existing local institutions in management of minor irrigation schemes</li> </ul>
<b>Groundwater</b>			
Key policies	Groundwater Act, Irrigation Policy	Bihar State Water policy, State Irrigation Act and Rules	Groundwater Act, West Bengal State Water Policy, Minor Irrigation Policy
Main focus	<ul style="list-style-type: none"> <li>-Assessment of groundwater potential</li> <li>-Subsidies in STW installation and pump – mainly in group</li> <li>-Permission for STW installation</li> </ul>	<ul style="list-style-type: none"> <li>- Assessment of groundwater potential</li> <li>-Control declining groundwater table through efficient management</li> <li>-Subsidies in STW installation</li> </ul>	<ul style="list-style-type: none"> <li>- Assessment of groundwater potential – quality and economic viability</li> <li>- Subsidies in STW/DTW installation – in group</li> </ul>
<b>Organizational structure</b>	National, regional and district level	National, state and district level	National, state and district level

In case of surface water, providing year-round irrigation through development of irrigation infrastructure has been one of the key focus. While doing so small-scale irrigation infrastructure has been given high importance. Another major emphasis is on participatory irrigation management ensuring active participation of local users through water users’ association (WUA). We can clearly see that policies have envisaged promoting community based institutions and acknowledged the key roles of existing local institutions in managing the small-scale surface irrigation infrastructure.

Likewise, in case of groundwater one of the key focus of the policies was the assessment of groundwater potential. Groundwater has been considered as main source of irrigation for all the areas in Eastern

Gangetic plains. Subsidies in shallow tubewells (STWs) installation and pumps has been on the key policy instrument to facilitate groundwater expansion in those areas.

### **3.1 Water management policies and institutional framework in Nepal**

Nepal's water resource utilization and development history dates back to the Religious Era (Aryal, 1982). Farmers in Nepal have been developing and managing irrigation since time immemorial alongside the advancement of agricultural technology. The irrigation seems to have been used for replacing or supplementing rainfall with water from another source for growing crops. During ancient period irrigation structures were found to have been developed to enhance productivity with clearly defined rules on water distribution to avoid disputes (Baral, 2001). The water resources policies entered into legal domain with the enactment of the first comprehensive statutory law called the Civil Code (*Muluki Ain*) in 1854 (Khanal, 1982). It established the rights of people on the usage of water owing to their land being located in the irrigation system command area. The ownership of land within an irrigation system provided individual rights for the usage of water. It also made provision that irrigation systems diverting water from the streams should have prior rights and the new systems must get approval from the users of the existing irrigation system using the water from same source.

After the introduction of planned development (five-year development plans) in the mid-1950s, various policy interventions were made in the water resources sector including the irrigation. The first of such attempt to make a specific law for the water sector was the 'Irrigation Act 1961'. This act laid the first legal framework for irrigation. This was replaced by the comprehensive 'Canal, Electricity and Water Resources Act 1967', which introduced the concept of water tax and licensing for water use, although licensing was only implemented for the use of water in hydropower generation. However, it must be mentioned that water law in Nepal consists of customary rights and statutory laws. The past, centralized system of governance primarily satisfied the interests of ruling elites rather than those of the producers, traders and consumers.

With the restoration of multi-party democracy in the year 1990 there has been a shift towards community participation and private sector involvement in decision-making. This has led to changes in the way government institutions operate and the role played by non-government institutions. In the wake of political changes in the country the government made many policy changes. The government brought out the Water Resources Act (1992) and Irrigation Policy (1992). The irrigation policy has gone through subsequent revisions in 1997, 2003 and recently in 2013. In addition, there exist Water Resource Regulation (WRR) 1993, and Irrigation Regulation (IR) 1999. Currently, water management in Nepal is guided by a series of act and policy formulated over the period. The important aspects of these acts, regulations and policies are briefly discussed below.

#### ***Water Resource Act 1992***

The government of Nepal (then HMG/N) promulgated WRA 1992 on 17 December 1992 (HMGN, 2001). The Act specifies that the ownership of water resources within the country remain with the state. It states that no one can use water resources without permission of the state. Everyone should obtain permission to use water resources except for drinking and domestic uses, irrigation, water turbine, navigation, and water resource confined within the private land. The act also cautions that an individual or an organized institution should make beneficial use of water resource without harming other's use.

Importantly the act has made provision for water users' organization (WUO) to make use of water resource for collective benefits. WUOs have been recognized as autonomous bodies with perpetual succession. This act provided crucial attention on the participation of the users.

WRA 1992 has set the priority for water resource use in seven categories: drinking water and domestic uses, irrigation, agricultural uses like animal husbandry and fishery, cottage industry, industrial entrepreneurship and mining related use, water navigation, entertainment uses, and others. Irrigation stands in the second priority after drinking and domestic use of water resource. This indicates the importance being given to irrigation. Use of water resource for drinking and domestic purposes being only a smallest portion of total consumption, this prioritization has least threat to irrigation. As provisioned in the WRA 1992, the Government of Nepal (then HMG/N) can make agreement with domestic and foreign companies or organized institutions or persons for the use, development and expansion of services related to water resources and contractor can fix and collect fees for the services rendered on the basis of mutual agreement. This provision opened new avenue to consider water resources as economic good. It enabled agency-managed irrigation systems and farmer-managed irrigation systems sustain their irrigation systems through cost recovery, particularly the operation and maintenance (O&M) costs.

### ***Water Resource Regulations 1993***

With the power given in the Section 24 of WRA 1992, government promulgated 'Water Resource Regulations (WRR) 1993' on 17 August 1993. The WRR 1993 prescribes the formation and registration of water users' organization, information to be provided in WUO constitution, and provision for the amendment of constitution. It has made provision for a nine-member District Water Resource Committee authorized to sanction permission for water resource utilization. The committee is multidisciplinary team representing government and non-government administrative and water resources development and management related organizations so that discipline and other biases are minimized. WRR 1993 also defines the procedure for obtaining, renewing and selling or handing over of the license.

Similarly, WRR 1993 has made provisions for a 'Water Resource Utilization Examination Committee' to deal with water resource utilization disputes. The Committee consists of representatives from the Ministry of Water Resource as chairperson, one each representative of District Development Committee of concerned district and Regional Office of National Planning Commission as members. In case of disputes between more than two districts, the committee includes representatives from all concerned District Development Committees.

Provision for Service Fee Fixation Committee and the amount of service fee has been defined in the regulation. Such committee consists of three members: two persons designated by government as Chairperson and Member Secretary; and another person from among the water users also designated by government as member. The Regulation would have been more transparent and representative if the member representing water users were elected or selected by the users themselves instead of his/her designation by government.

The WRR 1993 also describes about compensation mechanism in case of the acquisition of house and land at the time of construction of irrigation infrastructure. It has the provision of the Compensation

Fixation Committee that also includes the owner or representative of those whose fixed assets have been acquired for irrigation (or other water resource utilization) project.

### ***Irrigation Regulations 1999***

The government of Nepal has framed and enforced 'Irrigation Regulations (IR) 1999' as per the provision given in WRA 1992. The first amendment of IR 1999 was done on 23 February 2004. The IR 1999 clearly defines irrigation as the "means of the act of supplying water through structures on the field for agricultural use." By definition the regulation prohibits use of irrigation water for purposes other than agriculture. IR 1999 has made provisions for: registration, election and dissolution of Executive Committee; function, responsibility and right; and renewal of WUO. It also defines the procedures for registration of Users Coordination Organization, establishment of operation and maintenance (O&M) fund, handover of the project, and joint management of the system.

It also describes the formation of local level Irrigation Service Fee Fixation Committee consisting of the chief of District Irrigation Office (DIO) as chairperson, and representative of District Agriculture Development Office (DADO) and chairperson of concerned WUA as members. This committee is responsible for determining the irrigation service fee for management turned-over and jointly managed schemes only. In addition, it defines the priority bases for the distribution of water in consultation with DADO. All these provide clear techno-legal guide to WUOs for good governance.

### **Water Resources Strategy Nepal – WECS, 2002**

The present situation with regard to Nepal's water resources can be summarized as follows:

- 66% of the population has access to safe water;
- 41% of irrigated land has year round irrigation facilities;
- less than 400 MW of hydropower capacity is available; and
- little consideration is being given to environmental requirements.

Water Resources Strategy Formulation (WRSF) involves the understanding of a range of problems and constraints to sustainable water resource development. It is recognized that water resources development needs to be more holistic giving due consideration to and implementation of social development principles, economic development principles and environmental sustainability principles. Thus, key objective of the WRSF is to identify effective, scientific, sustainable and consensus-based mechanisms to facilitate the implementation of action-oriented initiatives and programs. With the goal of meeting its water supply needs and achieving long-term sustainability, The Water Resources Strategy (WRS) provides a systematic framework for water resources development and identifies action plans to avoid and resolve conflicts, and achieve Nepal's water-related development objectives.

WECS used a participatory log-frame approach to formulate water sector strategies. The long-term WRS envisions a continuous process with some thresholds in between. This approach involved development of an overall strategic goal, identification of short- (5-year), medium- (15-year) and long- (25-year) term purposes to contribute to that goal, and the definition of ten strategic outputs to accomplish these purposes. In the short-term purpose, focus is made on improving access to sufficient water to meet the basic needs with support from capable institutions involving all stakeholders. The extent of these benefits will gradually increase over the medium-term and benefits from water resources are maximized at the national scale in a sustainable manner in the long-term and significantly improve the living

conditions of Nepal. All the ten strategic outputs are categorized with reference to a particular aspect of water resources development: Security (1. Disaster management; 2. Environment), Uses (3. Water supply and sanitation; 4. Irrigation; 5. Hydropower; 6. Other economic activities such as for industry, tourism, fisheries and navigation) and Mechanisms (7. Information Systems; 8. Policy and Legal issues; 9. International Cooperation and 10. Institutional Mechanisms)

Effective implementation of the Water Resources Strategy requires strengthening of Nepal's human resources capacity at all levels of government, in the private sector and academic research institutions, in user groups and community-based organizations, and in NGOs. The WRS summarizes human resource development needs in each of these areas with reference to planning, implementation, operation, data collection, research and regulation activities. In addition, its successful implementation will involve the provision of adequate funding. Approximately 25% of the total required investments are expected to come from the private sector, primarily for hydropower. The remainder will need to be provided by government, with significant donor support. Phase 3 of the WRSF process is the preparation of a National Water Plan (NWP) to guide the implementation of the WRS. Priorities for specific projects and investment plans have been set out in the NWP.

#### **National Water Plan – WECS, 2005**

In order to implement the activities identified by the WRS of Nepal, National Water Plan (NWP) was developed and endorsed by the Government of Nepal in 2005. The NWP lays down short-, medium-, and long-term action plans for the water resources sector, including programmes and project activities, institutional aspects, investments and human resource development. The implementation of NWP activities is to take place within the time frame of 5, 15 and 25 years. The NWP also attempts to address environmental concerns, which is reflected by the incorporation of the Environmental Management Plan in the document. The preparation process involved as many stakeholders as possible at different levels and from varied professional and civil society sectors, including politicians and user groups. A provision of periodic review of the NWP has been made to address the emerging development needs and the experience gained during the process of its implementation. The Canadian Government, through the Canadian International Development Agency (CIDA) and the World Bank, through the Nepal Irrigation Sector Project (NISP) were the main external supporting agencies, both technically and financially.

The broad objective of the NWP is to contribute, in a balanced manner, to the overall national goals of economic development, poverty alleviation, food security, public health and safety, decent standards of living for the people and protection of the natural environment. It is based on the principles of IWRM and RBM with focus on establishment of 1) enabling environment, 2) institutional framework and 3) management instruments. It is a framework to guide, in an integrated and comprehensive manner, all stakeholders for developing and managing water resources and water services. The NWP professes activities of integration, coordination, decentralization, popular participation and implementation of water-related programmes within the framework of good governance, equitable distribution and sustainable development.

Salient features and targets of the NWP can be listed out as follows:

- Management of major types of water induced disasters
- Management of watersheds and aquatic ecosystems
- Provide safe drinking water and basic sanitation facilities to majority of the Nepalese population
- Strengthen and improve irrigation facilities

Targeted by 2007

- ✓ Year-round irrigation is provided to 49% of the total irrigated area
- ✓ Seventy-one per cent of the potential area is served by irrigation systems
- ✓ Irrigation efficiency increases to 35%.

Targeted by 2017

- ✓ Year-round irrigation is provided to 64% of the total irrigated area
- ✓ Eighty per cent of the potential area is served by irrigation systems
- ✓ Irrigation efficiency increases to 45%

Targeted by 2027

- ✓ Year-round irrigation is provided to 67% of the total irrigated area
- ✓ Ninety-seven per cent of the potential irrigable area is served by irrigation systems
- ✓ Irrigation efficiency increases to 50%

- Hydropower development

Targeted by 2007

- ✓ Up to 700 MW generating hydropower capacities are developed to meet the projected domestic demand, excluding export.
- ✓ Per capita electricity consumption of 100 KWh is achieved.

Targeted by 2007

- ✓ Up to 2035 MW hydropower electricity is developed to meet the projected domestic demand, excluding export.
- ✓ Per capita electricity consumption of 160 KWh is achieved.

Targeted by 2017

- ✓ Up to 4,000 MW of hydropower is developed to meet the projected domestic demand at base case scenario, excluding export.
- ✓ Per capita electricity consumption of over 400 KWh is achieved.

- Enable efficient and sustainable water use in the industry, navigation and tourism sectors
- Establish an efficient & functional decision support system for river basin planning and management
- Establish regional cooperation mechanism for power export/exchange & equitable sharing of water
- Revise existing legal framework, develop and enact new acts, policies, regulations and standards
- Restructure administrative institutions and rationalize clear roles, and setup institutional framework for coordinated and integrated development at the basin level

### **Irrigation Policy, 1997, 2003, 2013**

Optimal use of available physical and institutional infrastructures for the expansion of irrigated area round the year is today's need. Thus, it is necessary to effectively adopt the participatory management

system and also to increase involvement and investment of the organized users at all stages of project implementation as well as to transfer the responsibility of operation, maintenance and protection to the users' association. The Agriculture Perspective Program perceives of increasing agricultural production and reduction of poverty through creation of rural employment opportunities which requires extension of irrigation services even to marginal farms. Promotion of the conjunctive use of groundwater and surface water irrigation systems along with the initiation of advanced technologies in irrigation systems has become imperative. Thus, the Irrigation Policy, 2003 (IP) was drafted to support the implementation of Irrigation Policy, 1997, objectives of the Tenth Five Year plan and the Water Resources Strategy. The major objective of the IP is to provide round the year facility to the irrigable land by effective utilization of the current water resources of the country. In addition, enhancement of institutional capability of water users and capacity building of technical human resources, water users and non-government organizations is also envisioned by the IP.

The Irrigation Policy, 2003 has put forward some policies regarding the overall development of the irrigation sector in Nepal. Provision of declaration of 'irrigated area' by the government where the irrigation facility is available, implementation of programmes guided by the principles of IWRM, construction of water reservoirs and rainwater harvests along with ground water resources to supplement rainfall and preparation of a detailed master plan for inter-basin water transfer are some key points. Conjunctive use of water and co-ordination of the Department of Irrigation with the Water and Energy Commission for the development and management of multipurpose-storage projects has been encouraged. Opportunities of investing in, and construction, operation and management of the irrigation systems have been opened to the private sector. Transferring the ownership of government-constructed irrigation systems to the users and strengthening the capability of local bodies along with active participatory approach in operation, maintenance and management of the irrigation systems have been envisaged in the IP. The concept of quantitative measurement in the irrigation facility together with efficiency related to water quantity, provision of training and increasing the research capabilities of the manpower involved in irrigation and legal and institutional reform has been also been introduced.

A set of Working Policies have also been outlined in the IP. Criteria for study, identification and selection of feasible irrigation projects, their implementation procedures, role and responsibilities of water users' associations, resource mobilization and people's participation are some of the important points highlighted. Along with that, effective system management, provision of irrigation service charges, activities related to maintenance and system operation, liabilities and responsibilities, environment protection, development and capacity building of technology and technical manpower, co-ordination with relevant institutions and the importance of evaluation and monitoring of irrigation systems are also clearly set out. The Irrigation Policy has gone through another revision recently in 2013.

### **3.2 Water management policies and institutional framework in Bihar**

Water management in Bihar is guided by a series of act and policy formulated over the period. The key policies include: India National Water Policy 2002; Bihar State Water Policy 2010 (Bihar State Water Policy 1993); Bihar Irrigation Act 1997; Bihar Irrigation Water Management Rules 2000; and Bihar Irrigation, Flood Management and Drainage Rules 2003.

## **India National Water Policy 2002**

The most recent national Water Policy of India (2002) recognizes that in future the growing population, increasing needs because of economic development as well as the given indications of the impact of climate change will have significant pressure on the availability of utilizable water with the possibility of deepening water conflicts among different user groups. In such context, the new National Water Policy (NWP) aims to take cognizance of the existing situation, to propose a framework for creation of a system of laws and institutions and for a plan of action with a unified national perspective.

As mentioned in the NWP, the present scenario of water resources and their management in India has given rise to several concerns, important amongst them, which could also be applicable to the State of Bihar, are;

- Large parts of India have already become water stressed. Rapid growth in demand for water due to population growth, urbanization and changing lifestyle pose serious challenges to water security.
- Issues related to water governance have not been addressed adequately. The mismanagement of water resources has led to a critical situation in many parts of the country.
- There is wide temporal and spatial variation in availability of water, which may increase substantially due to a combination of climate change, causing deepening of water crisis and incidences of water related disasters, i.e., floods, increased erosion and increased frequency of droughts, and others.
- Groundwater, though part of hydrological cycle and a community resource, is still perceived as an individual property and is exploited inequitably and without any consideration to its sustainability leading to its over-exploitation in several areas.
- Water resources projects, though multi-disciplinary with multiple stakeholders, are being planned and implemented in a fragmented manner without giving due consideration to optimum utilization, environment sustainability and holistic benefit to the people.
- Inter-regional, inter-State, intra-State, as also inter-sectoral disputes in sharing of water strain relationships and hamper the optimal utilization of water through scientific planning on basin/sub-basin basis.
- Grossly inadequate maintenance of existing irrigation infrastructure has resulted in wastage and under-utilization of available resources. There is a widening gap between irrigation potential created and utilized.
- Low consciousness about the overall scarcity and economic value of water results in its wastage and inefficient use.
- Characteristics of catchment areas of streams, rivers and recharge zones of aquifers are changing as a consequence of land use and land cover changes, affecting water resource availability and quality.

Public policies on water resources need to be governed by certain basic principles, so that there is some commonality in approaches in dealing with planning, development and management of water resources. Among other issues the guiding principle emphasizes that the impact of climate change on water resources availability must be factored into water management related decisions. Water using activities need to be regulated keeping in mind the local geo-climatic and hydrological situation.

The NWP points the need of National Water Framework Law [NWFL] providing the guidelines on roles and powers of the Centre, the States and the local governing bodies. This eventually should lead the way for the legislation and the water governance mechanism in every State and devolution of necessary authority to the lower tiers of government to deal with the local water situation. The NWP notes the need of optimum utilization of water in all the diverse uses and foster an awareness of water as a scarce resource. For better management, community based water management should be institutionalized and strengthened.

The anticipated increase in variability in availability of water because of climate change should be dealt with by increasing water storage in its various forms, namely, soil moisture, ponds, ground water, small and large reservoirs and their combination. States should be incentivized to increase water storage capacity, which should include revival of traditional water harvesting structures and water bodies. The adaptation strategies could also include better demand management, particularly, through adoption of compatible agricultural strategies and cropping patterns and improved water application methods, such as land levelling and/or drip /sprinkler irrigation as they enhance the water use efficiency, as also, the capability for dealing with increased variability because of climate change.

The NWP suggests that the availability of water resources and its use by various sectors in various basin and States in the country need to be assessed scientifically and reviewed at periodic intervals, such as every five years. The trends in water availability due to various factors including climate change must be assessed and accounted for during water resources planning. The NWP emphasizes on demand management and improving water use efficiency. Water saving in irrigation use is of paramount importance. While every effort should be made to avert water related disasters like floods and droughts, through structural and non-structural measures, emphasis should be on preparedness for flood/drought with coping mechanisms as an option. On institutional arrangements, the NWP mentions that Integrated Water Resources Management (IWRM) taking river basin / sub-basin as a unit should be the main principle for planning, development and management of water resources.

***National Water Policy and Bihar State Governments' View:*** The NWP has clearly spelled out that the State Water Policies may need to be drafted/ revised in accordance with this policy keeping in mind the basic concerns and principles as also a unified national perspective. But, in case of Bihar, the state government has shown reservations on many aspects of the new policy, and so to revise the Bihar State Water Policy 2010.

### **Bihar State Water Policy 2010**

The critical issues identified by the Bihar State Water Policy (BSWP) 2010 are:

- **Uncertainty in availability of water:** Rainfall in large parts of the State is usually adequate but varies from year to year and place to place. The maximum rainfall occurs mainly during two months of monsoon
- **Low operational efficiency of water resources systems:** The problem of limited water availability is further aggravated by low operational efficiency. Two major users of water namely, drinking and irrigation both show avoidable losses. This situation calls for immediate remedial measures.

- **Depleting groundwater resources and deteriorating quality of water:** With increasing dependence on groundwater, the groundwater resources are depleting at an alarming rate. Over exploitation of groundwater has progressively deteriorated water quality affecting human health. High fluoride, arsenic and other chemical contamination is a cause of worry.
- **High cost of service, low cost recovery and low level of expenditure on O&M:** There is a need to rationalize the O&M charges to move towards full recovery of O&M charges for sustainable development of water resources.
- **Lack of ownership amongst the stakeholders:** The construction and management in the water resources sector is the responsibility of the Government. But with the inadequate resources, it is imperative that stakeholders are involved in construction, maintenance, revenue collection and O & M for sustainable results.

Through the BSWP 2010, the Government of Bihar adopted a radical shift from predominantly engineering-based solutions to local community-based water management solutions. This involves a combination of 'bottom-up' decision-making and 'top-down' technical support within a much more holistic conceptual framework.

The key features of BSWP 2010 are:

- All new projects shall be planned based on micro watershed planning basis so as to ensure equity in use of surplus water.
- Priorities will be fixed for different uses of water distribution.
- Maintenance of the existing projects will be done along with the construction of new projects.
- This policy will be directed towards reducing irrigation water demand through both increased irrigation efficiency, and optimum utilization of the available surface water resource. Any imbalance will also be narrowed through the application of a wide variety of water conservation measures, including effective artificial recharge.
- For efficient water resources planning and well-developed information system will be initiated.
- Demand-based water management will replace the supply-based management in the policy.
- Community based institutions will be encouraged to participate in water management.
- Necessary amendments will be enacted to control the constantly declining groundwater table and efficient water management.
- Water pricing will be done in a rational manner.
- Capacity Building programs will be undertaken to enhance the working efficiency of water related departments.

BSWP includes the provision for the studies on climate trends, and their long-term implications for marginal and environmentally sensitive areas. The findings of such studies will be disseminated to the community level for appropriate planning. Further, considering the impact of climate change, the BSWP emphasizes on the need to deal water-specific climate risks such as the drought and flood. As mentioned in the policy document, in respect of water resources management the needs of drought prone areas will be given priority. Resilience to drought in the most vulnerable areas will be promoted through community-based initiatives with technical assistance by related department. Suitable water systems will be developed so as to minimize the impact of flood on the communities and their livelihoods.

### **Irrigation related policies in Bihar**

The Bihar state government has followed a phase-wise approach of irrigation development along with the management transfer of irrigation infrastructure to the water users at local level. The visionary programme of the state had clearly proposed that 50% of the total irrigated area by 2007, and the entire command area in the state would be transferred to WUAs by 2012. The history of irrigation related policies in Bihar dates back to more than 150 years. Until the construction of the Sone System, there was no direct government involvement in irrigation in Bihar, which was purely a local enterprise. To facilitate government management of the Sone System and other systems, the colonial government of Bengal had enacted the Bengal Irrigation Act of 1876. This law, as amended, still forms the primary legal basis for government regulation of irrigation in Bihar. Subsequently, the state enacted a series of laws concerning irrigation. The most important of these are:

- Bihar Irrigation Act 1997
- Bihar Irrigation Water Management Rules 2000
- Bihar Irrigation, Flood Management and Drainage Rules 2003

These policies provide government agencies the basis for irrigation management. The salient features of irrigation management as stipulated in these policies are:

- The Water Resources Department (WRD) is responsible for the operation and maintenance of headworks and government channels in major and minor schemes. The Minor Irrigation Department and the Bihar Water Development Corporation are responsible for the operation and maintenance of state tubewells and small river lift schemes.
- Water is allocated first to the “assured irrigable command area” for each season. The District Collector or responsible WRD official declares this area. The amount of water allocated shall be “sufficient for the maturity of the crops” in the area during that season.
- All landholders within the “assured irrigable command area” must pay irrigation fees for the season whether or not they take water for irrigation.
- If extra water is available during a season, the government officer responsible for the area may then allocate water sufficient for the crops to the “probable irrigable command area”. Landholders in the area allocated water must pay irrigation fees for the season subject to actually receiving sufficient water.
- The government sets irrigation fees on a per hectare basis. Different fees are set for different seasons. In addition, a distinction may be made between a single irrigation and more than one irrigation in a season. The law says that fees may differ from scheme to scheme.

The irrigation related policies in Bihar have put special focus on irrigation management transfer (IMT) as well. The IMT applies only to the major systems and government operated lift systems. The concerns for the two types of system are somewhat different. Bihar has formally accepted and implemented irrigation management transfer policy for major systems. The state has shown enormous interest in greater farmer involvement in irrigation management and has formulated supportive legal framework and guidelines through those policies/acts. The Bihar Irrigation Act, 1997, clause 46(1), says “the government may transfer any government distributary, minor or water course to the water user association/s (WUAs) formed by the beneficiaries or to a group of persons who may be considered fit by the government of to be owner of the said channels for their maintenance and operation”. The Act also assures adequate

water supplies to WUAs through clause 46(2): “in case the management of distributary, sub-distributary or minor is handed over to the WUA, the WUA shall be supplied with authorized discharge at the head regulator of such channel. The executive engineer will ensure that the water so supplied will be in proportion to the area to be irrigated from that channel”. Likewise, the ‘Bihar Irrigation, Flood Management and Drainage Rules 2003’ has made necessary provisions regarding transfer of the management of canal systems to Water Users’ Association.

### **3.3 Water management policies and institutional framework in West Bengal**

Water management in West Bengal is guided by a series of act and policy formulated over the period. India’s National Water Policy of 1987, which may be called first step towards a national policy for water resources development and management invites involvement of farmers in management of the irrigation systems, including water distribution and collection of water taxes. National Water Policy of 2002 reemphasized the participatory approach for the management of irrigation water. The central government has brought out a model Bill and encouraged the states to enact new legislation to formalize the Participatory Irrigation Management (PIM).

### **West Bengal State Water Policy 2011**

As per Entry 56 of the List 1(Union List) of the constitution of India, development and management of water is primarily a state subject, for which legislations are framed and administrative exercises are done within the limit of the State boundary. The surface and groundwater resources that are available in West Bengal need to be systematically developed and properly harnessed, adopting suitable approaches for the overall development of the State. As the demand of water uses for various purposes is increasing due to the growth process and economic activities, the need to formulate a State Water Policy (SWP) was realized responsive to the State's future needs.

The State Water Policy is required to achieve the objective of conservation, development, utilization and management of water resource in conformity with the National Water Policy, 2002. Water resource should be treated as a part of the larger ecosystem. Socioeconomic needs of the State are to be kept in mind while formulating eco-friendly planning and management of this vital resource. This policy states that in view of the existing gap between the estimated utilizable water resources of the state and the future water demand, optimum utilization of available water resources should be planned to the maximum possible extent. Perspective plan has to be prepared for each basin/sub basin and all individual development projects/schemes are to be formulated with a view to optimize the use of maximum available water resources. All sources, both conventional and non-conventional, should be explored to the fullest extent. Research and development activities should be promoted for further utilization of water resources through nonconventional methods.

For effective planning, development and management of the water resources basin/sub basin wise along with a multi-sectoral, multidisciplinary and participatory approach, the existing local bodies/beneficiary committee and institutions at various levels under the water resources sector will have to be appropriately reoriented/reorganized and even created, wherever necessary. The premier institutions dealing with studies and development of water resources, river morphology etc. have to be involved on regular basis to have the latest input of technical knowledge and guidance.

This policy included provision for the water allocation. The priorities for planning, implementation and operation of any development project based on water resources should broadly follow the order as: i) drinking water; ii) irrigation; iii) industry, power; iv) hydropower; and v) navigation and ecology. But the priorities could be modified after judgment of the merit of each individual project in the concerned basin/sub basin/District/Block.

The State Water Policy noted that the maintenance of water resources schemes are being neglected as it has not been considered as priority. Therefore, the policy emphasized that the institutional arrangement should be such that this vital aspect is given due importance, sometimes even higher priority over new constructions. The State Water Policy has included specific provisions for groundwater development and utilization. In the planning of irrigation projects, due consideration must be given to the irrigability of land and the groundwater status of the command area, taking into consideration the quality of the available water and economic viability of its extraction. Periodical scientific assessment of ground water potential should be done. Central and the State Governments are to adopt suitable measures to avoid over exploitation of ground water from any area for averting deterioration of the quality of groundwater leading to health hazards as well as environmental problems and to obviate land

subsidence. Ground water recharge projects should be developed and implemented to ensure better quality and easy availability of groundwater. Replenishment of groundwater shall be done by creating new water bodies for natural recharge as well as artificial recharge of water.

While planning any irrigation project, the irrigability of land and cost effectiveness is the prime consideration. For optimizing water use efficiency, suitable cropping pattern and appropriate irrigation techniques have to be adopted for optimal use of water and bringing maximum area under command. Irrigation intensity should be such as to extend benefit to as many number of farmer families as possible and to maximize production. Water use and land use policies should have good integration, preferably through a State Agriculture Policy. The policy suggests to adopt a rotational system of water distribution on a volumetric basis to obviate the imbalance in the availability of water between the head reaches and the tail reaches of the distribution network, and between farms of small and large holdings.

This policy promotes participatory approach to water resources management. Participatory Irrigation Management is very much essential in water resources development project to reduce wastage of water and achieve optimal use of irrigation water. Over and above, the government agencies, the user farmers and other stakeholders can play an important role in an effective and decisive manner in all the spheres of activities, like planning, design, development and management. Water Users' Associations, Beneficiary Committees, Municipalities/Gram Panchayats should be involved particularly in operation, maintenance and distribution of water. Necessary legal and institutional changes need to be affected accordingly with a view to extending such facilities to the user groups/local bodies.

### **Groundwater Act 2005**

In most parts of the West Bengal there is ample groundwater, yet less than half of it is being used. The main obstacles are policy restrictions and the widespread perception that groundwater is scarce. Groundwater development in the state is 42%, and none of the districts use more groundwater than annual renewable recharge capacity. Yet, policies are quite restrictive for providing the permission for new wells. The 2005 Groundwater Act provided policy framework for groundwater management in the State. The Act aimed to control the number of new wells and create an inventory of groundwater structures. One of the main reasons for restrictive policy was the concern over declining water levels.

Permits and registration applications were routinely rejected even in districts where groundwater development was only 20-25% or where groundwater depth was less than 30 feet. At the receiving end were small and marginal farmers who were denied access to groundwater. The state's Groundwater Act of 2005 was amended in November, 2011. The revision states that farmers in 301 safe blocks with pumps of 5 horsepower (HP) or less and a discharge rate of 30 m<sup>3</sup>/hour or less will no longer require prior permission from the SWID to apply for an electricity connection. Following this change in the Groundwater Act, little has actually been done to implement it.

### **West Bengal State Agriculture Plan**

India's National Agricultural Development Program or Rashtriya Krishi Vikas Yojana (RKVY) aims at holistic development of agriculture and allied sectors through all the eligible States of India. As per the scheme, the Government of West Bengal has to prepare Comprehensive District Agriculture Plans (CDAPs) covering agriculture and allied sectors based on guidelines issued by the Planning Commission.

The State Agriculture Plan (SAP) is the aggregation of physical and financial projections under respective CDAPs covering all the districts and with prioritization of strategies to be adopted and the policy interventions that are necessary. The basic objective of the RKVY is to provide incentives to the State for increasing public investment in agriculture and allied sectors, convergence of related development programmes, facilitating private investment in agriculture infrastructure and sustainable exploitation of available natural resources. The ultimate goal is to achieve 4% growth rate under the sector.

The vision of SAP is 'to achieve sustainable livelihood opportunities for the people through ecofriendly, clean and value-added agriculture and related activities'. SAP suggests the need to tap the irrigation potential of the state especially through minor irrigation development both surface and groundwater. The plan also suggests effective participatory irrigation management through water users' groups for better utilization of water resources.

### **ADMI-Accelerated Development of Minor Irrigation- West Bengal**

Recently, the State Government of West Bengal formulated the program of the 'Accelerated Development of Minor Irrigation' (ADMI) with the aim to develop and/or rehabilitate community-based minor irrigation systems on sound techno-economic, environmental and social principles. ADMI commenced in the year 2011 and implementation continue for six years after start. This is an external aided project with funding assistance from International Development Association (the World Bank). The ADMI is being implemented by Water Resources Investigation and Development Department (WRIDD), Government of West Bengal.

The execution of the program stresses on the strategy of conjunctive use of surface and ground water relying on the principles of equitable distribution of water keeping in view, in particular, the socially and economically disadvantaged groups amongst farming communities in project influence areas. Through the execution of this program, the cropping intensity has been proposed to be raised to the level of 200% on an average in 6 agro-climatic regions of the state, which was at the level of 180% in 2011. However, the State Government noted that the sustainability of the minor irrigation schemes largely depends on institutionalizing participatory irrigation management taking into account the specifics of traditions, socio-cultural parameters of farmers and water user associations in different agro-ecological regions of the State.

The program intended to bring in 63,555ha of land under surface water irrigation (through a total of 2395 minor surface water schemes consisting of 1994 medium and mini river lift irrigation schemes, 117 small water detention structures and 284 small surface flow schemes), and another 75,346ha of land under groundwater irrigation (through a total of 2265 schemes consisting of 359 medium duty tubewells, 522 clusters of low duty tubewells, 1309 clusters of shallow tubewells, and 75 clusters of pumped dug wells). In total, 4460 schemes are planned each serving between 20 and 50ha of agricultural land to be irrigated. The planned 4460 schemes are being implemented in 18 districts in the state. All these schemes are managed by community and farmer groups. ADMI also supports intensification and diversification of agricultural systems and adoption of improved post-harvest technologies, purposeful and effective advisory services coupled with a higher degree of market integration; capacity and institutional development for management of minor irrigation in the state.

In order to ensure that the projects under this program are in compliance with the environmental assessment, the ADMI has been planned in accordance to the principles set out in the following: the National Environmental Policy (2006); the National Agricultural Policy (2002), the National Water Policy (2002), the National Farmers' Policy (2007), and the West Bengal Environmental Policy (1985). According to the prevailing procedures, sub-projects or schemes might require (i) forestry clearances if any forest land is ever used in the schemes; and (ii) permission for groundwater schemes from State regulator-State Water Investigation Directorate (SWID) for all schemes that will use groundwater.

Likewise, North Bengal's Minor Irrigation Policies facilitate irrigation development to expand the irrigation facilities in the cultivable areas. Other national level program such as Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) promote small farm ponds for irrigation mainly to store rainwater for the dry season, allowing households to diversify crops, produce fish, increase livestock numbers and have more water for domestic use.

In West Bengal, the major shift of paradigm should be reduction of over-dependence on ground water and that is to be utilised within the rechargeable limit. Towards sustainability, institutions like IWRD, WRIDD, SWID, Panchayat Departments, Agricultural Department are responsible for implementing several region specific schemes under 12<sup>th</sup> and 13<sup>th</sup> plan for West Bengal.

## 4. Water management institutions at local level

After the review of policies and institutional framework at state/national level we shifted the focus of our analysis at local level. Water management and other relevant local institutions were analysed through interviews with key district level officials and focus group discussions at the community level.

### 4.1 Local context

At local level this study covered six villages from Nepal, Bihar and West Bengal. In Nepal, we covered Kanakpatti and Koiladi village of Saptari district. In Bihar, Bhagwatipur and Mahuyahi village from Madhubani district, and in West Bengal Dholaguri village of Coochbehar district and Uttar Chakhoakheti village of Alipur Duar district constituted study area. Before going into the details of local institutions, this section briefly discusses the local context, mainly focusing at the gap in access to land resources and gap in access to water resources. A detailed survey of socio-economic situation of the study area showed that a large gap exists in terms of access to land (Figure 4.1). Large proportion of farmers are landless labourers, pure tenants and smallholder part tenants – with some variations across locations.

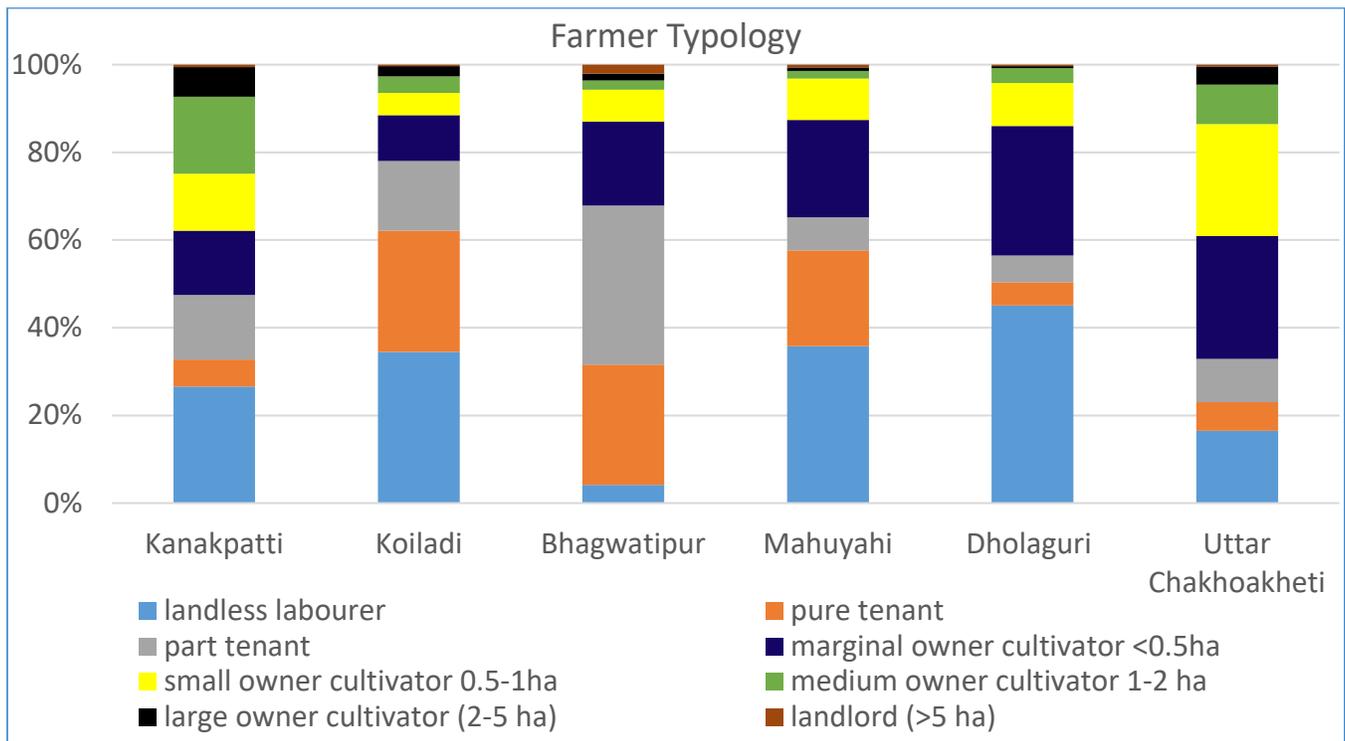
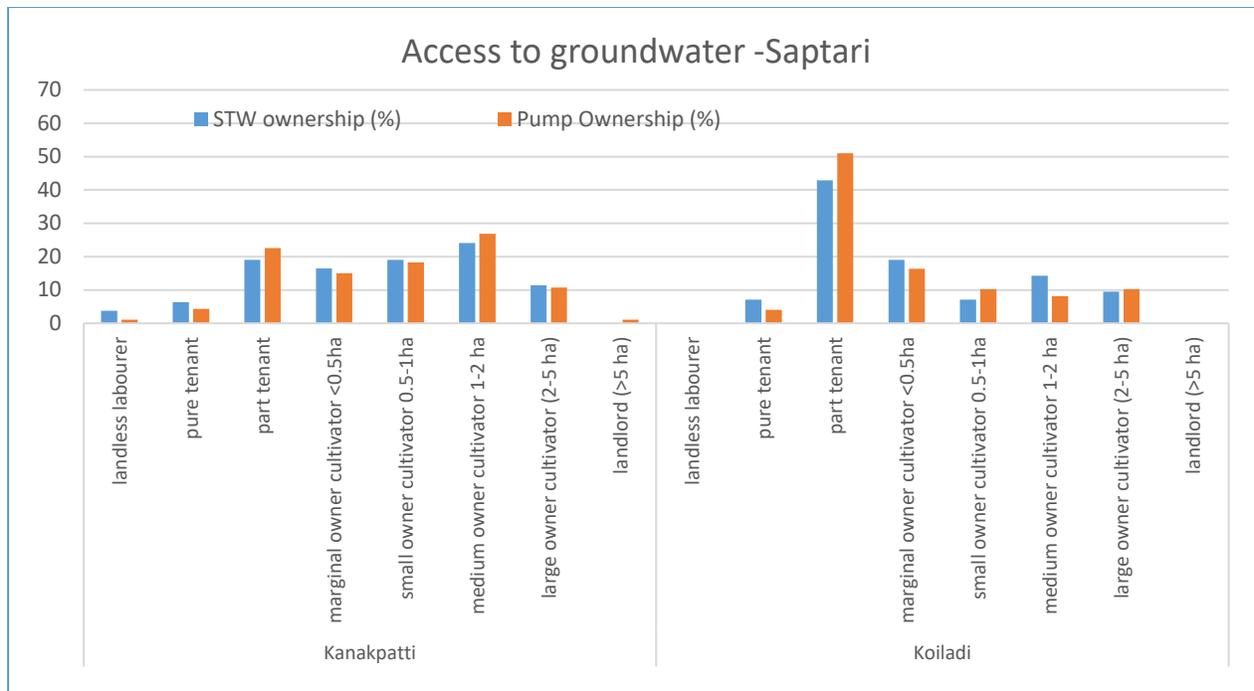
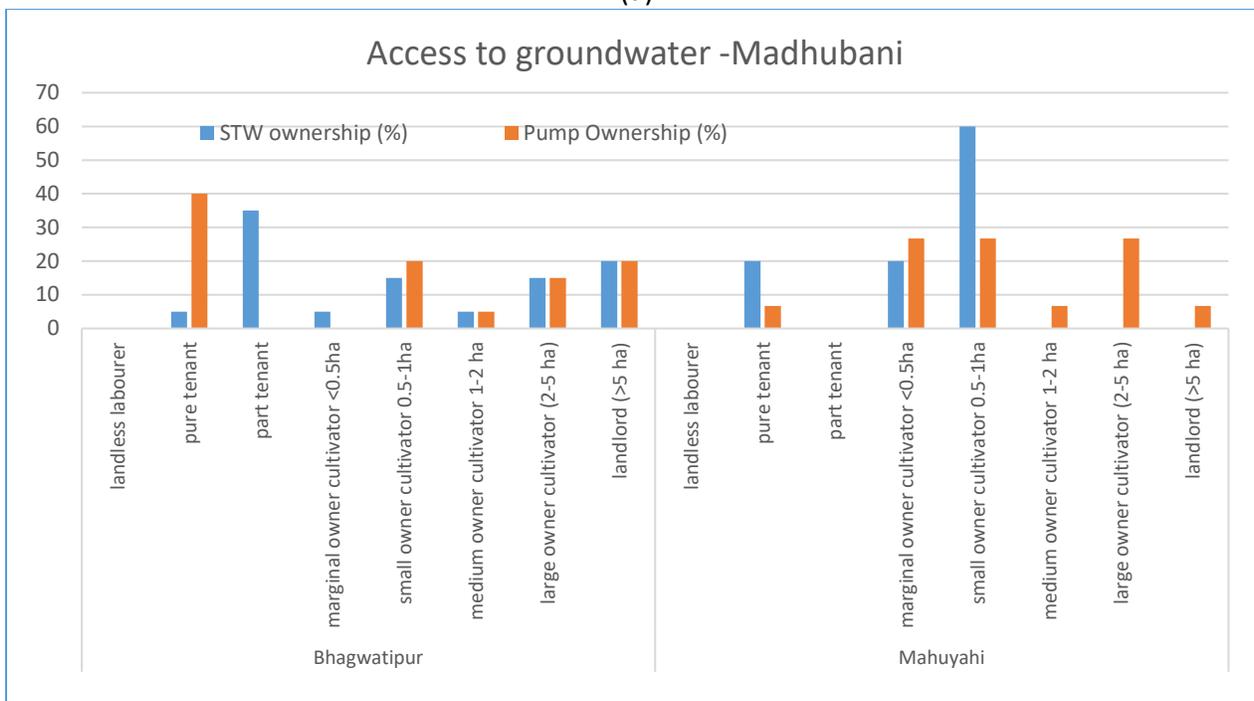


Figure 4.1 Distribution of farmers' categories based on landholding characteristics

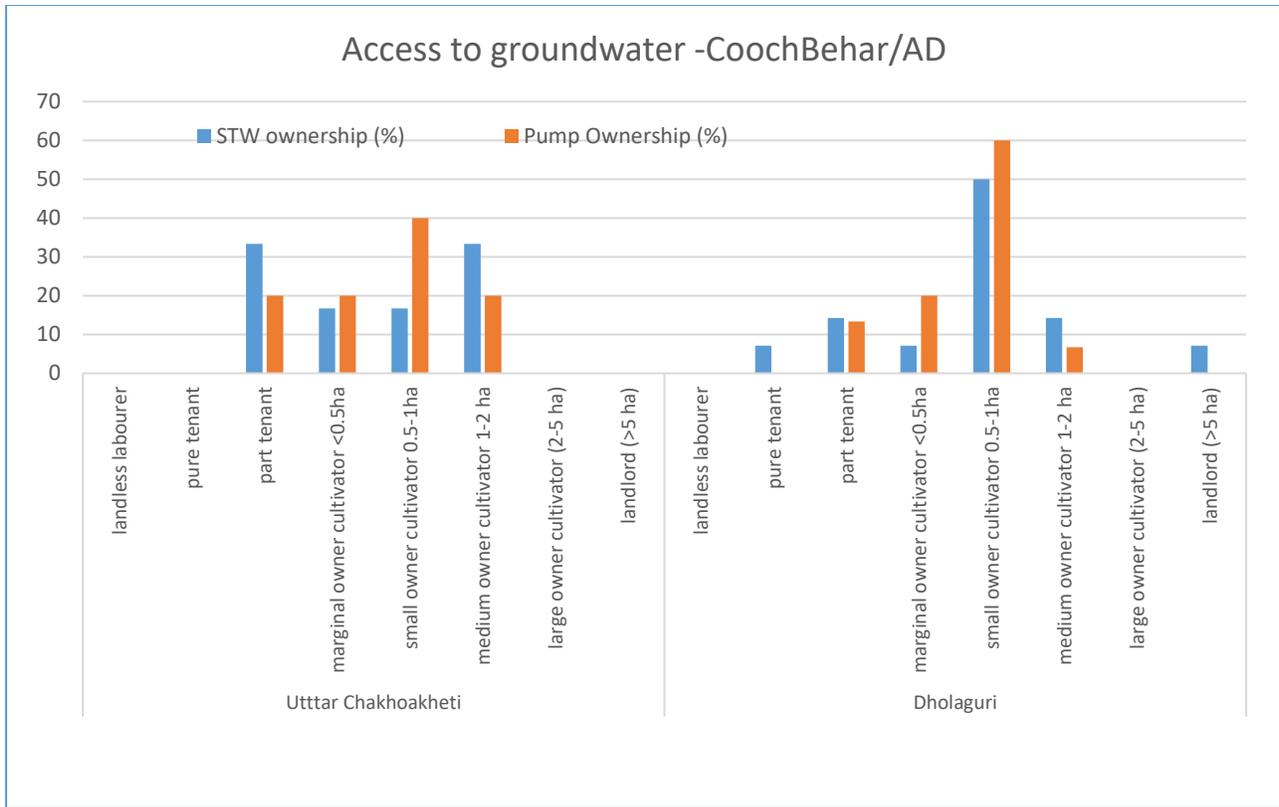
We also looked at the situation of access to water resources. Since groundwater was the main source of water we focused on mainly the ownership of shallow tubewells and pumps. The situation varied across the study sites though, in overall, smallholders have less access to groundwater. Result showed that STW and pump ownership skewed towards large farmers. Figure 4.2 (a-c) provides the STW and pump ownership situation in the study districts.



(a)



(b)



(c)

Figure 4.2 Access to groundwater – STW and pump ownership situation

#### 4.2 Institutional Mapping

We conducted focus group discussions with the community people, covering three areas that included: existing institutions; irrigation water access; and access to government support. Regarding each **existing institution**, FGD participants provided information on: formation of group/committee; membership structure; roles and responsibilities of the institution; resource allocation, contribution to operation and maintenance, benefit sharing, and equity; gender composition of groups; and rules as well as forms of collective action. Table 4.1 summarizes the key institutions that exist in the study villages. In overall, FGD participants reported existence of only limited number of formal/informal institutions in the villages.

Table 4.1 Institutional Mapping

Study villages	Formal institutions	Informal institutions
Koiladi	Village Development Committee, Koiladi Market Management Committee	Canal Water Users Committee
Kanakpatti	Village Development Committee, Pond Water Users' Committee,	Women's group, Informal network

	Kanak Small Farmers Cooperative Limited, Panchamukhi Small Farmers Cooperative Limited	
Bhagwatipur	Village Panchayat, Primary Agriculture Cooperative Society	Water Users' Committee, Women SHGs
Mahuyahi	Village Panchayat	Women SHGs
Dholaguri	Village Panchayat, Alor Dishari Farmers' Club, Pond Management Committee	Women Self Help Groups, STW Users' Committee
Uttar Chakhoakheti	Village Panchayat, Forest Protection Committee, Green Farmers' Club, Bandhan Microfinance	Women SHG

In **Koiladi village of Saptari district**, besides Village Development Committee, one marketing related committee and one canal water users' committee were reported. **Village Development Committee (VDC)** is the lowest level administrative unit of the government. VDC includes nine wards. VDC committee is formed through election. VDC is responsible for coordinating the development activities at the local level including small-scale irrigation infrastructure such as tertiary level canals, surface pond. But at present due to the absence of the elected VDC committee and political crisis the VDC has weakened as a local government, any such of activities do not exist. This village has one marketing related committee named **Koiladi Market Management Committee**. This committee manages weekly market in the village. It collects certain fee from the market stalls. In case of any dispute in the market the committee plays the mediator's role to settle the dispute. The collected fee is used for the tasks necessary for managing the weekly market, and is decided by the committee through meeting. One branch canal of Chandra Irrigation Canal passes through part of this village. There is no separate committee operating in this village, but canal users are members of the **Water Users Committee** at the branch canal. The main role of this committee is to repair and maintenance of the field level channels. The main and branch canal are maintained by the Chandra Canal directly.

In **Kanakpatti village of Saptari district**, *key formal institutions reported were* Village Development Committee, Pond Water Users' Committee, Kanak Small Farmers Cooperative Limited and Panchamukhi Small Farmers Cooperative Limited. Like as in Koiladi village, **VDC** is the major formal institution at the village, but not playing any major role in water resources currently. This village has **Pond Water Users' Committee**. About 20 bigha of land is irrigated from the surface pond, which is being managed by this committee. Irrigation is done mainly for wheat crop. The users' committee charges fee for using the water for irrigation. Farmers can provide Paddy/Wheat or cash equivalent to one kg of grain per kathha

of land irrigated each time. The collected grain/cash is utilized for the maintenance of the pond. Both Kanak Small Farmers Cooperative Limited (with 32 members) and Panchamukhi Small Farmers Cooperative Limited (# of members not available) are savings and credit organizations. Every members deposit monthly saving. Each cooperative provide loan to the members.

**Bhagwatipur** village of Madhubani district has a range of informal and formal institutions: (1) Village Panchayat; (2) Water Users' Committee; (3) Primary Agriculture Cooperative Society; and (4) Women SHGs. **Village Panchayat** (Gram Panchayat) is the lowest level administrative unit of the government. All households of the village are included as member of Gram Parsishad (Village Council). In Gram Panchayat, 33% quota is reserved for the female members. Gram Panchayat is responsible for implementing government projects. It is also responsible for the construction of rural roads. Gram Panchayat plays mediators role between local community and government offices. It facilitates getting support for development activities that also includes STW installation. But in this village, Gram Panchayat was not playing any significant role in water management or agriculture related activities.

In Bhagwatipur village, there is one informal **water users' committee**. There is a canal in one part of the village but not working properly. During monsoon season, some villagers (4-5 households) come together and do some minor repair work to bring water for paddy cultivation. Landlord informally plays the coordinating role. Users are organized mainly to repair the headwork in the river. As field channels are not developed properly they divert water to the field from upper part of canal and irrigate using flooding method.

**Primary Agriculture Cooperative Society (PACS)** has been working in this village since 7 years. PACS is government formed body at Gram Panchayat level. All farmers in village become PACS member after paying certain membership fee. The members will elect the head of the PACS, normally at Gram Panchayat Level. At village level also there is elected members. PACS provides credit and input services to the farmers such as fertilizer. It also purchases outputs from farmers. In this village PACS buy paddy at minimum support price (MSP), a guaranteed price level. Women **SHGs** are formed by Sakhi-Bihar in this village. Main activity includes savings and credit. SHG members also received training on empowerment and awareness related issues.

In **Mahuyahi village of Madhubani district**, FGD participants reported existence of only limited number of formal/informal institutions in the village. Village Panchayat was one of the formal institution exist in the village. **Village Panchayat** (Gram Panchayat) is the lowest level administrative unit of the government. All households of the village are included as member of Gram Parsishad (Village Council). In Gram Panchayat, 33% quota is reserved for the female members. Gram Panchayat is responsible for implementing government projects. But farmers reported that they are not getting any support from Gram Panchayat. Even though one irrigation canal exists in the village, there was no formal committee for operation. In fact, the distribution structures are not complete and thus when there is water in the canal it goes from one field to another.

In **Dholaguri village of Coochbehar district**, FGD participants reported the existence of a range of informal and formal institutions in the village. It included: (1) Alor Dishari Farmers' Club; (2) Women Self Help Groups; (3) Pond Management Committee; and (4) STW Users' Committee.

**Alor Dishari Farmers' Club** was formed on 6<sup>th</sup> January 2011. The club has 15-member executive committee. Any farmer in the village can be the general member of the club. Initially many villagers were involved as member. But since they could not get any benefit or resource from the club many of them dropped out as member and remain inactive. Mostly recently, since early 2015, some members of the club have introduced fresh drive to increase the number of members. One of the key roles of farmers' club is to facilitate formation of self-help groups [SHGs] of the farmers. At present there are 4 SHGs in this village. Other major roles include: defining modern farming technologies with the help of UBKV; facilitate livelihood options of the local people such as mushroom, azolla, fabrics, duckery, vermi-compost, and fish seed production. Farmers club in coordination with UBKV provides training to SHGs. Upon receiving the training, each SHG operates independently – with separate financial arrangement, resource collection, use and benefit sharing.

In Dholaguri, there are **4 SHGs**, namely: (i) Mahila, Sanchaya Swanirbhar Gosthi; (ii) Dhaulogiri Mahila Swanirbhar Gosthi; (iii) Dhaulogiri Sabujh Swanirbhar Gosthi; and (iv) Ma Manusha Swayambhar Gosthi. All four SHGs are female groups, which mean all the members are female. Each SHG has 11 members. Primarily these SHGs seems to be savings and credit group. They collect certain membership fee at the beginning that ranges from INRs 20 to 50. Then each member deposit a monthly savings in the range of INRs 30-50. SHGs provide loan to the members with the interest rate of 2%. Such loans are used mainly to cover some household needs as well as to support the cost items in agricultural cultivation. SHG members reported that they are involved in collective farming. But, we should note the fact that some other related studies (especially by CDHI) found those SHGs were not explicitly engaged in collective farming. However, the FGD conducted with the SHG members revealed their involvement in collective farming. They take land on lease (SHG member with own land provide her land for the collective farming), purchase inputs, contribute labor (the magnitude of labor contribution depends on whether any member has provided own land for collective farming or not, if land contribution the labor contribution is less), and at the end share the benefit equally. Collective farming mainly done for the cultivation of potato, turmeric and pulses.

One **pond management committee** exists in the village to manage fishing activities of a community pond with an area of 1.5 bigha. The committee was formed about 30 years ago by the local people. It is an informal committee with 30 households as member. The main roles and responsibilities of the committee include: purchase of fish fingerlings and release in the pond; application of quick lime; harvest of the fish (normally every 2 years); sale the harvested fish as well as distribution of the harvested fish for consumption among the members. The pond does not require any regular/frequent maintenance except application of quick lime. They don't provide any specific feed to the fish but all household waste (mainly biodegradable such as waste food, any other residuals) are put into the pond. In terms of *resource contribution*, normally the fish fingerlings are purchased using the money from fish sale. But, if the money is not sufficient, all the members contribute money to purchase fingerlings. In terms of benefit sharing, they distribute all the income from fish harvest equally after keeping some money for the purchase of fingerlings. They also distribute fish to the members for household consumption. In terms of *gender involvement*, mainly the male members contribute in releasing fingerlings, application of quick lime, harvest and sale of the fish. Even though this pond is not used for irrigating the crops, it is used for other *multiple purposes*. In addition to fishing other uses include: cleaning utensils, clothes and few use as drinking water for their animals.

Farmers have formed a **shallow tube well (STW) management committee** three years ago (in the year 2012). It is also an informal group of 11 households from the village. This committee manages a common STW, with the depth of 100 ft. Total cost of STW was INRs 23000 that include INRs 16000 for installation and INRs 7000 for other materials cost. There is no pump in common. Whenever needed they rent pump from other villagers. When they rent pump from others they have to pay INRs 150-200/hr, mainly for the diesel pump. If some farmers, especially non-members, need to use water from this STW, they charge INRs 20/hr of STW use. The committee has adopted *allocation mechanism* for the STW operation and distribution of water. In case of group members, when they need water, they have to inform the committee, then the turn is provided on first-come-first basis. Once one chain is complete, they repeat the same system for another cycle of allocation. Any member cannot use water twice if another member is waiting for the first turn. In case of non-members, if someone asks for water the committee suggests the farmer to wait until they could get the turn (in case group members are waiting for the turn) and suggest not to apply any input that is critical to irrigation requirement. Then the committee try to adjust the scheduling within 2-3 days, or even earlier based on the urgency of the need. In terms of *benefit sharing*, the group members can get free water from the STW, they only need to cover the cost of pump rent. It is direct benefit to the members, as the non-members need to pay INRs 20/hr to use the water from STW. The committee is sensitive in *ensuring equity* in terms of benefit sharing and resource contribution. As mentioned above, each member gets water from the STW. Farmers with more land get more time for pumping the water. However, it is done in equitable way, farmers with more land contributing more on maintenance when there is need. They revealed that the STW does not require any regular *operation and maintenance*. In the year 2015, there was some damage in head of STW. The committee used the money collected from selling water to the non-members. In case of any such damage and the collected money is not sufficient, the group members will contribute based on the need on equitable basis, mainly based on the cultivated area served by the particular STW. In terms of *gender involvement*, they reported that all members are male. Female members are not involved in STW operation and maintenance.

FGD participants in **Uttar Chakhoakheti village of Alipur Duar district** reported the existence of a range of informal and formal institutions in the village. It included: (1) Village Panchayat; (2) Forest Protection Committee; (3) Green Farmers' Club; (4) Bandhan Microfinance and (4) Women SHG. **Village Panchayat** (Gram Panchayat) is the lowest level administrative unit of the government. The Village Panchayat includes one Head (known as Panchayat Pradhan), and 12 village representative (known as Pradhan). It includes Panchayat Secretary. It facilitates the link between government and local people. All households of the village are included as member of Gram Parsishad (Village Council). In Gram Panchayat, 33% quota is reserved for the female members. Gram Panchayat facilitates getting support for STW installation. Local people are not fully aware about the roles (including water management) of Gram Panchayat. But in some cases when they face any problem related to agriculture or water availability they inform Panchayat.

This village is in the vicinity of national forest and national park area, and, therefore, the need was felt to establish formal institution for the protection of forest and manage other related aspects. As a result, a **Forest Protection Committee** was formed in 1990 including about 120 members at the time of formation. The main roles of the committee included: protection of forest from illegal logging; use of non-timber forest products (NTFPs); promote livelihood options such as mushroom collection from the

forest; help in other income generating activities (IGAs) such as duck farming; and fencing to protect crops and houses from the wild animals, especially wild elephant. The committee was working well at the beginning, but later the members became inactive. At present the committee includes only 5-7 members.

**Bardhan Microfinance** is working in the village. It has more than one group and each group consists 50 female members. Each member has to deposit INRs 240 as security deposit. It provides loan to local women without any collateral. The loan is used for a range of activities that include: construct sanitation facilities such as toilet; buy life insurance; purchase of bullocks to use in agricultural cultivation; land leasing and to meet other household needs.

Likewise, there are **8-9 Women SHGs** (LAMPS SHG) in Uttar Chakhowakheti village. They are federated under Alipur Duar Multipurpose Cooperative Society. Each SHG include 10-12 members, all female members. Each member of SHGs deposit a monthly savings of INRs 50. SHGs provide loan to the members. Some of the SHGs plan to do improved agricultural activities such as flower cultivation.

Recently, in year 2015, UBKV facilitated formation of **Green Farmers' Club**. The Club aims to create awareness about the improved farming technologies and enhance the capacity of local people for their livelihood improvement.

The institutional mapping in the study villages showed that in general the institutional development is insufficient to facilitate the access to various resources. Table 4.2 summarizes the key issues.

Table 4.2 Institutional framework at local level

Key features	Saptari – Nepal	Madhubani – Bihar	Coochbehar/AD - WB
Existing institutions	Small number of formal & informal institutions - better in Kanakpatti village	Small number of formal & informal institutions exist	Range of formal & informal institutions in CB– less in AD
Gender composition	Not clear, except in formal institution	Ensured participation of female members	Ensured participation of female members
Resource contribution	Equitable contribution	Not clear except in women SHGs	Equitable contribution
Benefit sharing	Equitable benefit sharing	Not clear except in women SHGs	Equitable benefit sharing
Forms of collective action	Kanakpatti village has relatively better situation but not another	Bhagwatipur village has relatively better situation but not another	Moderate level of collective action in CB– STW, pond and SHGs
Institutional development	Relatively better in Kanakpatti village	Relatively better in Bhagwatipur village	Poor in AD, relatively better in Coochbehar

### 4.3 Irrigation water access and groundwater market

Regarding *irrigation water access*, FGD participants provided further details on various aspects that included: details on formal and informal institutions for water management: how farmers access water from existing water infrastructure; water allocation mechanism; payment for accessing water; and contribution to operation and maintenance. We further focused on– STW and pump ownership, water selling and buying activities, payment mechanisms, and issues related to GW uses. Table 4.3 summarises key aspects irrigation water access in the study villages.

Table 4.3 Irrigation water access at local level

Key features	Saptari – Nepal	Madhubani – Bihar	Coochbehar/AD - WB
Irrigation water access	Groundwater, canal and surface pond	Groundwater, and limited # of farmers use canal water	Groundwater mainly in Coochbehar – less in AD
Explicit water management committee	Formal committee for canal, informal arrangement for STWs	Informal arrangement to access canal water	Informal committees for STW & pond management in Coochbehar, not in AD
Water allocation mechanism	Turn basis at branch level but no any specific mechanism at field level	No any specific mechanism	First-come-first basis, Priority based on urgency of the need
Groundwater market	Exists but informal	Exists but informal	Exists in Coochbehar but informal
Pumping charge	Based on hours of use – amount vary according to pump capacity	Based on hours of use – amount varied	Based on hours of use – amount varied
Key gaps in water management	Poor canal structure, # of STWs not sufficient, high energy cost, land tenure	# of STWs not sufficient, poor canal structure, high energy cost, land tenure	# of STWs not sufficient, lack of investment capacity, high energy cost

Regarding the way to *access water for irrigation*, farmers in Koiladi village use groundwater and canal. Groundwater is mainly used for irrigating the winter crops. In monsoon, basically cultivation is done in rainfed condition, except some fields which is covered by the branch canal. There is not any defined water allocation mechanism for the canal water at field level. But at branch level main canal releases water at certain interval only. Several surface ponds exist in the village that include 16 private and 2 community ponds. Surface ponds were mainly used for fish farming and farmers could not access water for irrigation purpose. About 10-12 STWs are installed in the village. All STWs are installed and managed as private STW. Selling and buying of groundwater was found in this village. All STW owners sell water, and about 100 households were purchasing groundwater from them. Pumping charge varied according as the capacity of the pump. They charge NPRs 150/hr (for 2.5 hp pump) to NPRs 250/hr (for the 5 hp pump). All are diesel pumps.

In Koiladi village, main problems associated with water management include:

- Unreliable supply of irrigation water. Canal water is available only in monsoon season and even that is not enough to meet the demand. In winter, farmers rarely get canal water.
- Diesel is expensive resulting into high cost for pumping groundwater from STWs. As a result, farmers cannot afford and land remains fallow.
- Majority of the farmers are tenant with insufficient capacity to invest in STW.
- Farmers cannot access water from surface pond for irrigation as the owners do not allow fishing is the main purpose.

Farmers of Koiladi village suggested possible solutions to deal with water management issues discussed above include:

- Canal renovation and improve reliability
- More number of STWs required
- Cost effective energy options
- Provision to access water from the pond

Farmers in Kanakpatti village access water mainly in two ways: groundwater using STWs and water from the surface pond. Groundwater is mainly used to irrigate the winter season crops. Five STWs are installed in this village as group STW with the support of Groundwater Resources Office, Lahan. Likewise, many (50-55 need to verify # again) private STWs are also installed in this village, out of which about 10 are not working. One deep tube well is also installed with the support of Groundwater Resources Office, Lahan, but not working. Likewise, about 30-40 farmers also irrigate from one electric pump nearby the village. In addition, some farmers irrigate wheat using the surface pond as well. This village has three surface ponds. In this village, STW owners are selling groundwater and most of the farmers purchase from them. Majority of the farmers purchase groundwater using diesel pump. Depending on the capacity of the pump, STW/Pump owners charge NPRs 160/hr (2 hp pump) to NPRs 180/hr (2.5 hp pump). About 30-40 farmers purchase water from the electric pump nearby the village. The existing water sources (STWs and ponds) are not enough to meet the demand of irrigation water in the village. As a result, part of land remains fallow in winter and most in the summer.

Regarding the way to *access water for irrigation*, farmers of Bhagwatipur village mainly use groundwater for irrigating the crops in winter season. In monsoon, basically cultivation is done in rainfed condition. A number of STWs (around 40) are installed to access the groundwater for winter crops. All pumps are private pumps. People who do not own STW or pump rely on others for accessing groundwater. Only in some part of village people divert water from one nearby canal and practice flood irrigation. There is no allocation system, once they built the check dam, water flows to the field. Cost sharing is done based on the area of land.

In Bhagwatipur village, there are a total of 40 STWs out of 197 households in the village. There are about 12-14 pumps owned by the villagers. STW owners sell water to other villagers. Two systems are common while purchasing water. In one case farmers purchase from STW and pump owners and pay INRs 150/hr of pumping. In another case, if any farmer has own pump or use rented pump the STW owner allow pumping water from his/her STW at minimal cost of INRs 5/hr. Main feature of groundwater market

here is that only limited farmers (especially landlords) own those 40 STWs (each landlord has installed at least 3-4 STWs) and they sell water to the tenants. In this village all the tenant farmers are water purchasers as they cannot install STW in rented land.

Main problems associated with water management in Bhagwatipur village include:

- High operational cost of groundwater pumping (using STW)
- STWs coverage is still not enough
- Land tenancy – that constrains STW development. Normally cultivated on share cropping basis-tenant farmers don't want to put extra efforts in input use and other aspects of farming as the produce need to be shared in half. And thus the land productivity is low.
- Land feature – unlevelled land surface making irrigation difficult
- Even though canal exists in some part of the village, the distribution structures are not complete. The headwork also gets damaged every year needing frequent repair.

Farmers suggested possible solutions to deal with water management issues discussed above include:

- Land levelling
- Access to improved agricultural technology
- Canal renovation and improve reliability
- More STWs installation
- New land lease mechanism – fixed rent could be win-win situation

Farmers in Mahuyahi village access water mainly in two ways: groundwater using STWs and water from the surface pond. Lohapipra hamlet has about 5 STWs out of which only two seem to be in fully operational condition. Majority of the farmers in this hamlet purchase water paying fix rent based on hours of pumping. In Mahuayi hamlet also, there are 5 STWs and only two are working in better condition. Other three STWs are not working properly, they have low discharge. Likewise, one canal exists in the village covering both hamlets but not functional. The distribution channels are not completed. When there is water in the canal it goes from one field to another. No water allocation mechanism exists. Sometimes farmers may need to wait 2-3 weeks to get irrigation water.

In Lohapipra hamlet of Mahuyahi village, landlords own 5 STWs but only two are operating properly. Tenants cultivating in landlords' field purchase water from them. They pay the rent of INRs 120/hr of pumping. Because of limited number of STWs water is not available when needed. STW owners first irrigate their own field and thereafter other farmers can purchase. Groundwater market is informal and poorly organized in this hamlet. Mahuyahi hamlet of same village also has 5 STWs, and two are working in better condition. Other three STWs, though working, has low discharge. All STWs are privately owned and operated by diesel pumps. All five STWs in this hamlet sell water. Farmers purchase water paying INRs 120/hr of pumping.

Majority of the farmers in Mahuyahi village were landless or marginal farmers mainly cultivating in landlord's land based on share cropping. This system of land tenancy was found inefficient as input use was low either from the landlords or the tenants. Recently there have been changes in tenancy to the fixed rent system. Paddy and wheat are major crops in monsoon and winter seasons respectively. But the productivity of both crop is low because of lack of irrigation facilities. One problem in land

management and cultivation was reported to be the land rent arrangement. Normally, the landlords do not provide their land to tenants for more than 2-3 consecutive years. It constrains tenants' willingness to make any improvement that requires more labor or additional costs. This village has only few STWs that cannot cover all the water demand. Besides not all installed STWs are working properly, few of them having low discharge.

Farmers suggested some possible solutions to deal with the water management issues:

- Improved access to irrigation facilities – through – increased number of STWs installation and use of surface ponds
- Access to agricultural inputs – fertilizer and seed (landlord need to support)
- Land rent for long-term

Groundwater is the main source of irrigation water in the study districts of West Bengal (Coochbehar and Alipur Duar districts). District level irrigation officials revealed that the State Government of West Bengal provides full subsidy for the installation of the tube wells, both shallow (STW) and deep tube wells (DTW). In order to get this subsidy, farmers should follow certain procedures. A guideline exists for the same. A group of farmers should form one users' committee. Then they have to start application process, which should be endorsed by Gram Panchayat. After that the application needs to be submitted to the government office (Water Resources Investigation and Development Department). After that the office prepares technical design and then installs tube wells. For STW, farmers should form a cluster of 6 ha and then process for necessary application. For DTW, individual farmer or a group of farmers can apply ensuring that it has minimum command area of 20 ha. It can cover up to 40-50 farmers. Land for the DTW infrastructure should be donated by farmers.

Many other efforts are underway to improve the irrigation facility in West Bengal, such as Teesta Command Area Development Authority, and RIDL, which also provide different combinations of subsidies for groundwater development. Surface irrigation facilities are developed through MNREGA, which focuses on reviving the surface water structures. ADMI, the recent program of State Government of West Bengal covers Coochbehar district with 262 Surface water schemes irrigating 5880 ha; and 459 groundwater schemes irrigating 15670 ha of the cultivable land.

Officials reported that despite of provisions made in policies and ongoing programs/projects, farmers at local level seem to be not fully benefited from such provisions. One of the main problem was lack of coordination between local administration and politicians in dealing with government offices. The situation further became poor perhaps because of lack of proper institutional development at local level.

Farmers in the **Dholaguri** village reported that supplementary irrigation is required mainly in the winter and pre-monsoon season. Paddy cultivation in monsoon season is done on rainfed condition. Only in exceptional cases they have to use groundwater at the time of transplanting the paddy seedlings. Winter is the main season for groundwater use, especially for potato cultivation. STW was the main water infrastructure exist in the village. This village doesn't include any canal infrastructure. Water allocation for the group STW was done on turn basis, whereas for the individual STW farmers approaching first will get water. Farmers have to pay for using groundwater in different ways. In case of group STW, members do not need to pay for using STW, but need to pay the pump rent, normally INRs 150/hrs. Non-members

in that case have to pay extra INRs 20/hr for STW use. In case of individual STWs, if the water was pumped using STW owner's pump they charge INRs 200/hr. But in most cases if the non-owner bring pump from others, in general no need to pay, with exceptional cases where they have to pay INRs 20/hr for STW use.

The FGD participants also provided some details on *groundwater market* prevailing in the Dholaguri village. In this village, a total of 22 STWs out of 250 households in the village. Only 10 pumps are reported from the village, out of which two are electricity operated and rest operated by diesel. All households having cultivable land use STW water for irrigation. This shows that groundwater market exists in the village. FGD revealed that all 22 STW owners sale water. It was noted that if any farmer arranges its own, in general the STW owners allow pumping from their STW without any charge, however in some cases they charge INRs 20/hr of STW use. The interesting fact was that even though STW owners allow free pumping from their STW, in case of any damage its owner's responsibility, except in case of the group STW mentioned earlier where the group members contribute in repair and maintenance based on the need. Only few farmers (out of 22 STW owners) own pump as well, there were few who own pump but not STW. In case purchasing water from STW owners pump they charge INRs 200/hr. The groundwater market operates in informal basis, and therefore, sometimes the pump rent could vary and user farmers may not access water at the time of need.

FGD at Dholaguri highlighted some issues and gaps regarding water management at local level. In **monsoon season**, farmers cultivate paddy in rainfed condition. No need of irrigation except in some dry spells. In such situation they use groundwater. But any serious issues were not reported for the monsoon season. In **winter season**, farmers mainly cultivate potato, other vegetables and maize. Groundwater is the only source available. They revealed that in general groundwater is available when needed. However, some issues were highlighted by the villagers. **First**, the number of installed STWs are less compared to the demand for irrigation. In case of any damage to any of the existing STWs it is difficult to provide water to all farmers in time. It ultimately affects the cropping schedule. **Second**, many field plots are located far from the STW point, and in those cases the STW/Pump owner charge INRs 250/hr. It also requires more pumping hours to irrigate the field because of the conveyance losses. **Third**, many farmers are smallholders representing two important dimensions that limits their capacity to use groundwater. Because of small and fragmented land holding it might not be cost effective for them to install their own STW. Even if they want to install, such farmers lack investment capacity to install STW and purchase pump. Fourth, access to suitable energy source is one of the major concerns. The low voltage of electricity line constrains the use of electric pump, and, on the other hand, the diesel cost is high. In **summer season**, farmers cultivate jute and some vegetable crops, covering just about 10% of the cultivated area. It is, however, possible to cultivate paddy in summer season. But, paddy requires more frequent irrigation. As discussed above the existing number of STWs cannot cover all area in summer season. In addition, because of soil type, sandy loam soil, the water requirement is high, and it wouldn't be cost effective to irrigate using STW.

Farmers suggested some possible solutions to deal with the water management issues as discussed. First, in order to increase the coverage installation of addition STWs is necessary. Second, as only few pumps are available at village, the number of pump should be increase. Third, since electricity supply is not good and diesel price is high, alternate low-cost pumping options could be helpful. Fourth, farmers

reported that they are not able to get appropriate price for their agricultural produce, often very low that sometimes even cannot cover all costs associated with production, harvesting and marketing. To deal with such situation it may be necessary to improve market access and implement the mechanism to ensure that farmers get competitive price.

Regarding the way to *access water for irrigation*, farmers in Uttar Chakhoakheti village reported that they use supplementary irrigation mainly in winter season. Paddy cultivation in monsoon season is done on rainfed condition. In winter some of the farmers use groundwater. But only few (8) STWs are installed in the village. But because of the poor aquifer the discharge is very low and as a result farmers are not able to use those STW in efficient way and meet the water demand. Operation of STW is not being done properly because of low discharge. Since the selling or buying activity do not exist for groundwater there is no issue of payments. Two surface ponds exist in the village but not being used for irrigation purpose. One river lifting system has been installed but not functioning properly as the distribution channels are not completed yet.

Groundwater selling and purchasing activity was not found in Uttar Chakowakheti village. Eight STWs are installed in the village. All installed STWs were supported by the government. Out of eight installed STWs, all are in working condition but discharge is low. Water table is shallow but because of different layers of aquifer the discharge is very low. Water can be pumped continuously just for 2-3 hours. Because of this situation no one sale groundwater.

In **monsoon season**, more than 90% of the farmers cultivated paddy in rainfed condition. Some vegetables such as cow pea, ridge gourd and other cucurbits were also cultivated in this season. In general, no supplementary irrigation is required in monsoon season. But in some years, especially in the recent years, the erratic rainfall (sometimes dry spells, sometimes more water and water logging) has resulted in late transplanting of paddy or even land remained fallow. In **winter season**, farmers mainly cultivate some vegetable crops, mustard and potato. But because of lack of irrigation facility almost 90% land remains fallow. This village has two sources of irrigation: groundwater and surface pond. In the village eight STWs are installed. Water can be pumped during early winter but the water table goes down fast. There is no reliable access to electricity for groundwater pumping. There are two ponds in the village, but they are not being used for irrigation purpose. One river lifting system has been installed but not functioning properly as the distribution channels are not completed yet. In **summer season**, farmers cultivate jute, some vegetable crops and maize. Only about 30% of the area is cultivated in this season. Farmers do not apply any supplementary irrigation for the summer crops. It was mainly due to the lack of irrigation facility. Farmers lack investment capacity to install STW, and they also lack any technical knowledge about water management and improved agricultural practices.

Farmers suggested some possible solutions to improve agricultural productivity and water management. First, in order to improve the water availability and access it may be necessary to: construct elevated tank and irrigate using gravity flow; and install more STWs. Second, protect crops from wild animals through improving the condition of the forest so that wild animals stay in forest, and improving coordination between forestry department and panchayat. Third, it is necessary to promote improved agricultural technology and build the capacity of the local people. Fourth, it is necessary to promote

alternate income generating activities especially focusing the women members, such as sewing machines. Fifth, bring river lifting system in operation through necessary renovation works.

**4.4 Access to government support services**

FGD participants were asked about their familiarity with the **government policies** and whether they are benefited from any of such policies. In overall, farmers revealed that they were aware about the various support services existing in government policies (that we discussed in section 3). But, except in some cases, they were not able to access such support services due to lack of awareness of detail procedure and lack of coordination with local stakeholders (Table 4.4).

Table 4.4 Access to government support services

Key features	Saptari – Nepal	Madhubani – Bihar	Coochbehar/AD - WB
Aware about policies and available support	Aware about the STW subsidy, pond rehabilitation support	Aware about STW subsidy	Aware about STW subsidy
Receiving any benefits	Subsidy for STW and pond renovation in one village but not in another	Not received any benefits	-Not received any support in Coochbehar -Some farmers in AD installed STWs with subsidy
Reasons for not getting benefits	Lack of awareness about the procedure, lack of coordination	Lack of awareness about the procedure	Lack of awareness about the procedure, lack of coordination

In the study villages of Saptari district, farmers revealed that they were aware about the existence of subsidy for STW and pond renovation support. Some farmers in one village also reported getting subsidy for STW and pond renovation but not in another village. But they are not yet aware about the details of government policies related to water management and agriculture. Specifically, the reported lack of awareness about the procedure to access such support services and also indicated lack of coordination with other stakeholders.

In the study villages of Madhubani district, farmers revealed that they have heard about the government policies related to water management and agriculture. For example, they heard farmers could get subsidy in STW installation. But none of them are benefitted from any such policies. It was primarily due to the lack of information and awareness about the necessary procedure to access benefit from the government policies.

In Dholaguri village, farmers revealed that they have heard about the government policies related to water management and agriculture. For example, they heard farmers could get subsidy in STW installation. But none of them are benefitted from any such policies. It was primarily due to the lack of information and awareness about the necessary procedure to access benefit from the government policies. However, in Uttar Chakhoakheti village, as part of West Bengal government's groundwater policy, some farmers received financial and technical supports to install the STWs.

#### **4.5 Institutional constraints and potentials**

Key observations based on policy reviews and assessment of local institutions include:

- Policy and institutional framework exist at national, state and district level
- Policies include provision for subsidies and other supports
- National policies do not trickle down to the local level in effective way.
- Inadequate institutional development at local level varied across the study villages – leading to poor access to resources.
- High energy cost, land tenancy and poor water infrastructure were major constraints – resulting due to poor institutional environment at local level
- However, findings reveal local institutions are important and could play crucial roles

Local institutions could play crucial roles through (Bastakoti et al., 2014):

- Initiating unique management solutions suitable to local context
- Act as catalyst facilitating adoption of water management options through technical and material support, and
- Act as bridge between local people and external agencies.

This suggests the need of facilitating the appropriate institutional development at community level. But we should also consider already existing formal/information institutions and synergies among them. It could help to build on from the on-going efforts of local people and could also help avoid any disputes.

### **5. Institutional interventions and key learnings**

Considering the institutional constraints, a number of social and intuitional interventions have been made in the study villages. The key interventions were:

#### **(i) Group formation and strengthening**

Altogether 17 groups have been formed in six study villages: 3 in Kanakpatti, 3 in Koiladi, 4 in Bhagwatipur, 1 in Mahuyahi, 3 in Dholaguri and 3 in Uttar Chakhoakheti. These groups were formed after a series of discussions with community people facilitated by the project researchers. Each group consists of executives (chairperson, secretary and treasurer) and members. All of these groups convene regular monthly meetings in which they discuss about various issues related to their agricultural

cultivation. All these groups have strategy regular monthly savings as well. Based on their discussions in meetings the groups prepare intervention planning for each season that include choice of crops, crop calendar and input procurement.

(ii) Collective farming models

One of the interventions was to promote collective farming models. Four collective models are adopted in different villages that include: Pure collective (input and benefit sharing), collective procurement but operate individually, organized into group but input procurement and cultivation individually. Farmers were facilitated making them aware about various potential benefits of collective models.

(iii) Capacity building – trainings and exchange visits

A range of trainings have been conducted for capacity building of the farmers. The trainings included mainly on agronomic practices, diseases and pest management, on-farm water management, group functioning, and gender and social inclusion. In addition, farmers' exchanges visits were organized with the aim to exposures and cross learnings. Farmers from Saptari visited to project intervention sites in Madhubani. Likewise, farmers from Madhubani visited research station in Ranchi, Jharkhand.

(iv) Stakeholder consultation and engagement (including landlord)

Local stakeholders are integral part of the project and important local institutions that facilitate the access to various resources. Stakeholders meetings have been organized in each study districts including a range of stakeholders including landlord. Such meetings aimed at orienting the stakeholders about the project, discussing their potential roles and establishing linkages with local farmers.

Based on the interventions, regular interaction and engagement with farmers and other stakeholders, the key lesson learnt are:

- Collective decision making helps in better interventions planning
  - Crop calendar, input procurement and use, benefit sharing
  - Increased access to agricultural inputs (of women farmers)
  - Local leadership plays key role
  - Sharing responsibility and tangible benefits
- Exchange visits enhanced cross learnings
- Local level stakeholders facilitate access to government subsidies for irrigation (such as Solar and Drip) and technical support
- Farmers have realized the importance of group and willing to adopt/continue working together; BUT
  - Need further efforts in group strengthening.
  - Improved coordination with state agencies at local level.



## References

- Aryal, I. R. 1982. Naya Nepal ko Itihans. Ratna Pustak Bhandar, Kathmandu, Nepal. pp. 10-21. (In Nepali language)
- Baral, R. R. 2001. Nepal ko Itihans. Ratna Pustak Bhandar, Kathmandu, Nepal. p. 21. (In Nepali language)
- Khanal, R. R. 1982. Muluki Ain Kehi Bibechana (in Nepali language). Lalitpur, Nepal: Sajha Prakashan Press.
- HMG/N, National Planning Commission of Nepal. 1994. Irrigation Development in Retrospect: Search for a Breakthrough. Kathmandu, National Planning Commission.
- HMGN. 2001. Jalashrot Ain 2049 (Water Resources Act 1992), Jalashrot Niyamawali 2050 (Water Resources Regulation 1993), and Sinchai Niyamawli 2056 (Irrigation Regulation 2000). Legal Document Management Committee of HMGN, Kathmandu, Nepal.

[need to update]

## **Annex 1. Checklists used for the collection of primary data**

### **A. Checklist for water management institutions**

[FGD with community people]

1. List of existing formal and informal institutions in the community (irrigation committees, farmer groups, forest groups)
2. Following details on each existing institution
  - Formation of group/committee
  - Membership structure
  - Roles and responsibilities of the institution.
  - Resource allocation, O&M, benefit sharing, equity
  - Gender composition of groups, rules, forms of collective action
3. Details on formal and informal institutions for water management
  - a. How farmers access water from existing water infrastructure
  - b. Water allocation mechanism
  - c. Payment for accessing water
  - d. Contribution to operation and maintenance
4. Details on canal management if present: access, allocation, payments, and contribution to operation and maintenance
5. Groundwater markets – STW and pump ownership, water selling and buying activities, payment mechanisms, issues related to GW uses

6. Key issues and gaps in water management at local level

**B. Checklist for policy context on irrigation and agriculture sector**

[Interviews with officials of irrigation and agricultural sector]

1. Current policy of government on irrigation and agriculture sectors
2. Key provision of policy framework in facilitating irrigation management at national/state level
3. Key provision of policy framework in facilitating irrigation management at district level
4. Key provision of policy framework in facilitating irrigation management at local
5. Key provision of policy framework in facilitating agricultural development at national/state level
6. Key provision of policy framework in facilitating agricultural development at district level
7. Key provision of policy framework in facilitating agricultural development at local level
8. Government subsidy and support framework in case of surface water
9. Government subsidy and support framework in case of groundwater
10. Government subsidy and support framework in case of agricultural inputs
11. Government subsidy and support framework in marketing and prices of agricultural commodities
12. Overtime changes in policy framework (at least in last 30 years) and effects at various levels
13. Provisions of incorporating feedbacks from bottom level in making changes in policy framework
14. Major shortcomings in existing policy framework on irrigation management

15. Major shortcomings in existing policy framework on agricultural development

16. Any feedbacks to improve irrigation management as well as agricultural development