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# Participatory Irrigation Management in India: An Evaluation of the Performance in Andhra Pradesh, Gujarat and Maharashtra

**Vasant P. Gandhi**
**N.V. Namboodiri**

**Centre for Management in Agriculture**
**Indian Institute of Management, Ahmedabad**

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**N.V. Namboodiri**[1]

## Chapter 1
## Introduction

### 1.1 Background

Participatory Irrigation Management (PIM) has assumed great importance in India in the last few decades due to the growing difficulties faced in water resource management, and the realization that stakeholder involvement and participatory management leads to substantial improvements. This research was undertaken on the suggestion of the Ministry of Agriculture, Government of India, which received a request for such a study from the Ministry of Water Resources. It was undertaken as a coordinated research project across the states of Andhra Pradesh, Maharashtra and Gujarat, in partnership with Agro Economic Research Centres (AERCs) in these states, under the overall coordination of the Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad. The studies were conducted in each state and separate manuscripts were prepared for each of the states. This manuscript consolidates the findings of the entire research and further analyses them to draw overall results.

### 1.2 The Problem

There is a growing crisis in water resource management in India and this is becoming increasingly serious as development accelerates (Gandhi and Namboodiri

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2002). Scarcities of water are becoming common and frequent and the quality of water is suffering as well. The management of water distribution across the vast areas of the country, and amongst millions of users, in a sustainable manner is becoming a major challenge. There is crisis in the management of surface water because of the huge investment requirements, project implementation delays, problems of maintenance, institutional difficulties and environmental concerns. There is crisis in the management of ground water because of excessive exploitation against inadequate recharge resulting in receding water tables in many areas. The crucial role of irrigation in food production as well as livelihoods needs no emphasis. The technical and economic solutions to these problems are typically known and often simple, but their institutional management in a participative political economy framework is becoming very difficult and posing a serious challenge (Gandhi 1998).

The role of governments in the construction and management of irrigation systems has existed for a long time (Randhawa 1980). However, since independence, irrigation development has become part of a positive government strategy of development, and canal irrigation development has expanded substantially. In many states, governments have also installed tube wells under public management for irrigation to make available ground water for the farmers. However, government controlled irrigation systems frequently show low water use efficiency, poor maintenance, weak financial sustainability and excessive dependence on subsidies. The efficiency of irrigation systems in various operations from water accumulation to extraction, diversion to its actual use through various stages has been poor (Majumdar 2000). The poor utilization of the irrigation potential created over the planning bears this out. The analysis of the shortcomings of the conventional irrigation management points substantially to the

lack of meaningful involvement of the farmers in decision making and in various physical activities (Sivamohan and Scott 1994). This realization has led to a growing emphasis on participative irrigation management.

**1.3 Need for Participatory Irrigation Management (PIM)**

The experience over the last two decades shows that if farmers actively participate in irrigation management there is marked improvement in water utilization efficiency (Gandhi and Namboodiri 2002). Uphoff (1986) has highlighted some of the important benefits, drawing upon international studies. With participation, there is increase in the area under irrigation and also in the number of farmers who gain access to irrigation. In Pochapad, the irrigated area increased by 25 to 30 percent after Warabandi and the formation of pipe committees. Similar findings have come from the Mula Command in Maharashtra and the water users cooperatives in Gujarat. Cooperation between farmers was found to increase and due to this, many water related disputes get sorted out. The agency was able to supply water with great control and economy. In Mula, for example water logging had perceptibly declined after the formation of Pani Panchayats (Singh 1991).

A change/ transfer in irrigation management whereby farmers take over the management of operation and maintenance while government agencies mainly focus on developing and improving the management of water at the main system level has been supported by many researchers including Vaidyanathan 1999, Subramanian et.al. 1997, and Meinzen-Dick and Mendoza 1996. Such ideas have led to the promotion of Participatory Irrigation Management (PIM). Several states have modified the old irrigation acts to accommodate group management by farmers. Some are in the process of

enabling farmers to form water cooperatives and charging for water by volume as against the usual crop acre rate.

The PIM broadly refers to the formation of groups of water users/ farmers in a formal body for the purpose of managing parts or whole of an irrigation system. The bodies are often called Water Users' Associations (WUA) but may also go by other names such as irrigation cooperatives or partnerships. PIM implies the involvement of water users in different aspects and levels the management of the water including planning, design, construction, maintenance, and distribution as well as financing. The primary objective of PIM is typically to achieve better availability and utilization of the water through a participatory process that gives farmers a significant role in the management decisions of water in their hydraulic units (Salman 1997).

This system of user management is preferred since it is felt that the users have a stronger incentive to manage water more productively, and can respond more quickly to management problems in the system, particularly at the farm level (Brewer J, et.al. 1999, Grocenfeldt and Svendsen, 1997, Subramanian et al, 1997)). Moreover, transferring responsibilities has also come to be seen as a way to reduce pressures on thinly stretched government finances, while at the same time improving irrigated agricultural production and ensuring the long term sustainability of irrigation systems (Geijer et al 1996, Vermillion 1991, Mitra 1992). The intention is also to encourage efforts by individuals to take responsibility for the management of the resource, in the belief that individuals have greater stake and better information for making efficient resource allocations (Brewer et al 1997).

Therefore, PIM or the user participation in the management of irrigation systems in India typically seeks to address the following objectives:

1. Improve efficiency of irrigation systems.
2. Ensure sustainability of irrigation systems
3. Improve performance of irrigated agriculture
4. Reduce pressures on government finances
5. Permit farmers to play a greater role, which is a major shift away from conventional government policy.

### 1.4 The PIM Policy in India

The PIM policy of the Government of India covers the management of diverse water resources through a participatory approach. According to the policy, this is to be done by involving users, other stakeholders and various governmental agencies in the decision making. This must cover various aspects including planning, design, development and management of the water resources. Necessary legal and institutional changes should be made at various levels for this purpose.

The proposed major objectives of the government's PIM policy (India, Ministry of Water Resources) are:

1. To create a sense of ownership of water resources and the irrigation system among the users, so as to promote economy in water use and preservation of the system
2. To improve service delivery through better operation and maintenance
3. To achieve optimum utilization of available resources through better/ sophisticated methods, accurately as per crop needs
4. To achieve equity in water distribution

5. To increase production per unit of water, where water is scarce and to increase production per unit of land where water is adequate
6. To make best use of natural precipitation and ground water in conjunction with canal irrigation for increasing irrigation and cropping intensity
7. To encourage better use of water through better choice of crops, cropping sequence, timing of water supply, period of supply and frequency of supply, depending on soils, climate and other infrastructure facilities available in the commands such and roads, markets, cold storage etc. so as to maximize the income and returns
8. To encourage collective and community responsibility of the farmers for collecting water charges and making payments to irrigation agency
9. To create a healthy atmosphere between the irrigation agency personnel and the users

**1.5 Adoption of PIM Policy in Selected States**

Recognizing the need for a sound legal framework for PIM, the Government of India brought out a Model Act to be used by the State Governments for enacting new irrigation acts or amending the existing ones for facilitating the successful implementation of PIM. Eight state governments have used this to develop and pass new Acts or amended the existing ones. Andhra Pradesh is one of them. Gujarat and Maharastra have experimented with the idea of farmers' cooperatives in irrigation management and made a good beginning. Maharashtra has also recently passed a new Act. Programmes based on the PIM concept are at various stages of implementation in these states. The study proposes to cover all these states.

Maharashtra has formulated policies for promoting transfer of irrigation management responsibilities from the government to the farmers. The policy is based on

a long history in Maharashtra regarding respect for farmers' water resources management abilities. The Irrigation Department manages the canal systems in the state. Under the basic irrigation management approach of the *shejpali* system, every farmer is required to apply for irrigation water every season, indicating the crops to be irrigated and the area of each crop. This helps the management to plan for water distribution according to the needs of the farmers. The primary objective behind encouraging irrigation management transfer was to improve water use efficiency. Most canal systems serve only a fraction of the planned command. The Irrigation Department has adopted a policy for creating Water Users' Association (WUA) at the Minor canal level (average command of 500 hectares), transfer O&M responsibilities for the Minor and smaller channels to the WUAs, allocate water to the WUAs through a 5-year agreement, and charge WUAs for water on the basis of the volume actually taken. The government has encouraged NGOs and Irrigation Department officials to help farmers in creating WUAs. The state also offers various incentives to the farmers such as support for channel repairs, rebates for prompt payment of irrigation fees, volumetric fees lower than crop-area fees, and maintenance grants. The Irrigation Department monitors the progress of transfer throughout the state. As of March 1995, the Irrigation Department reported transfer of O&M functions to 75 WUAs and another 205 WUAs are in the process of formation in major systems. So far, these WUAs cover only a limited fraction of the canal commands in the state. In July 2001 the Maharashtra State has issued a Government Resolution making mandatory to form Water Users Cooperative Societies (WUCS) on Distributaries and Minors of fully developed irrigation systems. Canal water will be supplied only to those farmers who are members of the WUCS.

In 1995 the Government of Gujarat approved policy resolutions for implementing PIM in the state and subsequently approved model bye-laws for irrigation co-operative societies and a model Memorandum of Understanding between Government Administration and Water Users Association. An action plan was finalised for implementing Government policy resolution on PIM. A year later, i.e., in 1996, a State level working Group for Participatory Management was formed and entrusted the responsibility for 13 pilot projects through Chief Engineer, PIM. Since then a large number of Water Users' Associations have been formed and are working in various parts of the state.

The Andhra Pradesh Legislative Assembly approved a special Act called `Farmers' Management of Irrigation Systems Act' in 1997. The major focus in the organizational component was the establishment of WUAs, Distributory Committees (DCs), and Project Committees. Through the Act, the irrigation management of about 5 million hectare land was to be brought under the control of millions of farmers, mainly smallholders. Over 10,000 Water Users' Associations and 174 Distributory Committees were created. They were given the responsibility of planning and implementing the water distribution, maintenance and improvement of irrigation systems. The role of the irrigation department changed from a "doer" to a "facilitator". During its first year of operations, the area where the Act was put into practice reached 200,000 hectare. The implementation of the Act has been accompanied by large awareness campaigns, including training of office-bearers of WUAs and DCs and issuing written materials and newsletters. The state government regularly monitors the activities and programmes (Brewer J, et al).

### 1.6 Objectives of the Study

The major objectives of the overall study were to examine the following:

(i) Examine the evolution of PIM in Andhra Pradesh, Gujarat and Maharastra

(ii) To examine if the devolution of power to the WUAs has taken place in the selected states

(iii) To examine if the WUAs have contributed towards regular water supply, efficiency in water use, collection of water charges, and operation and maintenance of the water delivery systems

(iv) To examine if there is any change in the performance/ pattern of agriculture and well-being seen by the beneficiaries

(v) Identify constraints in the effective implementation of PIM, problems in the coordination between the WUAs and the irrigation agencies, and ways to remove the constraints including training needs and proper organization structure.

(vi) Suggest ways by which successful PIM models can be replicated in other states and possible actions for the effective implementation of PIM in all states and Union Territories.

This report consolidates the findings from Andhra Pradesh, Gujarat and Maharashtra.

### 1.7 Methodology

The study was conducted in the states of Andhra Pradesh, Maharashtra, and Gujarat through the involvement of the respective AERCs. CMA was closely involved with the AERCs. The study involved the examination and survey of a sample of WUAs/ PIM organizations in selected districts of these states. The selection of the districts was done by the AERCs based on the information available about the PIM implementation

and WUAs in each state. PIM activities of different types and in projects of different sizes were covered and included a range of farm sizes and locations. The survey instruments were prepared by CMA and finalized in consultation with the AERCs. Efforts were made to maintain uniformity across states through meetings, communications and visits. Data was collected during the 2004-05 season and effort was made to cover information of 2003-04 were ever possible based on recall. This research consolidates the findings of the research conducted by the different state AERCs.

# Chapter 2
# Evolution of Participatory Irrigation Management in the Three States

This chapter gives a brief account on the evolution of Participatory Irrigation Management (PIM) in the selected states, the major roles and functions and the legal framework under which they operate.

## 2.1 Evolution of PIM in Andhra Pradesh

Since the formation of the state Andhra Pradesh in 1956, the expansion of irrigation has been one of the highest development priorities. Budgetary allocations have been very substantial to irrigation sector, much of it to public canal irrigation. However, the large gap between irrigation potential created and actual area being irrigated under surface irrigation systems in the state has been a major worry. A number of factors could be attributed to the inefficiency of public surface irrigation systems in the state. Critical among them are lack of sufficient allocation of funds for operation and maintenance, inequality in the distribution of water between head and tail end farmers, deterioration of irrigation infrastructure, poor cost recovery, low priority to minor irrigation and lack of involvement of local institutions. It is under this backdrop the Andhra Pradesh Farmers' Management of Irrigation Systems Act (APFMIS Act) was passed in the legislative assembly on March 27, 1997.

Creation of an institutional structure for the users of water for irrigation viz., the Water User Associations (WUA) as its basic elements has been proposed in the above Act. The Act proposed that the farmers falling under selected command areas may be organized into a committee and it was envisaged that this committee would supervise the

distribution operations, maintenance and ensure equity. Under provisions of the Act, a three-tier Farmers' organizations was proposed (Table 2.1).

Table 2.1: Organizational Structure and Functions of Three-tier WUAs in Andhra Pradesh

| Farmers Organization | Irrigation Systems | Composition and Functions |
|---|---|---|
| Water User Associations (WUA) (at the primary level) | Minor, Medium and Major Irrigation systems | Formed on Hydraulic basis<br>Area of a WUA to be divided into territorial constitutions (TC) to give adequate representation to all farmers in head, middle and tail reaches.<br>All land holders and tenants with in the notified area are members with voting rights.<br>All other water users are members without voting rights. |
| Distributory Committee (DC) (at the Distributory level) | All Major Irrigation systems only | Presidents of WUAs constitute a Distributory Committee.<br>All WUAs in its jurisdiction are its members<br>Look after medium drains and distributories<br>Resolve disputes of WUAs |
| Project Committee (PC) (at the Project Level) | All Major and Medium Irrigation systems | A part or whole of the project to have a project committee<br>The presidents of the DC and WUA are its members in respect of project committees of major and medium projects only<br>Resolve disputes of DCs and WUAs. |

At the primary level there will be the WUA covering a well-defined hydraulic unit with a group of minors. The group of WUAs along the distributory or distributaries are federated to form the second tier called the Distributory Committee (DC). The DCs of the entire irrigation system will form the Project Committee (PC). Under the Act, a one tier (WUAs) was proposed under minor irrigation system, two tier under medium

irrigation projects and three tier under major projects. After the enactment of the APFMIS Act, the process of formation of WUAs covering all the irrigation projects in the state was initiated. The entire district administration under the District Collector was mobilized and WUAs were formed following the normal democratic process. As of now about 10,292 WUAs and 174 DCs have been formed covering a total command area of 4.80 million hectares.

The APFMIS Act of 1997 was a revolutionary legislation since it was the first of its kind in India seeking to bring a paradigm shift in irrigation management. It would be worthwhile to mention some of the major clauses incorporated in this Act. The Act contains broad provisions relating to the types of irrigation schemes, tiers of farmers organizations (FOs), elections, functions of FOs, resources and penalties for offenses. The Act also provides for linkage between irrigation department and farmers' organizations thorough appointment of officers as competent authorities. The competent authorities are responsible for implementation and execution of all decisions taken by the farmers' organizations. At WUA level, Assistant Executive Engineer is the competent authority while Deputy Executive Engineer acts as the competent authority at Distributory committee level. At project committee level the Superintending Engineer/Chief Engineer will be the competent authority. The WUAs are formed as legal entities, and powers devolved to the WUAs are backed by legal rights and obligations. The Act mainly gives water rights and control of the system to the WUAs. It provides functional and administrative autonomy and WUAs can take their own decisions. And, most importantly, the Act makes the Irrigation Department accountable to the WUA. At the primary level powers like maintenance of the system, conflict resolution, record keeping, etc. have also been delegated.

## 2.2 Evolution of PIM in Gujarat

The Government of Gujarat has adopted a policy to encourage the management of irrigation projects on participatory basis in mid 1990s. The state has already earned a name in the country for its efforts in promoting farmer managed irrigation projects in certain areas of the state. The government has taken a series of measures to facilitate the programme on handing over the management of irrigation projects from the Government to farmer's organization. Most of these orders are issued by Narmada & Water Resources Department. The major elements of these policy measures include: format for agreement between government departments and voluntary organizations when development works are entrusted to them, formation of state level working group for participatory irrigation management, financial assistance to voluntary organizations for providing services to community organizations for promoting PIM.

On June 1995 the Gujarat Government passed a Policy Resolution for implementing Participatory Irrigation Management in the state and signed a memorandum of understanding (MOU) between government administration and Water Users' Association (WUAs) for transferring the government's irrigation projects to WUAs. In November 1995 an Action Plan for implementing the Policy Resolution on Participatory Irrigation Management was formulated. In February 1996 the Government has entrusted the responsibility for 13 pilot projects to the Chief Engineer under the Irrigation Department for implementing the PIM policy of the state.

The basic framework followed for the formation of WUAs is as follows. The farmers' association shall be registered under the Co-operative Act/Societies registration Act/Indian Company Act. The ownership of head of canal and other structures shall be with the state government. The farmer members will be involved in planning,

administration, operation and management. Government will provide financial assistance depending on the nature of work, rights as per the present legal provisions. Different types of WUAs have been envisaged for various irrigation systems. Under canal system WUA shall be formed on hydraulic basis at minor/sub-minor level having a command area of 400-500 hectares for the outlets directly from the distributory, a branch or a main canal. Smaller WUAs shall be associated with the nearby Distributory Committee or project committee. The Distributory Committee at the secondary level shall have a command area of 4000-5000 hectares. The Branch Committee at the third level shall be formed at branch level with an area of 50000 hectares. Finally, there would be a Project Committee at the project level with representation from all the Distributory/Branch Committee presidents.

The Sardar Sarovar Project would cover an area of about 18 lakh hectares of irrigated area and it is proposed to form about 5230 WUAs and out of which 1074 WUAs have already been formed, 661 WUAs have been registered and the rest are in the formation stage. However, many WUAs are yet to be made operational. The Gujarat Water Resource Development Corporation (GWRDC) has been motivating the farmers to form the WUAs under the tubewell irrigation system. Out of a total of 4432 public tubewells in the state, 2596 tubewells are used for irrigation purposes. As of 2004-05, 2192 tubewell out of the above used for irrigation have been transferred to irrigation cooperatives by the GWRDC. Banaskantha district dominates in respect of number of irrigation tubewells managed by cooperatives followed by Mehsana, Anand and Patan districts. Besides this, by 2005, as many as 44,500 check dams of various sizes have been constructed in the state through the efforts of NGOs, Farmers' Associations and the

state government in various parts of the state particularly in the central and Saurashtra regions of the state.

**2.3 Evolution of PIM in Maharashtra**

Maharashtra has a long history with regard to PIM and farmers managed irrigation systems such as "Phad" and "Malgujari" tank irrigation systems and these have been practiced over centuries. The new forms of PIM started picking up only after the mid-eighties since the announcement of the National Water Policy in 1987. Significant progress has taken place since 1992 as the Irrigation Department has been encouraging the farmers to form WUAs. In terms of formation of WUAs, the state has made rapid progress over the last decade. In order to give legal recognition to the WUAs the state has recently passed an Act known as Maharashtra Management of Irrigation Systems by Farmers Act, 2005. There has been significant progress in the number of WUAs functioning/registered/proposed since 1996 (Table 2.2). During the last 10 years since 1996, the number of WUAs functioning in the state has increased from 100 to over 774 with a six fold increase in their command area. About 3250 WUAs are in various stages of formation such as signing the agreements with the government, registration with government, submitting the proposals and so on.

While most of the WUAs are formed with state support, some WUAs that have been formed with the support of NGOs and users in the state. The Pani Pachayat in Maharastra is a good example for such initiatives. The Pani Panchayats were established on the initiative of some NGOs during the 1970s in the rain fed areas of Maharashtra. The NGO that played a major role in their establishment was Gram Gaurav Prasthan Trust. The establishment of the Pani Panchayat has enabled the farmers to cultivate high value crops in place of low value, low yielding crops. Besides this, WUAs under Lift

Irrigation Schemes, i.e., lifting water from rivers, have been in existence in Maharastra for some time. They operate on a cooperative basis and use either electric or diesel pumps to lifting water from rivers.

Table 2.2: Progress of WUAs Formation in Maharashtra

| Particulars | As of September 1996 | | As of July 2005 | |
|---|---|---|---|---|
| | Number | Area Controlled (ha.) | Number | Area Controlled (ha.) |
| Water User Associations Functioning | 100 | 43684 | 774 | 250521 |
| Agreement Singed, yet to hand over | 34 | 9894 | 426 | 151936 |
| Registered, yet to sign agreement | 180 | 60372 | 1201 | 433410 |
| Proposed | 143 | 55211 | 1650 | 704948 |
| Total | 457 | 169105 | 4051 | 1540815 |

# Chapter 3
# Data and the Profile of Sample Water User Associations and Farm Households

This chapter gives a brief account of the data collection and use and the profile of the sample WUAs under various irrigation systems in the three states as well as the profile of the sample farmer member households of these institutions. It covers the basic features of the selected institutions and sample farmer households.

## 3.1 Selection of WUAs in Andhra Pradesh

For the study, the sample of districts and water user associations (WUAs) are selected based on the information provided by the state Irrigation and Command Area Development Department on the list of institutions in which elections were held in October 2003 under the new set up under major, medium and minor irrigation systems. At the first stage, the districts with highest number of WUAs that are functioning under each irrigation system are selected. In the next stage, the institutions (WUAs) are selected after bifurcating the irrigation divisions under each system. The details of the selected WUAs have been briefly discussed below.

To represent the canal irrigation system, two WUAs under major and three WUAs under medium irrigation systems are selected. Godavari delta system is one of the oldest canal systems in the country that irrigates East Godavari and West Godavari districts since 1855. These areas are endowed with many resources and the farmers here are progressive in nature. In respect of medium irrigation, 'Tatipudi' reservoir in Vizianagaram district, which irrigates an area of 6218 hectares through direct and link channel system since 1963 was selected. One of the WUAs on Canal (major) selected

was formed in 1997, with eight villages, which comes under its jurisdiction, is located in Ravulapadu village. In the beginning (1997), an area of 5285 acres was under this WUA, but after amendment of the APFMIS Act in 2003, this was bifurcated into two WUAs and its area of operation got restricted to 2297 acres (Table 3.1).

| Table 3.1 : Details of Selected WUAs in Andhra Pradesh | | | | | |
|---|---|---|---|---|---|
| District | Mandal | Village | Irrigation Division | CAD/Tank | Command Area under the WUA(in Acres) |
| Canal ( Major) in Andhra Pradesh : **CMAP** | | | | | |
| East Godavari | Ravulapalem | Ravulapadu | Godavari Central Division | CAD | 2297 |
| East Godavari | Ravulapalem | Velampalem | Godavari Eastern Division | CAD | 5015 |
| Canal ( Medium)) in Andhra Pradesh : **CMEAP** | | | | | |
| Vizianagaram | Gantyada | Bonangi | Tatipudi Reservoir | CAD | 1607 |
| Vizianagaram | Gantyada | Madanapuram | Tatipudi Reservoir | CAD | 1275 |
| Vizianagaram | Jami | Jami | Tatipudi Reservoir | CAD | 1939 |
| Minor (Tanks) in Andhra Pradesh: **TAP** | | | | | |
| Chittoor | Gudipala | Kolavuru | Chittoor Division | Bangarakka Tank | 156 |
| Chittoor | R.C. Puram | Kuppam | Tirupati Division | Kuppam badur Tank | 116 |
| Chittoor | Renugunta | Guravaraju palle | Tirupati Division | Guravaraju palle Tank | 114 |
| Chittoor | Irala | Tirunampalli | Chittoor Division | Pillari Tank | 122 |

The command area of this WUA is subdivided in order to equitably handle the water management, maintenance and governance. Presently, there are 2500 farmer members in the WUA, spread over its command area. The entire area of operation is irrigated in both Kharif and Rabi seasons. Majority of the farmers belong to small and marginal (80%) and rest are big farmers owning more than 5 hectares on an average. Apart from paddy, the major crops in the area are Banana, Coconut, Turmeric. The major problem infested with this delta region is drainage. Inadequate drainage facilities have been a major problem. After formation of WUA, funds are utilized to desilt main canals, branch canals and distributaries. Other major activities undertook by the WUA include essential structures, which were neglected by the irrigation department, were now undertaken by the WUA funds and mid-dams are provided and repairs to some locks are done in many places. To implement warabandi system, shutters were provided in some places.

Another WUA selected under canal (major) was Velampale and this WUA has been formed with nine villages under its control. Earlier an area of 9347 acres was under this WUA but after its division the present area of operation was reduced to 5015 acres spread over these villages. The total number of farming households under its jurisdiction is 3200 mostly represented by the small and marginal holdings (about 83%). The peculiarity of this association is that the same management (body) was elected twice unanimously and proved that the party, caste and class background of the office-bearers are not coming the way of functioning of this institution. The major works taken up by the WUA include repairs to channels, weed removal, bridges across the channels.

The WUAs selected under the canal (medium) was Tatipudi reservoir. This reservoir is located across Gosthani River near Thatipudi village of Gantyada mandal in Vizianagaram district. About 10 WUAs are formed under this system. The registered ayacut under the project is 6218.45 hectares, out of which 2290.17 hectares is fed by Anicuts and Groynes located lower down within the ayacut area duly linked with the channel system. The balance of 3928.28 hectares is fed under various direct channel systems. Three WUAs under this system have been selected as a sample and these institutions are evaluated to represent medium irrigation system.

One the Another WUA selected under canal (medium) was Bonangi consisting about 636 farming households listed This WUA covers the villages of Bonangi (major part) and Madhupada. The area of operation is about 1607 acres and no additional area was brought under irrigation after formation of the WUA. This WUA was formed with 90 per cent of small and marginal farmers and the rest belong to higher holdings. Availability of adequate water at the ail end has been one of the major problem of the WUA when it was formed.

One of the other WUAs under canal (medium) selected was the pallapukaluva system under the Thatipudi Reservoir scheme. Five villages come under its jurisdiction. An area of 1939 acres has been controlled by this WUA and the same acreage is being irrigated since its formation in 1997. There is no change in the area of operation of the WUA. In addition to the direct channel system, there are nine channel fed tanks in different villages which provide irrigation in Kharif season. Irrigation was confined to a single season. The total farmer members in the WUA are 511. Social structure is dominated by backward castes and small farmers. Paddy and Sugarcane are the important crops cultivated in kharif season and pulses are grown in about 70 per cent of the total

area in rabi season in rice fallows. Ground water is used to supplement the reservoir water in scarcity conditions.

Under canal (medium) the other WUA selected was Madanapuram and this WUA is part of the Thatipudi medium irrigation scheme, located very close to the reservoir and an area of 1275 acres is being irrigated through this source since 1963. It covers six villages namely Thatipudi, Madanapuram, Bonangi (Part), Vasadhi, K. Velagada and Tamarapalli. Small and marginal farmers constitute major part (90%) of the members of the WUA. Paddy is the main crop in kharif season and greengram (pulse) is grown in rabi season. These two crops constitute about 82 per cent and 63 per cent of the total cropped area during the respective seasons.

Under minor irrigation system (tanks) the WUA selected was Pillari Tank and this WUA was formed to manage the 'Pillari Tank' in Irala mandal of Chittoor district, which originally irrigates 122.19 acres as per the revenue records. The wet lands of Kanipakam and Tirunampalli villages come under the command area of this WUA with participation of 120 farmer households. Almost all the ayacutdars come under small and marginal category because of the small ayacut area under the tank. The area under the tank was not irrigated for the last three years due to failure of monsoon. Earlier sugarcane and paddy crops were grown during kharif season and lands were kept fallow for the rest of the year. At present only an area of 20 acres was under sugarcane as rain fed crop. This is a pitiful situation and the farmers depend on dairying as a major source of income and other non-farm employment in nearby urban centres. An amount of Rs. 2.52 lakhs has been spent for tank bund repair and closing of breach to feeder channel in the years 1997 and 2001 respectively.

Another WUA under the minor - tank irrigation system selected was Bangarakka Tank in Gudipala mandal of Chittoor district. This WUA is created with 183 farmers in Kolavuru, Vasantapuram and Basavapalle villages. The total area operated under the tank is 156.08 acres. But water for irrigation was available barely for irrigating 44 acres during the year 2003-2004. Large majority of the farmers are small. Prior to the formation of WUA, when tank was filled, paddy and sugarcane are cultivated

Another WUA under the Tank system selected was Guravarajupalle Tank situated near Renigunta in Tirupathi irrigation division intend to irrigate 114 acres as per the revenue records but another 50 acres are being irrigated under the tank unofficially. The total farmer members are 75. This is a channel fed tank and recently waste water (partly) is drained into the tank from sewage farm of Tirupathi town, which is situated at a distance of 15 kms. Paddy is cultivated in the entire area in kharif season and there is no sufficient water in the tank to irrigate for the second season.

***3.2 Selection of WUAs in Gujarat***

Three WUAs under the canal systems were selected for the intensive study in Gujarat. One of the WUAs under the canal system selected is located in Thalola village in Visnagar taluka in Mehsana district and situated at the tail reach of Dharoi canal project on the river Sabarmati (Table 3.2). There are about 185 households in the village and majority of them are small and marginal farmers. The total membership in this WUA is 260. Agriculture and dairying are the major economic activities in this village and it has a cooperative service society and a cooperative milk society. The major castes in the village include Patels and Thakores. This WUA was one among the pilot projects taken up by the government under its PIM policy. The WUA commands about 380 hectares of cultivated land and 270 hectares are irrigated. The other WUA under the canal system

selected is situated in Liyadar village in Visnagar taluka of Mehsana district. This WUA is in the middle reach of the Dharoi canal project in the river Sabarmati. The WUA has 455 hectares of cultivated area under its command and the total membership of the society is 104. Small and marginal farmers dominate this WUA. The third WUA selected under the canal system belongs to village Tranol in Anand taluka of district Anand. This WUA has 550 hectares of cultivated area under its command with a membership of 183. Majority of the farming households are with marginal and small holdings.

Four WUAs were selected under the tubewell system. One of this WUA belongs to village Bhesana in Mehsana district. This WUA commands an area of 40 hectares with a membership of 41. Marginal and small farmers dominate this WUA. The second WUA selected under the tubewell system belongs to village Savala of Visnagar taluka in Mehsana district. This tubewell cooperative has a command area of 38 hectares with a membership of 45. Most of them were small and marginal farmers. Another tubewell WUA selected belongs to village Dhobikui of Borsad taluka in Anand district. This WUA has 170 hectare cultivated area with a membership of 22 and most of them were medium farmers. The fourth WUA under the tubewell system selected was from Dabhasi village in Borsad taluka also from the Anand district. This WUA has a command area of 134 hectares with a membership of 67, most of them being small and marginal farmers.

Three WUAs have been selected under the check dam system. One of them is located at the village Ugmedi in Gadhada taluka in Bhavnagar district. 82 check dams have been constructed in this village including on river Kent. There are about 700 households in this village and virtually all of them participate in the activities of this WUA. Another WUA selected under the check dam system is located at village Lakhanka in Gadhada taluka in Bhavnagr district and this village has 400 households. So

far 63 check dams have been constructed in this village. Another check dam system WUA selected belongs to village Khopala in the same taluka and has 740 households with a cultivated area of nearly 2000 hectares. Nearly 200 check dams have been constructed so far in this village.

| Table 3.2: Details of the Selected WUAs in Gujarat | | | |
|---|---|---|---|
| Item | Village | Taluka | District |
| Canal System in Gujarat: **CG** | | | |
| Thalota Piyat Vistar Sahakari Mandli | Thalota | Visnagar | Mehsana |
| Kiyadar Sahakari Mandli | Kiyadar | Visnagar | Mehsana |
| Tranol Piyat and Krushi Vikas Sahakari Mandli | Tranol | Anand | Anand |
| Tubewell System in Gujarat: **TWG** | | | |
| Jay Shakti Mata Khedut Mandal | Bhesana | Mehsana | Mehsana |
| Madni Juth Oiyat Cooperative Society | Savala | Visnagar | Mehsana |
| Dhobukui Khedut Piyat Sahakari Mandli | Dhobikui | Borsad | Anand |
| Yogi Piyat Sahakari Mandli | Dabhasi | Borsad | Anand |
| Check Dam in Gujarat: **CDG** | | | |
| The Ugmedi Gram Vikas Samiti | Ugmedi | Gadhada | Bhavnagar |
| Lakhanka Gram Vikas Samiti | Lakhanka | Gadhada | Bhavnagar |
| Khopal Jalsanchay Vikas Samiti | Khopal | Gadhada | Bhavnagar |

### 3.3 Selection of WUAs in Maharashtra

In all 10 WUAs have been selected from Maharashtra. Of this five WUAs have been selected in the canal command areas, three in river lift irrigation systems, and two in Pani Panchayat schemes. Of the five WUAs selected from the canal command area one is located in the head reach, two in the middle and two in the tail reach (Table 3.3).

| Table 3.3 :Details of the selected WUAs in Maharashtra | | | |
|---|---|---|---|
| | Village | Taluka | District |
| Canal System in Maharastra: **CM** | | | |
| Shri Ganesh Water Users Association(Head) | Mangrul | Jamner | Pune |
| Biroba Cooperative WUA (Middle) | Ralegaon Thepal | Parner | Ahmednagar |
| Shivshakti Cooperative WUA (Middle) | Nighoj | Parner | Ahmednagar |
| Gangotri Coioperative WUA (Tail) | Belwandi | Srigonda | Ahmednagar |
| Khandobaraya WUA (Tail) | Yelapane | Srigonda | Ahnednagar |
| River Lift System in Maharastra: **RLM** | | | |
| Shri Chintamani Cooperative WUA | Tahrawad | Ambegaon | Pune |
| Shri Shambu Cooperative WUA | Pimpalgaon | Ambegaon | Pune |
| Shri Wardhani WUA | Takrarwadi | Indapu | Pune |
| Pani Pachayat in Maharastra: **PPM** | | | |
| Renuka Lift Irrigation Scheme | Mahoor | Purndar | Pune |
| Babdeo Irrigation Scheme | Shindewad | Purndar | Pune |

The WUA in canal head reach is located in Mangrul village of Jamner Taluka in Pune district. This was established in 1996 with 80 members and this number rose to 130 by today and with a command area of 65 hectares. Marginal and small farms dominate the irrigation command area. The society was established with the help of government officials of the irrigation department, and some progressive farmers in the village.

Two WUAs have been selected from the middle reach of the canal command. These WUAs are at Ralegaon Thepal, and Nighoj villages in Parner taluka of Ahmednagar district. These WUAs have command areas of 315 and 321 hectares

respectively with 112 and 207 farming households. Total membership in these institutions are respectively 102 and 186 respectively. Small and marginal farmers dominated both these WUAs.

Two WUAs working at the tail end of the canal irrigated areas selected for the indepth study belongs to Belwandi village in Shrigonda taluka in Ahmednagar district and Yelapane village in Ahmednagar district. Number of farmer households in these WUAs are respectively 114 and 122 with a command area of 305 and 915 hectares. Total membership in these WUAs are respectively 114, and 122. Small farmers dominated in these WUAs with an almost equal in number of large and marginal farms

Three WUAs selected in the lift irrigated system are from Pune district and have command areas of 101, 42 and 48 hectares respectively. These WUAs lift water from the river for the purpose irrigating the crops. Number of farming households in these WUAs were respectively 140, 80 and 29 with every one from these households being a member of the WUA.

Two water user associations working in Pani Panchayat area have also been selected for the study. The source of their water is village tanks. The irrigation command under them were respectively 48 and 29 hectares with the same number of members. These WUAs are established in the rainfed areas with the aim of protecting the livelihood of people often affected by droughts. They are not promoted by the state agencies, but by NGOs and the users.

**3.4 Selection of Beneficiary Farmer Households**

The sample farm households were selected using stratified random sampling with the intent of covering small (small and marginal – less than 2 ha), medium (2-4 ha) and large (above 4 ha) farmers. The number of beneficiary farmer households selected from

each of these WUAs is given in Table 3.4. The total sample size was 435. The composition of number of small, medium and large farm households are respectively 222, 124 and 89.

Table 3.4: Household Sample Distribution across States, Irrigation Systems and Farm Sizes

| Irrigation System | State | Abbreviation Used | No. of Institutions | Small (Below 2 ha) | Medium (2-4 ha) | Large (Above 4 ha) | Total |
|---|---|---|---|---|---|---|---|
| Canal: Major | Andhra Pradesh | CMAP | 2 | 12 | 10 | 8 | 30 |
| Canal: Medium | Andhra Pradesh | CMEAP | 3 | 18 | 15 | 12 | 45 |
| Canal System | Maharashtra | CM | 5 | 30 | 25 | 20 | 75 |
| Canal System | Gujarat | CG | 3 | 36 | 6 | 3 | 45 |
| Tank System | Andhra Pradesh | TAP | 4 | 30 | 20 | 10 | 60 |
| Tubewells | Gujarat | TWG | 4 | 48 | 8 | 4 | 60 |
| River Lift System | Maharashtra | RLM | 3 | 18 | 15 | 12 | 45 |
| Pani Panchayat | Maharashtra | PPM | 2 | 12 | 10 | 8 | 30 |
| Check Dams | Gujarat | CDG | 3 | 18 | 15 | 12 | 45 |
| Total | | | 29 | 222 | 124 | 89 | 435 |

Some of the major basic characteristics of the sample farmer households are given in Table 3.5. They show the following. The age of head of household in the sample households was in the range of 40 to 50 years. The average level of education of the head of households was 2.56 (based on no formal education=0, primary=1, secondary=2, basic degree=3, and higher degree=4). The average distance from nearest town was the lowest under CMAP (2.5 km) followed by CDG and the farthest was CG (18 km). Note that the

results presented in this report are based on the reports of the state studies, and individual household survey observations were not available from the AERCs for the analysis.

Barring few exceptions, the sample respondents were the head of households. Percentage of sample respondents as village leaders was 23 percent under CMAP and RLM but very low under CG followed by TWG systems. Some of the selected household heads were representatives on the managing committee of these WUAs.

The average ratings on the level of participation differed substantially among the WUAs under different irrigation systems studied. While the participation was very active under CG, CDG and TWG it was moderate under other systems. The participation was towards passive or none among CMEAP, CMAP, TAP and lastly PPM and included three systems in Andhra Pradesh.

Table 3.5 : Some Basic Characteristics of Sample Households under different Irrigation Systems

| | CMAP | CMDAP | CM | CG | TAP | TWG | RLM | PPM | CDG |
|---|---|---|---|---|---|---|---|---|---|
| Average Age of the Head of Household (years) | 46.23 | 49.04 | 43.16 | 52.84 | 52.50 | 46.64. | 55.98 | 53.03 | 48.18 |
| Education | 2.56 | 2.32 | 2.55 | 1.84 | 2.38 | 1.98 | 2.64 | 2.70 | 0.74 |
| No. of years of farming experience (years) | 30.37 | 30.00 | 22.44 | 28.47 | 33.78 | 24.47 | 29.60 | 28.73 | 28.39 |
| Average Number of family members | 5.70 | 4.80 | 7.53 | 6.81 | 4.82 | 6.45 | 8.24 | 6.67 | 6.69 |
| Distance from nearest town/city (kms) | 2.50 | 19.44 | 17.99 | 6.47 | 12.17 | 9.36 | 6.33 | 18.17 | 5.22 |
| Position in Village(Percentage) | | | | | | | | | |
| Head of Households | 96.67 | 97.78 | 92.00 | 96.00 | 100.0 | 95.45 | 91.11 | 93.33 | 97.23 |
| Village leader (%) | 23.33 | 17.78 | 16.00 | 2.22 | 8.33 | 3.22 | 22.22 | 10.00 | 4.47 |
| Position in the Water User Association(Percentage) | | | | | | | | | |
| Member | 93.33 | 86.67 | 89.33 | 87.41 | 78.33 | 90.11 | 71.11 | 96.67 | 89.78 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Managing Committee | 0.00 | 11.11 | 5.33 | 10.37 | 16.67 | 3.22 | 13.33 | 3.33 | 10.22 |
| Chairman | 0.00 | 2.22 | 2.67 | 2.22 | 5.00 | 1.67 | 8.89 | 0.00 | 0.00 |
| Vice Chairman | 6.67 | 0.00 | 0.00 | 0.00 | 0.00 | 1.67 | 2.22 | 0.00 | 0.0 |
| Secretary | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.33 | 2.22 | 0.00 | 0.00 |
| Staff | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.22 | 0.00 | 0.00 |
| Others | 0.00 | 0.00 | 2.67 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Participation in the Activities/Decision Making of WUA(Percentage) | | | | | | | | | |
| Very Active | 23.33 | 8.89 | 4.0 | 60.02 | 15.00 | 47.22 | 35.6 | 16.70 | 68.00 |
| Active | 53.33 | 55.56 | 70.7 | 33.33 | 26.67 | 52.78 | 57.8 | 46.70 | 32.00 |
| Passive | 23.33 | 11.11 | 25.3 | 6.35 | 51.67 | 0.00 | 6.7 | 36.70 | 0.00 |
| None | 0.00 | 24.44 | 0.0 | 0.00 | 6.67 | 0.00 | 0.0 | 0.00 | 0.00 |

# Chapter 4
# Participation, Involvement and Activity Levels of Different Functionaries and Groups in the WUAs

The involvement, participation, and activity levels of different functionaries and groups in functioning of the WUAs may vary but this is a very important indicator of the desired outcome and success of the WUAs. What is the level of participation and activity level of different functionaries and groups in the working of the WUAs of different kinds? Information on this has been collected for various functionaries and socio-economic groups and this has been analyzed and presented below (Tables 4.1 to 4.5).

It was observed the chairman and/or secretary in particular and the managing committee in general are actively involved in the affairs of almost all the WUAs studied here except PPM where they play only a marginal role. While the role of government officials was greater under the canal systems WUAs but the local institutions such as village panchayat have played only a passive role. The farmer member households irrespective of their farm size have been actively involved in WUAs. The landless labourers play an active role mainly under the CDG system compared to other irrigation systems. This could be due to the fact that the check dam construction was a village wide activity involving the entire village population and the benefit accrued to the landless households as well by way of higher water table leading to increased farming activity. Under the canal system both the head and tail reach farmers have been actively participating or rendering help to carry out various functions of the WUAs. One of the noticeable features was the interest showed by the members of these WUAs irrespective of their socio-economic background. On the whole the role played by various socio-economic group in various activities of the WUAs studied here substantially indicate the

active participation of people with the respective WUAs across economic and social divisions. The active role of the chairman, secretary and general body are noticeable. The involvement of local institutions such as Panchayat is however very limited in this activity.

Table 4.1 : Participation of various functionaries/socio-economic Groups in the functioning of the WUA

| Particulars | CMAP | | | | CMEAP | | | |
|---|---|---|---|---|---|---|---|---|
| | Very Active | Active | Passive | None | Very Active | Active | Passive | None |
| 1. General Body | 3.3 | 63.3 | 33.3 | 0.0 | 2.2 | 66.7 | 31.1 | 0 |
| 2. Chairman | 43.3 | 56.7 | 0.0 | 0.0 | 2.2 | 91.1 | 6.7 | 0 |
| 3. Managing Committee | 30.0 | 70.0 | 0.0 | 0.0 | 2.2 | 84.4 | 13.3 | 0 |
| 4. Members | 16.7 | 66.7 | 16.7 | 0.0 | 2.2 | 73.3 | 24.4 | 0 |
| 5. Non-members | 0.0 | 8.0 | 4.0 | 88.0 | 0 | 0 | 42.2 | 57.8 |
| 6. Secretary | 0.0 | 10.5 | 0.0 | 89.5 | 0 | 13.3 | 66.7 | 20 |
| 7. Other staff | 0.0 | 4.8 | 28.6 | 66.7 | 0 | 30.2 | 16.3 | 53.5 |
| 8. Any other individual | 0.0 | 5.3 | 5.3 | 89.5 | 0 | 0 | 4.4 | 95.6 |
| 9. Government Officials | 3.3 | 86.7 | 3.3 | 6.7 | 0 | 91.1 | 4.4 | 4.4 |
| 10. Panchayat | 0.0 | 6.7 | 73.3 | 20.0 | 0 | 2.2 | 17.8 | 80 |
| 11. Sarpanch | 0.0 | 6.7 | 63.3 | 30.0 | 0 | 2.2 | 17.8 | 80 |
| 12. Cooperative Credit Society | 0.0 | 0.0 | 3.3 | 96.7 | 0 | 0 | 2.2 | 97.8 |
| 13. Cooperative Marketing Society | 0.0 | 0.0 | 3.3 | 96.7 | 0 | 0 | 2.2 | 97.8 |
| 14. Other local institutions | 0.0 | 0.0 | 10.0 | 90.0 | 0 | 0 | 0 | 100 |
| 15. Any particular religious group | 0.0 | 0.0 | 6.9 | 93.1 | 0 | 2.3 | 2.3 | 95.3 |
| 16. Any particular caste group | 0.0 | 0.0 | 6.7 | 93.3 | 0 | 4.4 | 6.7 | 88.9 |
| 17. Any other specific group | 0.0 | 0.0 | 6.7 | 93.3 | 0 | 0 | 0 | 100 |
| 18. Women | 0.0 | 0.0 | 3.3 | 96.7 | 0 | 0 | 0 | 100 |
| 19. Poor | 0.0 | 0.0 | 3.4 | 96.6 | 0 | 0 | 0 | 100 |
| 20. Middle Income | 0.0 | 43.3 | 13.3 | 43.3 | 0 | 24.4 | 66.7 | 8.9 |
| 21. Upper Income | 0.0 | 62.1 | 6.9 | 31.0 | 0 | 82.2 | 8.9 | 8.9 |
| 22. Large/medium farmers | 0.0 | 93.3 | 3.3 | 3.3 | 0 | 95.6 | 4.4 | 0 |
| 23. Small/marginal farmers | 0.0 | 93.3 | 3.3 | 3.3 | 0 | 66.7 | 33.3 | 0 |
| 24. Landless | 0.0 | 0.0 | 40.0 | 60.0 | 0 | 0 | 44.4 | 55.6 |
| 25. Labour/wage earners | 0.0 | 0.0 | 13.3 | 86.7 | 0 | 2.2 | 8.9 | 88.9 |
| 26. Livestock owners | 0.0 | 0.0 | 10.0 | 90.0 | 0 | 0 | 0 | 100 |
| 27. Tribals | 0.0 | 0.0 | 4.5 | 95.5 | 0 | 2.2 | 0 | 97.8 |
| 28. Upper Caste | 0.0 | 30.0 | 13.3 | 56.7 | 0 | 82.2 | 6.7 | 11.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 29. Lower Caste | 0.0 | 13.3 | 30.0 | 56.7 | 0 | 24.4 | 57.8 | 17.8 |
| 30. Scheduled Castes | 0.0 | 0.0 | 26.7 | 73.3 | 0 | 2.2 | 24.4 | 73.3 |
| 31. Head Reach Farmers | 0.0 | 80.0 | 16.7 | 3.3 | 0 | 97.8 | 2.2 | 0 |
| 32. Tail Reach Farmers | 0.0 | 63.3 | 33.3 | 3.3 | 0 | 86.7 | 13.3 | 0 |
| 33. Youth | 0.0 | 0.0 | 24.1 | 75.9 | 0 | 0 | 26.7 | 73.3 |

Table 4.2 : Role of various functionaries/socio-economic Groups in the functioning of the WUA

| Particulars | CM | | | | CG | | | |
|---|---|---|---|---|---|---|---|---|
| | Very Active | Active | Passive | None | Very Active | Active | Passive | None |
| 1. General Body | 0.0 | 45.3 | 54.7 | 0.0 | 84.4 | 15.6 | 0.0 | 0.0 |
| 2. Chairman | 2.7 | 88.0 | 9.3 | 0.0 | 88.9 | 11.1 | 0.0 | 0.0 |
| 3. Managing Committee | 0.0 | 34.7 | 62.7 | 2.7 | 77.8 | 22.2 | 0.0 | 0.0 |
| 4. Members | 0.0 | 21.3 | 74.7 | 4.0 | 66.7 | 33.3 | 0.0 | 0.0 |
| 5. Non-members | 0.0 | 1.3 | 6.7 | 92.0 | 28.9 | 71.1 | 0.0 | 0.0 |
| 6. Secretary | 1.3 | 74.7 | 21.3 | 2.7 | 88.9 | 11.1 | 0.0 | 0.0 |
| 7. Other staff | 0.0 | 14.7 | 18.7 | 66.7 | 42.2 | 57.8 | 0.0 | 0.0 |
| 8. Any other individual | 0.0 | 1.3 | 4.0 | 94.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9. Government Officials | 0.0 | 42.7 | 41.3 | 16.0 | 42.2 | 57.8 | 0.0 | 0.0 |
| 10. Panchayat | 0.0 | 0.0 | 0.0 | 100.0 | 28.9 | 71.1 | 0.0 | 0.0 |
| 11. Sarpanch | 0.0 | 5.3 | 0.0 | 94.7 | 40.0 | 60.0 | 0.0 | 0.0 |
| 12. Cooperative Credit Society | 0.00.0 | 4.0 | 9.3 | 86.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13. Cooperative Marketing Society | 0.0 | 0.0 | 8.0 | 92.0 | 8.9 | 24.4 | 0.0 | 0.0 |
| 14. Other local institutions | 0.0 | 1.3 | 4.0 | 94.7 | 55.6 | 44.4 | 0.0 | 0.0 |
| 15. Any particular religious group | 0.00.0 | 0.0 | 0.0 | 100.0 | 2.2 | 31.1 | 0.0 | 0.0 |
| 16. Any particular caste group | 0.0 | 0.0 | 5.3 | 94.7 | 82.2 | 17.8 | 0.0 | 0.0 |
| 17. Any other specific group | 0.0 | 1.3 | 1.3 | 97.3 | 6.7 | 26.7 | 0.0 | 0.0 |
| 18. Women | 0.00.0 | 1.3 | 6.7 | 92.0 | 20.0 | 80.0 | 0.0 | 0.0 |
| 19. Poor | 0.0 | 1.3 | 4.0 | 94.7 | 20.0 | 80.0 | 0.0 | 0.0 |
| 20. Middle Income | 0.0 | 4.0 | 14.7 | 81.3 | 60.0 | 40.0 | 0.0 | 0.0 |
| 21. Upper Income | 0.0 | 10.7 | 10.7 | 78.7 | 60.0 | 40.0 | 0.0 | 0.0 |
| 22. Large/medium farmers | 1.3 | 84.0 | 10.7 | 4.0 | 60.0 | 40.0 | 0.0 | 0.0 |
| 23. Small/marginal farmers | 1.3 | 46.7 | 48.0 | 4.0 | 60.0 | 40.0 | 0.0 | 0.0 |
| 24. Landless | 9.3 | 2.7 | 16.0 | 72.0 | 6.7 | 0.0 | 16.3 | 77.0 |
| 25. Labour/wage earners | 26.7 | 28.0 | 20.0 | 25.3 | 44.4 | 55.6 | 0.0 | 0.0 |
| 26. Livestock owners | 18.7 | 41.3 | 17.3 | 22.7 | 64.4 | 35.6 | 0.0 | 0.0 |
| 27. Tribals | 0.0 | 0.0 | 4.0 | 96.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28. Upper Caste | 0.0 | 9.3 | 6.7 | 84.0 | 62.2 | 37.8 | 0.0 | 0.0 |
| 29. Lower Caste | 0.0 | 4.0 | 13.3 | 82.7 | 57.8 | 42.2 | 0.0 | 0.0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 30. Scheduled Castes | 0.0 | 1.3 | 2.7 | 96 | 4.4 | 95.6 | 0.0 | 0.0 |
| 31. Head Reach Farmers | 29.3 | 64.0 | 6.7 | 0.0 | 57.8 | 42.2 | 0.0 | 0.0 |
| 32. Tail Reach Farmers | 8.0 | 57.3 | 30.7 | 4.0 | 60.0 | 40.0 | 0.0 | 0.0 |
| 33. Youth | 0.0 | 1.3 | 0.0 | 98.7 | 66.7 | 33.3 | 0.0 | 0.0 |

Table 4.3: Role of various functionaries/socio-economic Groups in the functioning of the WUA

| Particulars | TAP | | | | TWG | | | |
|---|---|---|---|---|---|---|---|---|
| | Very Active | Active | Passive | None | Very Active | Active | Passive | None |
| 1. General Body | 0.0 | 63.0 | 37.0 | 0.0 | 85.0 | 15.0 | 0.0 | 0.0 |
| 2. Chairman | 0.0 | 73.0 | 27.0 | 0.0 | 90.0 | 10.0 | 0.0 | 0.0 |
| 3. Managing Committee | 0.0 | 70.0 | 30.0 | 0.0 | 76.7 | 23.3 | 0.0 | 0.0 |
| 4. Members | 0.0 | 62.0 | 33.0 | 5.0 | 41.7 | 58.3 | 0.0 | 0.0 |
| 5. Non-members | 0.0 | 3.0 | 30.0 | 67.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 6. Secretary | 0.0 | 7.0 | 28.0 | 65.0 | 88.3 | 11.7 | 0.0 | 0.0 |
| 7. Other staff | 0.0 | 0.0 | 18.0 | 82.0 | 28.3 | 71.7 | 0.0 | 0.0 |
| 8. Any other individual | 0.0 | 2.0 | 8.0 | 90.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9. Government Officials | 0.0 | 55.0 | 12.0 | 33.0 | 53.3 | 46.7 | 0.0 | 0.0 |
| 10. Panchayat | 0.0 | 2.0 | 15.0 | 83.0 | 36.7 | 63.3 | 0.0 | 0.0 |
| 11. Sarpanch | 0.0 | 2.0 | 10.0 | 88.0 | 45.0 | 55.0 | 0.0 | 0.0 |
| 12. Cooperative Credit Society | 0.0 | 0.0 | 8.0 | 92.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13. Cooperative Marketing Society | 0.0 | 0.0 | 7.0 | 93.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14. Other local institutions | 0.0 | 0.0 | 3.0 | 97.0 | 26.7 | 73.3 | 0.0 | 0.0 |
| 15. Any particular religious group | 0.0 | 0.0 | 2.0 | 98.0 | 63.3 | 11.7 | 0.0 | 0.0 |
| 16. Any particular caste group | 0.0 | 0.0 | 5.0 | 95.0 | 88.3 | 11.7 | 0.0 | 0.0 |
| 17. Any other specific group | 0.0 | 0.0 | 5.0 | 95.0 | 3.3 | 21.7 | 0.0 | 0.0 |
| 18. Women | 0.0 | 0.0 | 8.0 | 92.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 19. Poor | 0.0 | 0.0 | 5.0 | 95.0 | 6.7 | 93.3 | 0.0 | 0.0 |
| 20. Middle Income | 0.0 | 47.0 | 13.0 | 40.0 | 81.7 | 18.3 | 0.0 | 0.0 |
| 21. Upper Income | 0.0 | 50.0 | 13.0 | 37.0 | 66.7 | 33.3 | 0.0 | 0.0 |
| 22. Large/medium farmers | 0.0 | 52.0 | 15.0 | 33.0 | 68.3 | 31.7 | 0.0 | 0.0 |
| 23. Small/marginal farmers | 0.0 | 50.0 | 17.0 | 33.0 | 75.0 | 25.0 | 0.0 | 0.0 |
| 24. Landless | 0.0 | 5.0 | 5.0 | 90.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25. Labour/wage earners | 0.0 | 0.0 | 3.0 | 97.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 26. Livestock owners | 0.0 | 0.0 | 3.0 | 97.0 | 63.3 | 36.7 | 0.0 | 0.0 |
| 27. Tribals | 0.0 | 0.0 | 3.0 | 97.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28. Upper Caste | 0.0 | 47.0 | 5.0 | 48.0 | 96.7 | 3.3 | 0.0 | 0.0 |
| 29. Lower Caste | 0.0 | 47.0 | 5.0 | 48.0 | 21.7 | 78.3 | 0.0 | 0.0 |
| 30. Scheduled Castes | 0.0 | 38.0 | 13.0 | 48.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 31. Head Reach Farmers | 0.0 | 53.0 | 8.0 | 38.0 | 31.7 | 68.3 | 0.0 | 0.0 |
| 32. Tail Reach Farmers | 0.0 | 45.0 | 15.0 | 40.0 | 71.7 | 28.3 | 0.0 | 0.0 |
| 33. Youth | 0.0 | 5.0 | 7.0 | 88.0 | 80.0 | 20.0 | 0.0 | 0.0 |

| Table 4.4: Role of various functionaries/socio-economic Groups in the functioning of the WUA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Particulars | RLM | | | | PPM | | | |
| | Very Active | Active | Passive | None | Very Active | Active | Passive | None |
| 1. General Body | 26.7 | 71.1 | 2.2 | 0.0 | 3.3 | 40.0 | 26.7 | 30.0 |
| 2. Chairman | 33.3 | 64.4 | 2.2 | 0.0 | 23.3 | 26.7 | 16.7 | 33.3 |
| 3. Managing Committee | 24.4 | 73.3 | 2.2 | 0.0 | 20.0 | 23.3 | 13.3 | 43.3 |
| 4. Members | 17.8 | 71.1 | 11.1 | 0.0 | 6.7 | 53.3 | 40.0 | 0.0 |
| 5. Non-members | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 6. Secretary | 22.2 | 71.1 | 6.7 | 0.0 | 23.3 | 23.3 | 6.7 | 46.7 |
| 7. Other staff | 17.8 | 66.7 | 11.1 | 4.4 | 0.0 | 60.0 | 20.0 | 20.0 |
| 8. Any other individual | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 3.3 | 96.7 |
| 9. Government Officials | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 40.0 | 50.0 | 10.0 |
| 10. Panchayat | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 11. Sarpanch | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 12. Cooperative Credit Society | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 13. Cooperative Marketing Society | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| 14. Other local institutions | 64.4 | 17.8 | 0.0 | 17.8 | 0.0 | 0.0 | 6.7 | 93.3 |
| 15. Any particular religious group | 0.0 | 35.6 | 37.8 | 26.7 | 0.0 | 0.0 | 0.0 | 100.0 |
| 16. Any particular caste group | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 6.7 | 93.7 |
| 17. Any other specific group | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 10.0 | 10.0 | 80.0 |
| 18. Women | 0.0 | 26.7 | 57.8 | 15.6 | 0.0 | 0.0 | 3.3 | 96.7 |
| 19. Poor | 0.0 | 73.3 | 8.9 | 17.8 | 0.0 | 3.3 | 10.0 | 86.7 |
| 20. Middle Income | 0.0 | 91.1 | 4.4 | 4.4 | 0.0 | 3.3 | 23.3 | 73.3 |
| 21. Upper Income | 0.0 | 35.6 | 2.2 | 62.2 | 0.0 | 10.0 | 16.7 | 73.3 |
| 22. Large/medium farmers | 0.0 | 95.6 | 4.4 | 0.0 | 6.7 | 66.7 | 26.7 | 0.0 |
| 23. Small/marginal farmers | 6.7 | 88.9 | 4.4 | 0.0 | 0.0 | 66.7 | 33.3 | 0.0 |
| 24. Landless | 0.0 | 71.1 | 20.0 | 8.9 | 0.0 | 3.3 | 26.7 | 70.0 |
| 25. Labour/wage earners | 0.0 | 88.9 | 11.1 | 0.0 | 0.0 | 43.3 | 43.3 | 13.3 |
| 26. Livestock owners | 26.7 | 68.9 | 2.2 | 2.2 | 10.0 | 43.3 | 33.3 | 13.3 |
| 27. Tribals | 0.0 | 6.7 | 24.4 | 68.9 | 0.0 | 0.0 | 0.0 | 100.0 |
| 28. Upper Caste | 0.0 | 33.3 | 2.2 | 64.4 | 0.0 | 20 | 0.0 | 80 |
| 29. Lower Caste | 0.0 | 28.9 | 0.0 | 71.1 | 0.0 | 0.0 | 3.3 | 96.7 |
| 30. Scheduled Castes | 0.0 | 28.9 | 0.0 | 71.1 | 0.0 | 0.0 | 0.0 | 100 |
| 31. Head Reach Farmers | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 32. Tail Reach Farmers | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 33. Youth | 0.0 | 13.3 | 0.0 | 86.7 | 0.0 | 3.3 | 23.3 | 73.3 |

| Table 4.5 : Role of various functionaries/socio-economic Groups in the functioning of the WUA | | | | |
|---|---|---|---|---|
| Particulars | CDG | | | |
| | Very Active | Active | Passive | None |
| 1. General Body | 55.6 | 44.4 | 0.0 | 0.0 |
| 2. Chairman | 84.4 | 15.6 | 0.0 | 0.0 |
| 3. Managing Committee | 64.4 | 35.6 | 0.0 | 0.0 |
| 4. Members | 60.0 | 40.0 | 0.0 | 0.0 |
| 5. Non-members | 20.0 | 80.0 | 0.0 | 0.0 |
| 6. Secretary | 86.7 | 13.3 | 0.0 | 0.0 |
| 7. Other staff | 44.4 | 55.6 | 0.0 | 0.0 |
| 8. Any other individual | 48.9 | 17.8 | 0.0 | 0.0 |
| 9. Government Officials | 40.0 | 60.0 | 0.0 | 0.0 |
| 10. Panchayat | 35.6 | 64.4 | 0.0 | 0.0 |
| 11. Sarpanch | 46.7 | 53.3 | 0.0 | 0.0 |
| 12. Cooperative Credit Society | 0.0 | 0.0 | 0.0 | 0.0 |
| 13. Cooperative Marketing Society | 0.0 | 0.0 | 0.0 | 0.0 |
| 14. Other local institutions | 20.0 | 80.0 | 0.0 | 0.0 |
| 15. Any particular religious group | 2.2 | 64.4 | 0.0 | 0.0 |
| 16. Any particular caste group | 86.7 | 13.3 | 0.0 | 0.0 |
| 17. Any other specific group | 0.0 | 0.0 | 0.0 | 0.0 |
| 18. Women | 33.3 | 66.7 | 0.0 | 0.0 |
| 19. Poor | 35.6 | 64.4 | 0.0 | 0.0 |
| 20. Middle Income | 60.0 | 40.0 | 0.0 | 0.0 |
| 21. Upper Income | 86.7 | 15.6 | 0.0 | 0.0 |
| 22. Large/medium farmers | 77.8 | 22.2 | 0.0 | 0.0 |
| 23. Small/marginal farmers | 62.2 | 37.8 | 0.0 | 0.0 |
| 24. Landless | 28.9 | 71.1 | 0.0 | 0.0 |
| 25. Labour/wage earners | 31.1 | 68.9 | 0.0 | 0.0 |
| 26. Livestock owners | 31.1 | 68.9 | 0.0 | 0.0 |
| 27. Tribals | 0.0 | 0.0 | 0.0 | 0.0 |
| 28. Upper Caste | 84.4 | 15.6 | 0.0 | 0.0 |
| 29. Lower Caste | 44.4 | 55.6 | 0.0 | 0.0 |
| 30. Scheduled Castes | 26.7 | 73.3 | 0.0 | 0.0 |
| 31. Head Reach Farmers | 53.3 | 46.7 | 0.0 | 0.0 |
| 32. Tail Reach Farmers | 57.8 | 42.2 | 0.0 | 0.0 |
| 33. Youth | 77.8 | 22.2 | 0.0 | 0.0 |

# Chapter 5

## Devolution of Powers and Decision-Making

One of the most important aims of PIM is empowering farmers and giving them the decision-making and responsibility for managing the irrigation systems. The devolution of powers to the WUAs for the management of the irrigation system is a major aim of PIM and is considered very important for improving the water use efficiency. This devolution of powers can be examined by observing the devolution of decision-making related to planning, implementation, revenue, conflict resolution, and meeting the equity and efficiency considerations. High degree of devolution of power would mean less burden of external agencies in various activities of water resource management. To what extent the devolution of powers to the WUAs has taken place has been examined for different irrigation systems studied using a set of questions on who makes different important decisions of water resource management (Tables 5.1 to 5.9).

With respect to the canal system water institutions, the findings on the devolution of powers indicate the following. The control of government continues to be high in respect of assessment of water availability, release of water, water pricing and collection of water dues from the farmers. However, the devolution of powers to the WUA is high in the distribution of water, maintenance of irrigation structures, and equitable distribution of water. As far as the capital investments are concerned, the powers are by and large jointly held by the WUA and the irrigation authorities.

For the WUAs studied under the tank irrigation system in Andhra Pradesh, the devolution of power to the WUA has taken place very significantly only in terms of its maintenance and repairs of the irrigation structures, and the choice of deciding the cropping pattern. To some extent the WUA has the powers in planning for release of

water and in taking punitive action against members in case of misuse of water. Under the TWG system all powers are rested with the WUA. This is because the TWG studied here have been either handed over the structure and equipment or own the them entirely, and if at all they depended on the government only for availing of the government capital subsidies at the initial stage and for power supply.

Under RLM except for pricing of water the WUA has the sole power with respect to carrying out various functions as and when required. Under the PPM system, except in pricing and collection of due from the users, the devolution of powers to the WUA is nearly complete. Finally under the check dam system the powers rested with the government was only in terms of release of the investment subsidy to the WUA. Thus as far as the devolution of powers to the WUAs are concerned, the government agencies continues to have greater powers under the canal systems in terms of pricing of water, collection of dues from the farmers and release of water to the canals. For the rest, the devolution is substantial and the WUAs studied here have significant powers over the management of the water resource.

Table 5.1 : Devolution of Powers :CMAP

| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
|---|---|---|---|---|
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 16.7 | 23.3 | 60.0 | 0.0 |
| 2. Providing resources for investment | 23.3 | 10.0 | 66.7 | 0.0 |
| 3. Actual capital investment in irrigation structures | 24.1 | 13.8 | 62.1 | 0.0 |
| 4. Assessment of water availability | 80.0 | 6.7 | 13.3 | 0.0 |
| 5. Planning for release of water | 79.3 | 10.3 | 10.3 | 0.0 |

| | | | | |
|---|---|---|---|---|
| 6. Actual release of water | 89.7 | 6.9 | 3.4 | 0.0 |
| 7. Distribution of water among farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 8. Pricing of water received | 96.6 | 3.4 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 96.6 | 0.0 | 3.4 | 0.0 |
| 10.Collection of dues from farmers | 100.0 | 0.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 96.7 | 3.3 | 0.0 |
| 12.Providing resources for maintenance/ repair | 0.0 | 36.7 | 63.3 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 93.3 | 6.7 | 0.0 |
| 14.Monitoring use of water | 0.0 | 96.7 | 3.3 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 89.7 | 10.3 | 0.0 |
| 16.Action on misusers | 3.4 | 86.2 | 10.3 | 0.0 |
| 17.Crops to be grown | 0.0 | 96.3 | 0.0 | 3.7 |
| | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.2 : Devolution of Powers: CMEP

| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
|---|---|---|---|---|
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 66.7 | 2.2 | 31.1 | 0.0 |
| 2. Providing resources for investment | 71.1 | 0.0 | 28.9 | 0.0 |
| 3. Actual capital investment in irrigation structures | 68.9 | 0.0 | 31.1 | 0.0 |
| 4. Assessment of water availability | 93.3 | 4.4 | 2.2 | 0.0 |
| 5. Planning for release of water | 91.1 | 8.9 | 0.0 | 0.0 |
| 6. Actual release of water | 97.8 | 2.2 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 2.2 | 97.8 | 0.0 | 0.0 |
| 8. Pricing of water received | 60.0 | 40.0 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 100.0 | 0.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 100.0 | 0.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 100.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 48.9 | 22.2 | 28.9 | 0.0 |
| 13.Implementation of maintenance/ repair | 13.3 | 86.7 | 0.0 | 0.0 |

| | | | | |
|---|---|---|---|---|
| 14.Monitoring use of water | 4.4 | 95.6 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 8.9 | 91.1 | 0.0 | 0.0 |
| 16.Action on misusers | 33.3 | 66.7 | 0.0 | 0.0 |
| 17.Crops to be grown | 7.1 | 92.9 | 0.0 | 0.0 |
| | 0.0 | 0.0 | 0.0 | 0.0 |

| Table 5.3 : Devolution of Powers :CM | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 10.7 | 76.0 | 13.3 | 0.0 |
| 2. Providing resources for investment | 17.3 | 46.7 | 36.0 | 0.0 |
| 3. Actual capital investment in irrigation structures | 5.3 | 65.3 | 29.3 | 0.0 |
| 4. Assessment of water availability | 98.7 | 1.3 | 0.0 | 0.0 |
| 5. Planning for release of water | 100 | 0.0 | 0.0 | 0.0 |
| 6. Actual release of water | 100 | 0.0 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 2.7 | 96.0 | 1.3 | 0.0 |
| 8. Pricing of water received | 84.0 | 16.0 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 0.0 | 98.7 | 1.3 | 0.0 |
| 11.Decision on maintenance/repair requirement | 1.3 | 97.3 | 1.3 | 0.0 |
| 12.Providing resources for maintenance/ repair | 10.7 | 57.3 | 32.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 2.7 | 96.0 | 1.3 | 0.0 |
| 14.Monitoring use of water | 45.3 | 50.7 | 4.0 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 73.3 | 26.7 | 0.0 |
| 16.Action on misusers | 1.3 | 82.7 | 16.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 90.7 | 4.0 | 5.3 |

| Table 5.4 : Devolution of Powers: CG | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 65.0 | 35.0 | 0.0 | 0.0 |
| 2. Providing resources for investment | 100.0 | 0.0 | 0.0 | 0.0 |
| 3. Actual capital investment in irrigation structures | 100.0 | 0.0 | 0.0 | 0.0 |
| 4. Assessment of water availability | 95.6 | 4.4 | 2.2 | 0.0 |
| 5. Planning for release of water | 66.7 | 33.3 | 0.0 | 0.0 |
| 6. Actual release of water | 95.6 | 6.7 | 2.2 | 0.0 |
| 7. Distribution of water among farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 8. Pricing of water received | 100.0 | 0.0 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 40.0 | 60.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 95.6 | 4.4 | 0.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 14.Monitoring use of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 100.0 | 0.0 | 0.0 |
| 16.Action on misusers | 33.3 | 66.7 | 0.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 5.5 : Devolution of Powers: TAP | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 100.0 | 0.0 | 0.0 | 0 |
| 2. Providing resources for investment | 100.0 | 0.0 | 0.0 | 0 |
| 3. Actual capital investment in irrigation structures | 100.0 | 0.0 | 0.0 | 0 |
| 4. Assessment of water availability | 91.7 | 8.3 | 0.0 | 0 |
| 5. Planning for release of water | 63.3 | 31.7 | 5.0 | 0 |
| 6. Actual release of water | 50.0 | 41.7 | 8.3 | 0 |
| 7. Distribution of water among farmers | 38.3 | 55.0 | 6.7 | 0 |
| 8. Pricing of water received | 100.0 | 0.0 | 0.0 | 0 |
| 9. Pricing of water distributed to farmers | 100.0 | 0.0 | 0.0 | 0 |
| 10.Collection of dues from farmers | 32.8 | 60.3 | 6.9 | 0 |
| 11.Decision on maintenance/repair requirement | 5.0 | 78.3 | 16.7 | 0 |
| 12.Providing resources for maintenance/ repair | 60.0 | 13.3 | 26.7 | 0 |
| 13.Implementation of maintenance/ repair | 16.7 | 60.0 | 23.3 | 0 |
| 14.Monitoring use of water | 33.9 | 40.7 | 25.4 | 0 |
| 15.Stopping misuse/ waste | 0.0 | 100.0 | 0.0 | 0 |
| 16.Action on misusers | 16.7 | 43.3 | 40.0 | 0 |
| 17.Crops to be grown | 3.6 | 96.4 | 0.0 | 0 |
| | 80.0 | 13.3 | 6.7 | 0 |

| Table 5.6: Devolution of Powers: TWG | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 0.0 | 100.0 | 0.0 | 0.0 |
| 2. Providing resources for investment | 0.0 | 100.0 | 0.0 | 0.0 |
| 3. Actual capital investment in irrigation structures | 0.0 | 100.0 | 0.0 | 0.0 |
| 4. Assessment of water availability | 0.0 | 100.0 | 0.0 | 0.0 |
| 5. Planning for release of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 6. Actual release of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 8. Pricing of water received | 0.0 | 0.0 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 100.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 14.Monitoring use of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 100.0 | 0.0 | 0.0 |
| 16.Action on misusers | 0.0 | 100.0 | 0.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 5.7: Devolution of Powers: RLM | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 0.0 | 97.8 | 2.2 | 0.0 |
| 2. Providing resources for investment | 0.0 | 100.0 | 0.0 | 0.0 |
| 3. Actual capital investment in irrigation structures | 0.0 | 100.0 | 0.0 | 0.0 |
| 4. Assessment of water availability | 0.0 | 97.8 | 2.2 | 0.0 |
| 5. Planning for release of water | 2.2 | 97.8 | 0.0 | 0.0 |
| 6. Actual release of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 2.2 | 97.8 | 0.0 | 0.0 |
| 8. Pricing of water received | 62.2 | 37.8 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 100.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 14.Monitoring use of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 100.0 | 0.0 | 0.0 |
| 16.Action on misusers | 0.0 | 100.0 | 0.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 0.0 | 0.0 | 0.0 |

| Table 5.8 : Devolution of Powers: PPM | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 10.0 | 63.3 | 16.7 | 10.0 |
| 2. Providing resources for investment | 0.0 | 60.0 | 30.0 | 10.0 |
| 3. Actual capital investment in irrigation structures | 0.0 | 63.3 | 33.3 | 3.3 |
| 4. Assessment of water availability | 0.0 | 100.0 | 0.0 | 0.0 |
| 5. Planning for release of water | 0.0 | 96.7 | 3.3 | 0.0 |
| 6. Actual release of water | 10.0 | 90.0 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 8. Pricing of water received | 66.7 | 26.7 | 6.7 | 0.0 |
| 9. Pricing of water distributed to farmers | 46.7 | 50.0 | 3.3 | 0.0 |
| 10.Collection of dues from farmers | 46.7 | 13.3 | 40.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 100.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 14.Monitoring use of water | 3.3 | 96.7 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 6.7 | 83.3 | 10.0 | 0.0 |
| 16.Action on misusers | 6.7 | 93.3 | 0.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 5.9: Devolution of Powers: CDG | | | | |
|---|---|---|---|---|
| Decision/Activity | Govt. | WUA/ Farmers Body | Joint | Others |
| | As percentage of Households Reporting | | | |
| 1. Planning for capital investment in irrigation structures | 60.0 | 40.0 | 0.0 | 0.0 |
| 2. Providing resources for investment | 60.0 | 40.0 | 0.0 | 0.0 |
| 3. Actual capital investment in irrigation structures | 65.0 | 35.0 | 0.0 | 0.0 |
| 4. Assessment of water availability | 0.0 | 100.0 | 0.0 | 0.0 |
| 5. Planning for release of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 6. Actual release of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 7. Distribution of water among farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 8. Pricing of water received | 0.0 | 0.0 | 0.0 | 0.0 |
| 9. Pricing of water distributed to farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10.Collection of dues from farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 11.Decision on maintenance/repair requirement | 0.0 | 100.0 | 0.0 | 0.0 |
| 12.Providing resources for maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 13.Implementation of maintenance/ repair | 0.0 | 100.0 | 0.0 | 0.0 |
| 14.Monitoring use of water | 0.0 | 100.0 | 0.0 | 0.0 |
| 15.Stopping misuse/ waste | 0.0 | 100.0 | 0.0 | 0.0 |
| 16.Action on misusers | 0.0 | 100.0 | 0.0 | 0.0 |
| 17.Crops to be grown | 0.0 | 100.0 | 0.0 | 0.0 |

# Chapter 6
# The Impact of PIM on the Agricultural Economy

A major objective of PIM and the establishment of WUAs are to improve agricultural productivity, production and incomes through better utilization and efficiency in water resource use. What has been the impact of PIM and the WUAs on agriculture such as in terms of increase in area irrigated, shift in cropping pattern, change in input use including use of improved and high yielding varieties, and changes in productivity? This has been studied under the different irrigation systems. With the availability of water for irrigation, farmers may opt for water intensive but more remunerative crops and the availability of irrigation may also have impact on the use of various inputs. Whether the PIM has resulted in such shifts towards more irrigated high value crops, use of modern inputs and if there are any significant change in the levels of productivity, has been examined here.

Findings based on farmer responses on the change in cropped area and the level of irrigation as of now compared to that at the time of the formation of the WUAs are given in Tables 6.1. Note that the findings would be influenced by the conditions prevailing in the survey year, and the farmer recall of the position in the pre-PIM time. Under CMAP, although there was a marginal increase in irrigated area during the kharif and summer seasons, a decline in the irrigated area during the rabi season during the reference year appeared as an overall decline in irrigated area. On the contrary under CMEAP there was an increase in irrigated area during all seasons. Under the CM, the irrigated area during the kharif and summer seasons went up by almost 50 percent on an average. The expansion in irrigated area under canal system in Gujarat (CG) has also been very

dramatic since the WUA took over the management of the system. In fact the irrigated area registered a five fold increase.

The performance of the tank system in Andhra Pradesh (TAP) during the reference year in terms of area irrigated was very poor and this could be attributed to inadequate rainfall and no water in the tanks. Under the TWG, the sample households have been cultivating crops without irrigation until the WUAs came into existence. Since then almost two-thirds of the cropped area has received irrigation. Under RLM except during the summer there was only a small addition to the irrigated area since the establishment of the WUA. The most dramatic increase in irrigated area was under CD where there was a seven fold increase in irrigated area after the check dams have been constructed.

The change in the cropping pattern across the command area of the selected WUAs showed large variation. Under CMAP there was no major change in the cropping pattern since the formation of the WUA. The only notable change was in terms of the cultivation of some fodder crops during the summer under irrigated conditions. However, under CMEAP the irrigated area under fruits and vegetables during the kharif season and the cultivation of pulses under irrigation during the rabi season showed an increase. Under CM there was a very significant increase in irrigated area under vegetables and oilseeds during the kharif and rabi seasons. Under CG, both the cropped area and irrigated area under cash crops like cotton and castor and area under irrigated wheat have registered a significant increase. But no major shift in cropping pattern was observed under TAP. Under TWG, the cropped area under tobacco and wheat as well as the area irrigated under them have increased significantly. Under RLM the cultivation of vegetables under irrigation increased during the kharif and rabi seasons, and of oilseeds

during the rabi season since the establishment of the WUA. Under PPM the cultivation of foodgrains under irrigated conditions became more common among the sample households. A marked shift in cropping pattern in favour of high value cash crops like cotton away from bajra and jowar and cultivation of fodder crops during the rabi and summer have been a major change noticed under CD.

Table 6.1: Change Cropped Area and Irrigated Area

| | At the time of WUA Formation | | At Present | | Percentage Increase in Total Area | Percentage Increase in Irrigated Area |
|---|---|---|---|---|---|---|
| Season/Total | Average Area Under Crops per Household | Average Irrigated Area per Household | Average Area Crops per Household | Average Irrigated Area per Household | | |
| CMAP | | | | | | |
| Kharif | 3.03 | 2.80 | 3.14 | 2.90 | 3.56 | 3.86 |
| Rabi | 2.74 | 2.65 | 2.34 | 2.26 | -14.51 | -14.99 |
| Summer | 1.52 | 1.52 | 1.61 | 1.61 | 5.75 | 5.75 |
| Total | 7.30 | 6.98 | 7.10 | 6.77 | -2.77 | -2.90 |
| CMEAP | | | | | | |
| Kharif | 2.83 | 2.63 | 2.85 | 2.64 | 0.70 | 0.34 |
| Rabi | 1.27 | 1.25 | 1.29 | 1.27 | 1.42 | 1.43 |
| Summer | 0.37 | 0.37 | 0.37 | 0.37 | 0.00 | 0.00 |
| Total | 4.47 | 4.25 | 4.51 | 4.28 | 0.84 | 0.63 |
| CM | | | | | | |
| Kharif | 1.48 | 0.79 | 1.32 | 1.13 | -10.81 | 43.67 |
| Rabi | 1.61 | 1.51 | 1.53 | 1.52 | -4.97 | 0.70 |
| Summer | 0.16 | 0.16 | 0.25 | 0.25 | 56.25 | 56.25 |
| Perennial | 0.25 | 0.25 | 0.25 | 0.25 | 0.00 | 0.00 |
| Total | 3.50 | 2.71 | 3.35 | 3.16 | -4.29 | 16.40 |
| CG | | | | | | |
| Kharif | 1.40 | 0.28 | 1.40 | 0.94 | 0.00 | 239.28 |
| Rabi | 0.03 | 0.03 | 0.64 | 0.64 | 2002.90 | 2002.90 |
| Summer | 0.00 | 0.00 | 0.16 | 0.16 | | |
| Total | 1.43 | 0.31 | 2.20 | 1.75 | 54.18 | 466.50 |
| TAP | | | | | | |
| Kharif | 2.04 | 1.71 | 1.86 | 1.69 | -8.76 | -1.38 |
| Rabi | 0.60 | 0.60 | 0.15 | 0.15 | -74.63 | -74.63 |
| Summer | 0.04 | 0.04 | 0.04 | 0.04 | 0.00 | 0.00 |
| Total | 2.67 | 2.35 | 2.05 | 1.88 | -23.38 | -20.03 |
| TWG | | | | | | |
| Kharif | 0.80 | 0.00 | 1.34 | 0.91 | 66.65 | |
| Rabi | 0.00 | 0.00 | 0.32 | 0.32 | | |
| Summer | 0.00 | 0.00 | 0.26 | 0.25 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total | 0.80 | 0.00 | 1.92 | 1.49 | 138.65 | |
| RLM | | | | | | |
| Kharif | 2.13 | 1.96 | 1.53 | 1.53 | -28.17 | -21.99 |
| Rabi | 1.28 | 1.28 | 1.23 | 1.23 | -3.91 | -3.91 |
| Summer | 0.09 | 0.09 | 0.86 | 0.86 | 855.56 | 855.56 |
| Perennial | 0.36 | 0.36 | 0.36 | 0.36 | 0.00 | 0.00 |
| Total | 3.86 | 3.69 | 3.97 | 3.97 | 2.85 | 7.56 |
| PPM | | | | | | |
| Kharif | 1.50 | 1.34 | 1.71 | 1.04 | 14.00 | -22.10 |
| Rabi | 0.70 | 1.33 | 1.38 | 1.08 | 97.14 | -18.80 |
| Summer | 0.00 | 0.00 | 0.30 | 0.30 | | |
| Perennial | 0.00 | 0.00 | 0.00 | 0.00 | | |
| Total | 2.20 | 0.03 | 3.39 | 2.42 | 54.09 | 8987.54 |
| CDG | | | | | | |
| Kharif | 3.78 | 0.06 | 3.78 | 0.86 | 0.00 | 1312.82 |
| Rabi | 0.08 | 0.08 | 0.32 | 0.32 | 301.41 | 301.41 |
| Summer | 0.00 | 0.00 | 0.00 | 0.00 | | |
| Total | 3.86 | 0.14 | 4.09 | 1.17 | 6.17 | 741.08 |

Another aspect examined here was the change in the input use since PIM and establishment of WUAs. The change in the use of agricultural inputs have been measured on a five point scale ranging from large increase to large decrease and the finding based on the response of sample households on these aspect is shown in Tables 6.2 to 6.6. It is found that irrespective of the irrigation system, there have been a decline in the use of local varieties of seeds and the use of bullock labour. However, the use of improved and high yielding varieties of seeds, other modern inputs such as fertilizers and pesticides, and the use of farm machinery have show significant increases.

| Table 6.2 : Change in Input Use among Sample farmers(Percentage of Households Reporting) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CMAP | | | | | CMEAP | | | | |
| | Large Increase | Increase | No Change | Decrease | Large Decrease | Large Increase | Increase | No Change | Decrease | Large Decrease |
| 1. Seed Local | 0.0 | 0.0 | 7.0 | 50.0 | 43.0 | 0.0 | 0.0 | 23.0 | 49.0 | 29.0 |
| 2.Seed HYV | 3.0 | 7.0 | 90.0 | 0.0 | 0.0 | 3.0 | 5.0 | 83.0 | 0.0 | 0.0 |
| 3. Seed Improved | 0.0 | 3.0 | 10.0 | 41.0 | 45.0 | 0.0 | 10.0 | 51.0 | 26.0 | 13.0 |
| 4. Fertilizer | 20.0 | 47.0 | 33.0 | 0.0 | 0.0 | 9.0 | 40.0 | 51.0 | 0.0 | 0.0 |
| 5. Pesticides | 20.0 | 53.0 | 27.0 | 0.0 | 0.0 | 9.0 | 70.0 | 18.0 | 2.0 | 0.0 |
| 6. FYM | 0.0 | 7.0 | 80.0 | 13.0 | 0.0 | 0.0 | 31.0 | 67.0 | 2.0 | 0.0 |
| 7. Bullock Labour | 0.0 | 0.0 | 27.0 | 17.0 | 57.0 | 0.0 | 4.0 | 40.0 | 56.0 | 0.0 |
| 8. Machine Labour | 10.0 | 87.0 | 3.0 | 0.0 | 0.0 | 3.0 | 83.0 | 14.0 | 0.0 | 0.0 |
| 9. Family Labour | 0.0 | 3.0 | 30.0 | 67.0 | 0.0 | 2.0 | 11.0 | 67.0 | 20.0 | 0.0 |
| 10.Hired Labour | 3.0 | 3.0 | 93.0 | 0.0 | 0.0 | 0.0 | 11.0 | 86.0 | 2.0 | 0.0 |
| 11.Irigation Cost | 0.0 | 50.0 | 50.0 | 0.0 | 0.0 | 0.0 | 49.0 | 51.0 | 0.0 | 0.0 |
| 12.Other Costs | 3.0 | 70.0 | 23.0 | 3.0 | 0.0 | 0.0 | 66.0 | 34.0 | 0.0 | 0.0 |
| 13. Others | 0.0 | 50.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Table 6.3 : Change in Input Use among Sample farmers(Percentage of Households Reporting) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CM | | | | | CG | | | | |
| | Large Increase | Increase | No Change | Decrease | Large Decrease | Large Increase | Increase | No Change | Decrease | Large Decrease |
| 1. Seed Local | 0.0 | 1.3 | 0.0 | 76.0 | 22.7 | 31.1 | 64.4 | 4.4 | 0.0 | 0.0 |
| 2.Seed HYV | 13.3 | 66.7 | 13.3 | 6.7 | 0.0 | 66.7 | 33.3 | 0.0 | 0.0 | 0.0 |
| 3. Seed Improved | 33.3 | 64.0 | 1.3 | 1.3 | 0.0 | 68.9 | 28.9 | 2.2 | 0.0 | 0.0 |
| 4. Fertilizer | 26.7 | 68.0 | 2.7 | 2.7 | 0.0 | 91.1 | 8.9 | 0.0 | 0.0 | 0.0 |
| 5. Pesticides | 12.0 | 82.7 | 5.3 | 0.0 | 0.0 | 0.0 | 55.6 | 44.4 | 0.0 | 0.0 |
| 6. FYM | 2.7 | 26.7 | 45.3 | 25.3 | 0.0 | 8.9 | 75.6 | 15.6 | 0.0 | 0.0 |
| 7. Bullock Labour | 0.0 | 0.0 | 44.0 | 56.0 | 0.0 | 0.0 | 11.1 | 33.3 | 55.6 | 0.0 |
| 8. Machine Labour | 4.0 | 66.7 | 28.0 | 1.3 | 0.0 | 91.1 | 8.9 | 0.0 | 0.0 | 0.0 |
| 9. Family Labour | 5.3 | 66.7 | 25.3 | 2.7 | 0.0 | 0.0 | 82.2 | 17.8 | 0.0 | 0.0 |
| 10.Hired Labour | 1.3 | 86.7 | 5.3 | 6.7 | 0.0 | 66.7 | 31.1 | 2.2 | 0.0 | 0.0 |
| 11.Irigation Cost | 6.7 | 92.0 | 1.3 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 12.Other Costs | 2.9 | 94.3 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | |

| Table 6.4 : Change in Input Use among Sample farmers(Percentage of Households Reporting) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TAP | | | | | TWG | | | | |
| | Large Increase | Increase | No Change | Decrease | Large Decrease | Large Increase | Increase | No Change | Decrease | Large Decrease |
| 1. Seed Local | 0.0 | 6.0 | 4.0 | 0.0 | 90.0 | 3.3 | 93.3 | 3.3 | 0.0 | 0.0 |
| 2.Seed HYV | 0.0 | 67.0 | 33.0 | 0.0 | 0.0 | 1.7 | 93.3 | 5.0 | 0.0 | 0.0 |
| 3. Seed Improved | 0.0 | 70.0 | 30.0 | 0.0 | 0.0 | 0.0 | 53.3 | 43.3 | 3.3 | 0.0 |
| 4. Fertilizer | 0.0 | 47.0 | 53.0 | 0.0 | 0.0 | 90.0 | 10.0 | 0.0 | 0.0 | 0.0 |
| 5. Pesticides | 0.0 | 42.0 | 58.0 | 0.0 | 0.0 | 5.0 | 43.3 | 51.7 | 0.0 | 0.0 |
| 6. FYM | 0.0 | 3.0 | 97.0 | 0.0 | 0.0 | 0.0 | 40.0 | 50.0 | 10.0 | 0.0 |
| 7. Bullock Labour | 0.0 | 2.0 | 25.0 | 74.0 | 0.0 | 0.0 | 1.7 | 66.7 | 31.7 | 0.0 |
| 8. Machine Labour | 0.0 | 66.0 | 34.0 | 0.0 | 0.0 | 88.3 | 11.7 | 0.0 | 0.0 | 0.0 |
| 9. Family Labour | 0.0 | 2.0 | 45.0 | 53.0 | 0.0 | 0.0 | 41.7 | 56.7 | 1.7 | 0.0 |
| 10.Hired Labour | 0.0 | 60.0 | 40.0 | 0.0 | 0.0 | 51.7 | 48.3 | 0.0 | 0.0 | 0.0 |
| 11.Irigation Cost | 3.0 | 7.0 | 86.0 | 3.0 | 0.0 | 88.3 | 11.7 | 0.0 | 0.0 | 0.0 |
| 12.Other Costs | 0.0 | 14.0 | 86.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | |

| Table 6.5 : Change in Input Use among Sample farmers(Percentage of Households Reporting) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | RLM | | | | | PPM | | | | |
| | Large Increase | Increase | No Change | Decrease | Large Decrease | Large Increase | Increase | No Change | Decrease | Large Decrease |
| 1. Seed Local | 0.0 | 0.0 | 0.0 | 35.6 | 64.4 | 10.0 | 3.3 | 0.0 | 63.3 | 23.3 |
| 2.Seed HYV | 37.8 | 62.2 | 0.0 | 0.0 | 0.0 | 46.7 | 40.0 | 13.3 | 0.0 | 0.0 |
| 3. Seed Improved | 37.8 | 62.2 | 0.0 | 0.0 | 0.0 | 46.7 | 50.0 | 3.3 | 0.0 | 0.0 |
| 4. Fertilizer | 26.7 | 73.2 | 0.0 | 0.0 | 0.0 | 13.3 | 86.7 | 0.0 | 0.0 | 0.0 |
| 5. Pesticides | 28.7 | 73.3 | 0.0 | 0.0 | 0.0 | 6.7 | 90.0 | 3.3 | 0.0 | 0.0 |
| 6. FYM | 28.9 | 42.2 | 4.4 | 24.4 | 0.0 | 0.0 | 16.7 | 36.7 | 46.7 | 0.0 |
| 7. Bullock Labour | 2.2 | 0.0 | 15.6 | 82.2 | 0.0 | 0.0 | 0.0 | 23.3 | 76.7 | 0.0 |
| 8. Machine Labour | 26.7 | 73.3 | 0.0 | 0.0 | 0.0 | 0.0 | 96.7 | 3.3 | 0.0 | 0.0 |
| 9. Family Labour | 0.0 | 11.1 | 13.3 | 66.7 | 8.9 | 16.7 | 76.7 | 6.7 | 0.0 | 0.0 |
| 10.Hired Labour | 6.7 | 71.1 | 4.4 | 17.8 | 0.0 | 6.7 | 90.0 | 3.3 | 0.0 | 0.0 |
| 11.Irigation Cost | 8.9 | 88.0 | 2.2 | 0.0 | 0.0 | 20.0 | 80.0 | 0.0 | 0.0 | 0.0 |
| 12.Other Costs | 22.7 | 77.3 | 0.0 | 0.0 | 0.0 | 13.3 | 86.7 | 0.0 | 0.0 | 0.0 |
| | | | | | | | | | | |

| Table 6.6 : Change in Input Use among Sample farmers(Percentage of Households Reporting) | | | | | |
|---|---|---|---|---|---|
| | CDG | | | | |
| | Large Increase | Increase | No Change | Decrease | Large Decrease |
| 1. Seed Local | 11.1 | 77.8 | 11.1 | 0.0 | 0.0 |
| 2.Seed HYV | 64.4 | 35.6 | 0.0 | 0.0 | 0.0 |
| 3. Seed Improved | 60.0 | 40.0 | 0.0 | 0.0 | 0.0 |
| 4. Fertilizer | 55.6 | 44.4 | 0.0 | 0.0 | 0.0 |
| 5. Pesticides | 2.2 | 35.6 | 60.0 | 2.2 | 0.0 |
| 6. FYM | 17.8 | 80.0 | 2.2 | 0.0 | 0.0 |
| 7. Bullock Labour | 2.2 | 97.8 | 0.0 | 0.0 | 0.0 |
| 8. Machine Labour | 42.2 | 57.8 | 0.0 | 0.0 | 0.0 |
| 9. Family Labour | 0.0 | 66.7 | 33.3 | 0.0 | 0.0 |
| 10.Hired Labour | 8.9 | 80.0 | 11.1 | 0.0 | 0.0 |
| 11.Irigation Cost | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 12.Other Costs | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | |

Whether PIM has had an impact on increasing agricultural productivity has been examined based on the response of the sample households and the findings are given in Tables 6.7 to 6.15. Under CMAP there was noticeable increase in yields of major crops such as paddy, banana, and pulses since the devolution of power to the WUA. While 43.3 percent of the sample households reported large increase in paddy yield, the rest 56.7 percent also reported an increase in yield of paddy. However under CMEAP, none of the households reported large increase in yield, but a majority of them reported increase in yield. Since no change in the yield of unirrigated crops were reported by the sample households, the results indicate a positive impact on yields after the introduction of WUAs. This was also true for other irrigation systems studied here.

| Table 6.7 : Change in Crop Yields since the Establishment of WUA : CMAP | | | | | | |
|---|---|---|---|---|---|---|
| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| 1 Paddy | 100.0 | 43.3 | 56.7 | 0.0 | 0.0 | 0.0 |
| 2 Banana | 16.7 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 3 Black gram | 23.3 | 57.1 | 42.9 | 0.0 | 0.0 | 0.0 |
| 4 Green gram | 13.3 | 75.0 | 25.0 | 0.0 | 0.0 | 0.0 |
| 5 Tumeric | 3.3 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 6 Tapiaco | 3.3 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 7 Sugarcane | 3.3 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 8 Coconut | 3.3 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 9 Others | 26.7 | 0.0 | 12.5 | 87.5 | 0.0 | 0.0 |
| Unirrigated | | | | | | |
| 1 Paddy | 6.7 | 0.0 | 50.0 | 50.0 | 0.0 | 0.0 |
| 2 Banana | 10.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 3 Black gram | 26.7 | 12.5 | 12.5 | 62.5 | 12.5 | 0.0 |
| 4 Green gram | 6.7 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 5 Tumeric | 6.7 | 0.0 | 50.0 | 50.0 | 0.0 | 0.0 |
| 6 Tapiaco | 6.7 | 0.0 | 0.0 | 50.0 | 50.0 | 0.0 |

| Table 6.8 : Change in Crop Yields since the Establishment of WUA : CMEAP | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| 1 Paddy | 95.6 | 0.0 | 65.1 | 34.9 | 0.0 | 0.0 |
| 2 Sugarcane | 22.2 | 0.0 | 30.0 | 70.0 | 0.0 | 0.0 |
| 3 Green gram | 40.0 | 0.0 | 27.8 | 72.2 | 0.0 | 0.0 |
| 4 Banana | 40.0 | 0.0 | 61.1 | 38.9 | 0.0 | 0.0 |
| 5 Black gram | 60.0 | 0.0 | 29.6 | 70.4 | 0.0 | 0.0 |
| 6 Fodder Crop | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 7 Vegetables | 2.2 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 8 Gingelly | 4.4 | 0.0 | 50.0 | 50.0 | 0.0 | 0.0 |
| Unirrigated | | | | | | |
| 1 Paddy | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 2 Sugarcane | 6.7 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 3 Green gram | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 4 Groundnut | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 5 Vegetables | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 6 Mango | 6.7 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 7 Casurina | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 8 Horse gram | 2.2 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 6.9: Change in Crop Yields since the Establishment of WUA: CM | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| HYV Bajra | 85.3 | 17.2 | 68.8 | 10.9 | 3.1 | 0.0 |
| Groundnut | 40.0 | 3.3 | 46.7 | 13.3 | 36.7 | 0.0 |
| Wheat | 94.7 | 8.5 | 81.7 | 5.6 | 4.2 | 0.0 |
| Gram | 60.0 | 0.0 | 68.9 | 26.7 | 4.4 | 0.0 |
| Jowar Fodder | 1.3 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| HYV Jowar | 42.7 | 0.0 | 90.6 | 3.1 | 6.3 | 0.0 |
| Sugarcane | 32.0 | 12.5 | 50.0 | 8.3 | 29.2 | 0.0 |
| Maize | 46.7 | 0.0 | 14.3 | 85.7 | 0.0 | 0.0 |
| Tur | 12.0 | 11.1 | 66.7 | 22.2 | 0.0 | 0.0 |
| Lucerne | 36.0 | 0.0 | 7.4 | 92.6 | 0.0 | 0.0 |
| Kadwal | 37.3 | 0.0 | 25.0 | 75.0 | 0.0 | 0.0 |
| Onion | 76.0 | 1.8 | 54.4 | 14.0 | 29.8 | 0.0 |
| Pomegranate | 8.0 | 33.3 | 66.7 | 0.0 | 0.0 | 0.0 |
| | | | | | | |
| Unirrigated | | | | | | |
| HYV Bajra | 25.3 | 0.0 | 26.3 | 52.6 | 21.1 | 0.0 |
| HYV Jowar | 1.3 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| Tur | 2.7 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 6.10: Change in Crop Yield: CG | | | | | |
|---|---|---|---|---|---|
| | Crops | Percentage of Households Reporting | Large Increase | Increase | No Change |
| | | | As percent of Reporting Households | | |
| | Irrigated | | | | |
| 1 | Cotton | 33.3 | 100.0 | 0.0 | 0.0 |
| 2 | Til | 33.3 | 100.0 | 0.0 | 0.0 |
| 3 | Castor | 66.7 | 80.0 | 20.0 | 0.0 |
| 4 | Rajko (Kharif) | 66.7 | 70.0 | 30.0 | 0.0 |
| 6 | Mustard | 80.0 | 83.3 | 16.7 | 0.0 |
| 7 | Cumin | 33.3 | 100.0 | 0.0 | 0.0 |
| 8 | Gram | 26.7 | 100.0 | 0.0 | 0.0 |
| 9 | Bajari (Summer) | 20.0 | 33.3 | 66.7 | 0.0 |
| 10 | Rajko (Summer) | 6.7 | 100.0 | 0.0 | 0.0 |
| | Unirrigated | | | | |
| 1 | Cotton | 20.0 | 0.0 | 100.0 | 33.3 |
| 2 | Til | 6.7 | 0.0 | 100.0 | 0.0 |
| 3 | Jowar | 53.3 | 12.5 | 25.0 | 62.5 |
| 4 | Bajari (Kharif) | 100.0 | 33.3 | 66.7 | 0.0 |

| Table 6.11: Change in Crop Yields since the Establishment of WUA : TAP | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| 1 Paddy | 48.3 | 0.0 | 32.4 | 27.6 | 40.0 | 0.0 |
| 2 Sugarcane | 45.0 | 0.0 | 33.3 | 59.3 | 3.7 | 3.7 |
| 3 Red gram | 5.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 4 Banana | 3.3 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 5 Ragi | 1.7 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| 7 Groundnut | 33.3 | 0.0 | 5.0 | 65.0 | 15.0 | 15.0 |
| Unirrigated: | | | | | | |
| 1 Groundnut | 3.3 | 0.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| 2 Mango | 1.7 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |

| Table 6.12: Change in Crop Yield: TWG | | | | | |
|---|---|---|---|---|---|
| | Crops | | Large Increase | Increase | No Change |
| | | Percentage of Households Reporting | As percent of Reporting Households | | |
| | Irrigated | | | | |
| 1 | Castor | 93.3 | 92.9 | 7.1 | 0.0 |
| 2 | Paddy | 80.0 | 91.7 | 8.3 | 0.0 |
| 3 | Rajko | 80.0 | 91.7 | 8.3 | 0.0 |
| 4 | Wheat | 80.0 | 100.0 | 0.0 | 0.0 |
| 5 | Mustard | 86.7 | 84.6 | 15.4 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Bajra | 46.7 | 100.0 | 0.0 | 0.0 |
| 7 | Jowar | 6.7 | 0.0 | 100.0 | 0.0 |
| 8 | Cotton | 26.7 | 100.0 | 0.0 | 0.0 |
| 9 | Til | 26.7 | 75.0 | 25.0 | 0.0 |
| | Unirrigated | | | | |
| 1 | Bajra (Kharif) | 100.0 | 20.0 | 53.3 | 26.7 |
| 2 | Jowar Kharif) | 73.3 | 9.1 | 54.5 | 36.4 |
| 3 | Cotton | 40.0 | 0.0 | 50.0 | 50.0 |
| 4 | Til | 40.0 | 0.0 | 66.7 | 33.3 |
| 5 | Cumin | 20.0 | 0.0 | 33.3 | 66.7 |
| 6 | Moong | 20.0 | 0.0 | 0.0 | 100.0 |

Table 6.13: Change in Crop Yields since the Establishment of WUA: RLM

| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
|---|---|---|---|---|---|---|
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| HYV Bajra | 93.3 | 7.1 | 64.3 | 28.6 | 0.0 | 0.0 |
| Groundnut | 75.6 | 5.9 | 85.3 | 8.8 | 0.0 | 0.0 |
| Wheat | 51.1 | 8.7 | 69.6 | 21.7 | 0.0 | 0.0 |
| Jowar Fodder | 46.7 | 0.0 | 57.1 | 42.9 | 0.0 | 0.0 |
| HYV Jowar | 55.6 | 4.0 | 44.0 | 52.0 | 0.0 | 0.0 |
| Sugarcane | 46.7 | 9.5 | 85.7 | 4.8 | 0.0 | 0.0 |
| Maize | 13.3 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 |
| Lucerne | 44.4 | 0.0 | 70.0 | 30.0 | 0.0 | 0.0 |
| Onion | 68.9 | 38.7 | 58.1 | 3.2 | 0.0 | 0.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tomato | 42.2 | 52.6 | 47.4 | 0.0 | 0.0 | 0.0 |
| Beet | 37.8 | 17.6 | 87.4 | 0.0 | 0.0 | 0.0 |
| Cauliflower | 37.8 | 47.1 | 52.9 | 0.0 | 0.0 | 0.0 |
| Potato | 46.7 | 57.1 | 42.9 | 0.0 | 0.0 | 0.0 |
| Carrot | 35.6 | 37.5 | 62.5 | 0.0 | 0.0 | 0.0 |
| Sapota | 4.4 | 50.0 | 50.0 | 0.0 | 0.0 | 0.0 |
| Cabbage | 8.9 | 0.0 | 25.0 | 0.0 | 0.0 | 0.0 |
| Sunflower | 26.7 | 0.0 | 83.3 | 16.7 | 0.0 | 0.0 |
| Custard Apple | 15.6 | 14.3 | 85.7 | 0.0 | 0.0 | 0.0 |
| Unirrigated | | | | | | |
| HYV Bajra | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HYV Jowar | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Tuur | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 6.14 : Change in Crop Yields since the Establishment of WUA: PPM

| Name of Crop | Percentage of Households Reporting | Large Increase | Increase | No Change | Decrease | Large Decrease |
|---|---|---|---|---|---|---|
| | | As Percentage of Reporting Households | | | | |
| Irrigated | | | | | | |
| HYV Bajra | 36.7 | 36.4 | 63.6 | 0.0 | 0.0 | 0.0 |
| Groundnut | 50.0 | 33.3 | 66.7 | 0.0 | 0.0 | 0.0 |
| Wheat | 76.7 | 30.4 | 69.6 | 0.0 | 0.0 | 0.0 |
| Gram | 43.3 | 15.4 | 84.6 | 0.0 | 0.0 | 0.0 |
| Jowar Fodder | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| HYV Jowar | 56.7 | 41.2 | 58.8 | 0.0 | 0.0 | 0.0 |
| Onion | 30.0 | 77.8 | 22.2 | 0.0 | 0.0 | 0.0 |
| Tomato | 50.0 | 66.7 | 33.3 | 0.0 | 0.0 | 0.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Chilli | 10.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Vegetables | 16.7 | 40.0 | 60.0 | 0.0 | 0.0 | 0.0 |
| Flower | 53.3 | 56.3 | 43.8 | 0.0 | 0.0 | 0.0 |
| Custard Apple | 6.7 | 50.0 | 50.0 | 0.0 | 0.0 | 0.0 |
| Unirrigated | | | | | | |
| HYV Bajra | 73.3 | 0.0 | 68.2 | 31.8 | 0.0 | 0.0 |
| HYV Jowar | 33.3 | 0.0 | 80.0 | 20.0 | 0.0 | 0.0 |
| Hulage | 10.0 | 0.0 | 33.3 | 66.7 | 0.0 | 0.0 |
| Matkee | 30.0 | 0.0 | 22.2 | 77.8 | 0.0 | 0.0 |
| Pavata | 10.0 | 0.0 | 66.7 | 33.3 | 0.0 | 0.0 |

Table 6.15: Change in Crop Yield: CDG

| | Crops | | Large Increase | Increase | No Change |
|---|---|---|---|---|---|
| | | Percentage of Households Reporting | As percent of Reporting Households | | |
| | Irrigated | | | | |
| 1 | Cotton | 66.7 | 100.0 | 0.0 | 0.0 |
| 2 | Til | 60.0 | 55.6 | 44.4 | 0.0 |
| 3 | Rajko | 40.0 | 100.0 | 0.0 | 0.0 |
| 4 | Jowar Fodder | 40.0 | 100.0 | 0.0 | 0.0 |
| 5 | Wheat | 66.7 | 100.0 | 0.0 | 0.0 |
| | Unirrigated | | | | |
| 1 | Bajari | 100.0 | 13.3 | 20.0 | 66.7 |
| 2 | Groundnut | 100.0 | 20.0 | 20.0 | 60.0 |
| 3 | Moong | 66.7 | 20.0 | 60.0 | 20.0 |
| 4 | Muth | 40.0 | 0.0 | 50.0 | 50.0 |
| 5 | Cotton | 33.3 | 20.0 | 20.0 | 60.0 |
| 6 | Til | 40.0 | 0.0 | 50.0 | 50.0 |
| 7 | Castor | 20.0 | 0.0 | 20.0 | 80.0 |

## Chapter 7
## The Impact of PIM on Improving the Performance of Water Resource Management

What has been the impact of PIM on the performance of irrigation systems in improving water resource management? The expected impacts may include the performance on addressing water scarcity and use efficiency, improving the empowerment and equity, reducing adverse environmental impact, and improving financial viability. This has been examined in the study. In order to measure the efficiency of the WUA in managing the irrigation system we have considered six broad indicators viz., timely and adequate water availability, increase in irrigated area, change in cropping pattern, better maintenance of the irrigation structure and finally reduction in cost of maintenance. The equity related issues probed here are equitable distribution of water, empowerment of farmers, volumetric pricing and all land holders taking membership in the WUA. The equity and empowerment were also assessed in terms of beginning a sense of ownership, unification of diverse groups, freedom to raise resources, resolution of disputes and active involvement of all classes of farmers.

The responses were obtained from the farmers on a five point scale viz., highly positive, positive and no impact, negative, highly negative (Tables 7.1 to 7.4). Sometime this reduced defacto to a 3 point scale of highly positive, positive and no impact. Under CMAP the major positive factors stands out under the efficiency parameters are timely water availability, and better maintenance; under the equity considerations, three factors that stands out are more equitable distribution of water, empowerment of farmers and all land owners becoming member of the WUA. Beginning of a sense of ownership and

active involvement of all member farmers stood positive and highly positive. Other factors that are positive to highly positive are deciding the quantum of water to be used, and transfer of power to the WUAs. More or less a similarly views were expressed by the sample farmer households under CMEAP with the exception that the active involvement of all member farmers was not as strong as it was under CMAP.

Positive impacts of the WUA for the sample under CM are: adequate water availability, better maintenance of the irrigation system, equitable distribution of water, empowerment, freedom to raise resources, more farm employment and diversified economic activities. The farmers of CM reported positive impacts with respect to all the factors considered here except adequate water availability, reduction in cost of maintenance, volumetric pricing and transfer of power to the WUA in deciding water charges. Under TAP, except some marginal positive impacts on diversified economic activities no other major positive impact was reported by the sample households under. Under TWG, the WUA could not make much dent on empowerment of farmers to manage the irrigation system, all land owners becoming members, year round availability of water and choice of deciding irrigation timings. The overall impact of RLM was positive except those related to diversified economic activities. Whereas under PPM and CDG all sample farmer households reported a strong and positive impact on most indicators of equity, efficiency and social empowerment.

| Table 7.1: Impact of WUA o Efficiency, Equity, Social Cohesion (Percentage of Households Reporting) | | | | | | |
|---|---|---|---|---|---|---|
| | CMAP | | | AMEAP | | |
| | Highly Positive | Positive | No Impact | Highly Positive | Positive | No Impact |
| A. Efficiency Related | | | | | | |
| 1. Timely water availability | 3.3 | 96.7 | 0.0 | 0.0 | 77.8 | 22.2 |
| 2. Adequate water availability | 0.0 | 40.0 | 50.0 | 0.0 | 68.9 | 31.1 |
| 3. Increase in irrigated area | 0.0 | 20.0 | 80.0 | 0.0 | 31.1 | 68.9 |
| 4. Change in cropping pattern in favour of high value crops | 0.0 | 3.3 | 96.7 | 0.0 | 42.2 | 57.8 |
| 5. Better Maintenance of irrigation structure | 20.0 | 76.7 | 3.3 | 0.0 | 88.9 | 11.1 |
| 6. Reduction in the cost of maintenance | 0.0 | 30.0 | 70.0 | 0.0 | 35.6 | 64.4 |
| B. Equity Related | | | | | | |
| 1. Equitable distribution of water | 0.0 | 90.0 | 10.0 | 0.0 | 91.1 | 8.9 |
| 2. Empowerment of farmers to manage irrigation Systems | 0.0 | 83.3 | 16.7 | 0.0 | 84.4 | 15.6 |
| 3. Volumetric pricing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4. All land holders became WUA members with voting rights | 10.0 | 76.7 | 13.3 | 0.0 | 95.6 | 4.4 |
| C. Social Cohesion and Empowerment | | | | | | |
| 1. Beginning of a sense of ownership by farmers | 0.0 | 96.7 | 3.3 | 0.0 | 95.6 | 4.4 |
| 2. Unification of diverse groups in the area | 0.0 | 23.3 | 76.7 | 0.0 | 15.6 | 84.4 |
| 3. Freedom to raise resources | 0.0 | 30.0 | 70.0 | 0.0 | 26.7 | 73.3 |
| 4. Resolution of disputes and compounding of Offenses | 0.0 | 56.7 | 43.3 | 0.0 | 75.6 | 24.4 |
| 5. Active involvement of all classes | 0.0 | 93.1 | 6.9 | 0.0 | 28.9 | 71.1 |
| D. Others | | | | | | |
| 1. More Farm Employment | 0.0 | 3.3 | 96.7 | 0.0 | 2.2 | 97.8 |
| 2. Year-round availability of water for irrigation | 0.0 | 3.3 | 96.7 | 0.0 | 2.2 | 97.8 |
| 3. Diversification of cropping pattern | 0.0 | 10.0 | 90.0 | 0.0 | 71.1 | 28.9 |
| 4. Choice in deciding irrigation timings | 3.3 | 93.3 | 3.3 | 0.0 | 97.8 | 2.2 |
| 5. Choice in deciding quantum of water | 3.3 | 53.3 | 43.3 | 0.0 | 93.3 | 6.7 |
| 6. Diversified Economic Activities: Dairying | 0.0 | 30.0 | 70.0 | 0.0 | 20.0 | 77.8 |
| 7. Diversified Economic Activities | 0.0 | 3.3 | 96.7 | 0.0 | 4.4 | 95.6 |
| 8. Transfer of power to the WUA | 3.3 | 90.0 | 6.7 | 0.0 | 100.0 | 0.0 |
| 9. Transfer of power to WUA to decide water Charges | 0.0 | 13.3 | 86.7 | 0.0 | 20.0 | 73.3 |
| | | | | 0.0 | 0.0 | 100.0 |

| Table 7.2: Impact of WUA o Efficiency, Equity, Social Cohesion (Percentage of Households Reporting) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | CM | | | | CG | | |
| | Highly Positive | Positive | No Impact | Negative | Highly Positive | Positive | No Impact |
| A. Efficiency Related | | | | | | | |
| 1. Timely water availability | 1.3 | 34.7 | 56.0 | 8.0 | 88.9 | 11.1 | 0.0 |
| 2. Adequate water availability | 10.7 | 84.0 | 2.7 | 2.7 | 20.0 | 46.7 | 0.0 |
| 3. Increase in irrigated area | 44.0 | 42.7 | 12.0 | 1.3 | 100.0 | 33.3 | 0.0 |
| 4. Change in cropping pattern in favour of high value crops | 2.7 | 77.3 | 17.3 | 2.7 | 100.0 | 0.0 | 0.0 |
| 5. Better Maintenance of irrigation structure | 2.7 | 49.3 | 18.7 | 29.3 | 75.6 | 24.4 | 0.0 |
| 6. Reduction in the cost of maintenance | 0.0 | 40.0 | 22.7 | 37.4 | 0.0 | 0.0 | 100.0 |
| B. Equity Related | | | | | | | |
| 1. Equitable distribution of water | 1.3 | 93.3 | 4.0 | 1.3 | 100.0 | 0.0 | 0.0 |
| 2. Empowerment of farmers to manage irrigation systems | 1.3 | 62.7 | 21.3 | 14.7 | 75.6 | 24.4 | 0.0 |
| 3. Volumetric pricing | 1.3 | 60.0 | 34.7 | 4.0 | 22.2 | 11.1 | 66.7 |
| 4. All land holders became WUA members With voting rights | 0.0 | 49.3 | 10.7 | 40.0 | 26.7 | 73.3 | 0.0 |
| C. Social Cohesion and Empowerment | | | | | | | |
| 1. Beginning of a sense of ownership by farmers | 0.0 | 48.0 | 17.3 | 34.7 | 73.3 | 26.7 | 0.0 |
| 2. Unification of diverse groups in the area | 0.0 | 46.7 | 29.3 | 24.0 | 73.3 | 26.7 | 0.0 |
| 3. Freedom to raise resources | 0.0 | 88.0 | 10.7 | 1.3 | 73.3 | 26.7 | 0.0 |
| 4. Resolution of disputes and compounding of offenses | 0.0 | 46.7 | 34.7 | 18.7 | 73.3 | 26.7 | 0.0 |
| 5. Active involvement of all classes | 0.0 | 61.3 | 21.3 | 17.3 | 73.3 | 26.7 | 0.0 |
| D. Others | | | | | | | |
| 1. More Farm Employment | 30.7 | 53.3 | 14.7 | 1.3 | 86.7 | 13.3 | 0.0 |
| 2. Year-round availability of water for irrigation | 6.7 | 24.0 | 56.0 | 13.3 | 24.4 | 11.1 | 64.4 |
| 3. Diversification of cropping pattern | 16.0 | 53.3 | 29.3 | 1.3 | 53.3 | 46.7 | 0.0 |
| 4. Choice in deciding irrigation timings | 0.0 | 12.0 | 41.3 | 46.7 | 73.3 | 26.7 | 0.0 |
| 5. Choice in deciding quantum of water | 0.0 | 42.7 | 10.7 | 46.7 | 31.1 | 68.9 | 0.0 |
| 6. Diversified Economic Activities: Dairying | 32.0 | 64.0 | 2.7 | 1.3 | 2.2 | 97.8 | 0.0 |
| 7. Diversified Economic Activities | 2.7 | 69.3 | 1.3 | 26.6 | 40.0 | 60.0 | 0.0 |
| 8. Transfer of power to the WUA | 0.0 | 68.0 | 13.3 | 18.7 | 68.9 | 31.1 | 0.0 |
| 9. Transfer of power to WUA to decide water charges | 6.7 | 65.3 | 18.7 | 9.3 | 0.0 | 0.0 | 0.0 |

| Table 7.3: Impact of WUA o Efficiency, Equity, Social Cohesion (Percentage of Households Reporting) | | | | | | |
|---|---|---|---|---|---|---|
| | TAP | | | TWG | | |
| | Highly Positive | Positive | No Impact | Highly Positive | Positive | No Impact |
| A. Efficiency Related | | | | | | |
| 1. Timely water availability | 0.0 | 0.0 | 93.0 | 86.7 | 13.3 | 0.0 |
| 2. Adequate water availability | 0.0 | 0.0 | 93.0 | 85.0 | 15.0 | 0.0 |
| 3. Increase in irrigated area | 0.0 | 0.0 | 98.0 | 63.3 | 36.7 | 0.0 |
| 4. Change in cropping pattern in favour of high value crops | 0.0 | 0.0 | 97.0 | 60.0 | 40.0 | 0.0 |
| 5. Better Maintenance of irrigation structure | 0.0 | 0.0 | 98.0 | 68.3 | 31.7 | 0.0 |
| 6. Reduction in the cost of maintenance | 0.0 | 0.0 | 97.0 | 73.3 | 26.7 | 0.0 |
| B. Equity Related | | | | | | |
| 1. Equitable distribution of water | 0.0 | 0.0 | 95.0 | 80.0 | 20.0 | 0.0 |
| 2. Empowerment of farmers to manage irrigation systems | 0.0 | 0.0 | 97.0 | 40.0 | 26.7 | 33.3 |
| 3. Volumetric pricing | 0.0 | 0.0 | 96.0 | 44.4 | 22.2 | 33.3 |
| 4. All land holders became WUA members with voting rights | 0.0 | 0.0 | 97.0 | 3.3 | 0.0 | 96.7 |
| C. Social Cohesion and Empowerment | | | | | | |
| 1. Beginning of a sense of ownership by farmers | 0.0 | 0.0 | 97.0 | 85.0 | 15.0 | 0.0 |
| 2. Unification of diverse groups in the area | 0.0 | 0.0 | 97.0 | 80.0 | 20.0 | 0.0 |
| 3. Freedom to raise resources | 0.0 | 0.0 | 97.0 | 83.3 | 16.7 | 0.0 |
| 4. Resolution of disputes and compounding of offenses | 0.0 | 0.0 | 97.0 | 81.7 | 18.3 | 0.0 |
| 5. Active involvement of all classes | 0.0 | 2.0 | 95.0 | 80.0 | 20.0 | 0.0 |
| D. Others | | | | | | |
| 1. More Farm Employment | 0.0 | 0.0 | 98.0 | 60.0 | 40.0 | 0.0 |
| 2. Year-round availability of water for irrigation | 0.0 | 0.0 | 97.0 | 6.7 | 6.7 | 86.7 |
| 3. Diversification of cropping pattern | 0.0 | 2.0 | 97.0 | 71.1 | 28.9 | 0.0 |
| 4. Choice in deciding irrigation timings | 0.0 | 0.0 | 98.0 | 13.3 | 13.3 | 73.3 |
| 5. Choice in deciding quantum of water | 0.0 | 0.0 | 98.0 | 80.0 | 20.0 | 0.0 |
| 6. Diversified Economic Activities: Dairying | 0.0 | 52.0 | 47.0 | 62.2 | 37.8 | 0.0 |
| 7. Diversified Economic Activities | 0.0 | 50.0 | 48.0 | 64.7 | 35.3 | 0.0 |
| 8. Transfer of power to the WUA | 0.0 | 20.0 | 77.0 | 38.3 | 36.7 | 25.0 |
| 9. Transfer of power to WUA to decide water Charges | 0.0 | 20.0 | 77.0 | 15.0 | 10.0 | 75.0 |

| Table 7.4: Impact of WUA o Efficiency, Equity, Social Cohesion (Percentage of Households Reporting) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | RLM | | | | PPM | | | |
| | Highly Positive | Positive | No Impact | Negative | Highly Positive | Positive | No Impact | Negative |
| A. Efficiency Related | | | | | | | | |
| 1. Timely water availability | 20.0 | 80.0 | 0.0 | 0.0 | 26.7 | 60.0 | 13.3 | 0.0 |
| 2. Adequate water availability | 20.0 | 80.0 | 0.0 | 0.0 | 16.7 | 76.7 | 6.7 | 0.0 |
| 3. Increase in irrigated area | 22.2 | 77.8 | 0.0 | 0.0 | 40.0 | 60.0 | 0.0 | 0.0 |
| 4. Change in cropping pattern in favour of high value crops | 22.2 | 77.8 | 0.0 | 0.0 | 40.0 | 60.0 | 0.0 | 0.0 |
| 5. Better Maintenance of irrigation structure | 24.4 | 73.3 | 2.2 | 0.0 | 6.7 | 86.7 | 6.7 | 0.0 |
| 6. Reduction in the cost of maintenance | 8.9 | 73.3 | 13.3 | 4.4 | 0.0 | 73.3 | 20.0 | 6.7 |
| B. Equity Related | | | | | | | | |
| 1. Equitable distribution of water | 15.6 | 84.4 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 2. Empowerment of farmers to manage irrigation systems | 8.9 | 91.1 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 |
| 3. Volumetric pricing | 2.2 | 97.8 | 0.0 | 0.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| 4. All land holders became WUA members with voting rights | 8.9 | 86.7 | 2.2 | 2.2 | 0.0 | 26.7 | 43.3 | 30.0 |
| C. Social Cohesion and Empowerment | | | | | | | | |
| 1. Beginning of a sense of ownership by farmers | 2.2 | 97.8 | 0.0 | 0.0 | 10.0 | 60.0 | 30.0 | 0.0 |
| 2. Unification of diverse groups in the area | 4.4 | 95.6 | 0.0 | 0.0 | 13.3 | 66.7 | 20.0 | 0.0 |
| 3. Freedom to raise resources | 2.2 | 97.8 | 0.0 | 0.0 | 6.7 | 93.9 | 0.0 | 0.0 |
| 4. Resolution of disputes and compounding of offenses | 0.0 | 33.3 | 2.2 | 64.5 | 6.7 | 83.3 | 0.0 | 10.0 |
| 5. Active involvement of all classes | 6.7 | 82.2 | 2.2 | 8.9 | 6.7 | 60.0 | 13.3 | 20.0 |
| D. Others | | | | | | | | |
| 1. More Farm Employment | 13.3 | 86.7 | 0.0 | 0.0 | 43.3 | 56.7 | 0.0 | 0.0 |
| 2. Year-round availability of water for irrigation | 11.1 | 88.9 | 0.0 | 0.0 | 20.0 | 80.0 | 0.0 | 0.0 |
| 3. Diversification of cropping pattern | 11.1 | 88.9 | 0.0 | 0.0 | 36.7 | 63.3 | 0.0 | 0.0 |
| 4. Choice in deciding irrigation timings | 2.2 | 97.8 | 0.0 | 0.0 | 10.0 | 90.0 | 0.0 | 0.0 |
| 5. Choice in deciding quantum of water | 6.7 | 93.3 | 0.0 | 0.0 | 13.3 | 76.7 | 10.0 | 0.0 |
| 6. Diversified Economic Activities: Dairying | 24.4 | 75.6 | 0.0 | 0.0 | 20.0 | 46.7 | 26.7 | 6.7 |
| 7. Diversified Economic Activities | 0.0 | 2.3 | 9.3 | 88.4 | 10.0 | 46.7 | 20.0 | 23.3 |
| 8. Transfer of power to the WUA | 6.7 | 86.7 | 4.4 | 2.2 | 6.7 | 66.7 | 6.7 | 20.0 |
| 9. Transfer of power to WUA to decide water Charges | 6.7 | 86.7 | 4.4 | 2.2 | 6.7 | 73.3 | 0.0 | 20.0 |

| Table 7.4: Impact of WUA o Efficiency, Equity, Social Cohesion (Percentage of Households Reporting) | | | | | | |
|---|---|---|---|---|---|---|
| | CDG | | | | | |
| | Highly Positive | Positive | No Impact | Highly Positive | Positive | No Impact |
| A. Efficiency Related | | | | | | |
| 1. Timely water availability | 51.1 | 48.9 | 0.0 | | | |
| 2. Adequate water availability | 23.3 | 63.3 | 13.3 | | | |
| 3. Increase in irrigated area | 37.8 | 57.8 | 4.4 | | | |
| 4. Change in cropping pattern in favour of high value crops | 33.3 | 57.8 | 8.9 | | | |
| 5. Better Maintenance of irrigation structure | 60.0 | 33.3 | 6.7 | | | |
| 6. Reduction in the cost of maintenance | 43.3 | 56.7 | 0.0 | | | |
| B. Equity Related | | | | | | |
| 1. Equitable distribution of water | 60.0 | 33.3 | 6.7 | | | |
| 2. Empowerment of farmers to manage irrigation Systems | 46.7 | 46.7 | 6.7 | | | |
| 3. Volumetric pricing | 53.3 | 40.0 | 6.7 | | | |
| 4. All land holders became WUA members with voting rights | 43.3 | 56.7 | 0.0 | | | |
| C. Social Cohesion and Empowerment | | | | | | |
| 1. Beginning of a sense of ownership by farmers | 33.3 | 66.7 | 0.0 | | | |
| 2. Unification of diverse groups in the area | 57.8 | 37.8 | 4.4 | | | |
| 3. Freedom to raise resources | 26.7 | 70.0 | 3.3 | | | |
| 4. Resolution of disputes and compounding of Offenses | 46.7 | 46.7 | 6.7 | | | |
| 5. Active involvement of all classes | 76.7 | 23.3 | 0.0 | | | |
| D. Others | | | | | | |
| 1. More Farm Employment | 46.7 | 53.3 | 0.0 | | | |
| 2. Year-round availability of water for irrigation | 43.3 | 56.7 | 0.0 | | | |
| 3. Diversification of cropping pattern | 0.0 | 73.3 | 26.7 | | | |
| 4. Choice in deciding irrigation timings | 40.0 | 60.0 | 0.0 | | | |
| 5. Choice in deciding quantum of water | 0.0 | 73.3 | 26.7 | | | |
| 6. Diversified Economic Activities: Dairying | 100.0 | 0.0 | 0.0 | | | |
| 7. Diversified Economic Activities | 80.0 | 20.0 | 0.0 | | | |
| 8. Transfer of power to the WUA | 26.7 | 66.7 | 6.7 | | | |
| 9. Transfer of power to WUA to decide water Charges | 0.0 | 73.3 | 26.7 | | | |

## Chapter 8
## Difficulties Faced by the WUAs in the Operation of PIM

What are the difficulties faced by the WUAs in achieving effective operation of the PIM? What are the problems that need to be addressed to make PIM more effective? The farmers were asked about a range of possible problems associated with supply, management and distribution of water including financing and investment. The responses have been obtained on a five point scale ranging from very major to none, and the findings are given in tables 8.1 to 8.9. The study probed a number of problems that may be faced. We report here mainly those problems that are reported as very major to major.

Under CMAP the major problems that are stated are inadequate field channels, lack of start-up financial support from the government, lack of consensus on deciding the cropping pattern and the lack of freedom to decide on the water rates. However, the major problems faced by the WUAs under CMEAP are very different and they include non-availability of water, conflict among members about timing of water, complaint from tail-end farmers and lack of start-up financial support from the government. The farm households under CM reported few very major to major problems but these included inadequate maintenance, high cost of maintenance, inadequate field channels, lack of government support and little raining to staff members. The farmer households under CG reported only light to occasional problems namely inadequate maintenance, high cost of maintenance, non availability of water at the canal, inadequate field channels and complaints from the tail-end farmers, particularly when there is acute scarcity of water in the canal. Some of the major problems reported by the farmers under TAP are non-availability and poor quality of water in the tank, high cost of maintenance, lack of member cooperation, and complaints from tail end farmers on non-availability of water.

Under TWG three major problems have been stated by the farmers viz., high cost of electricity, high cost of repairing, fast receding water table in the wells. The major problems faced by the members of WUA under RLM are high cost of maintenance, high cost of electricity, lack of government support, while under PPM the major problems faced by the farmers were lack of financial support from the government and high cost of electricity. Under CDG problems such as receding water table, lack of mechanisms to control water use, and lack of training to members were the prominent problems reported.

| Table 8.1: Problems Faced by the WUA or its Members on various aspects of the functioning of WUA (as percentage of Households): CMAP | | | | |
|---|---|---|---|---|
| | Very Major | Major | Light/ Occasional | None/ No |
| 1. Inadequate maintenance | 0.0 | 10.0 | 87.0 | 3.0 |
| 2. High cost of maintenance | 0.0 | 57.0 | 3.0 | 40.0 |
| 3. Lack of members cooperation | 0.0 | 30.0 | 47.0 | 23.0 |
| 4. Non availability of water at the canal | 0.0 | 23.0 | 77.0 | 0.0 |
| 5. Poor quality of water | 0.0 | 3.0 | 83.0 | 13.0 |
| 6. Conflict among members about timing of water | 0.0 | 0.0 | 97.0 | 3.0 |
| 7. Conflict among members about quantity of water | 0.0 | 0.0 | 97.0 | 3.0 |
| 8. Conflict among members about pricing of water | 0.0 | 0.0 | 10.0 | 90.0 |
| 9. Inadequate field channels | 3.0 | 97.0 | 0.0 | 0.0 |
| 10. Lack of Government support/funding | 0.0 | 90.0 | 3.0 | 7.0 |
| 11. High cost of electricity | 0.0 | 0.0 | 0.0 | 0.0 |
| 12. Lack of financial support (start-up) | 0.0 | 87.0 | 13.0 | 0.0 |
| 13. High cost of Tube-well repairing | 0.0 | 0.0 | 0.0 | 0.0 |
| 14. Water table receding fast | 0.0 | 0.0 | 0.0 | 100.0 |
| 15. Lack of mechanism to control water use | 0.0 | 20.0 | 80.0 | 0.0 |
| 16. Lack of quality planting materials | 0.0 | 0.0 | 75.0 | 25.0 |
| 17. Lack of consensus in deciding cropping pattern | 0.0 | 63.0 | 30.0 | 7.0 |
| 18. Complaints from tail reach farmers | 0.0 | 14.0 | 79.0 | 7.0 |
| 19. Lack of training to staff/ members | 3.0 | 53.0 | 17.0 | 27.0 |
| 20. Non payment of water charges | 0.0 | 6.0 | 12.0 | 82.0 |
| 21. Lack of investment credit with farmers | 7.0 | 31.0 | 59.0 | 3.0 |
| 22. Problems in devising water distribution rules | 0.0 | 66.0 | 24.0 | 10.0 |
| 23. Lack of member cooperation | 0.0 | 0.0 | 8.0 | 92.0 |
| 24. Problems during the period when water is very scarce | 3.0 | 73.0 | 23.0 | 0.0 |
| 25. The margins earned by the association is too meager | 23.0 | 60.0 | 10.0 | 7.0 |
| 26. Limited control over water flow | 3.0 | 53.0 | 43.0 | 0.0 |
| 27. Lack of leadership | 0.0 | 0.0 | 0.0 | 100.0 |
| 28. Lack of freedom to determine water rates | 7.0 | 67.0 | 17.0 | 10.0 |
| 29.Lack of Member's willingness to take up management Functions | 0.0 | 0.0 | 7.0 | 93.0 |

| Table 8.2 : Problems Faced by the WUA or its Members on various aspects of the functioning of WUA (as percentage of Households): CMEAP | | | | |
|---|---|---|---|---|
| | Very Major | Major | Light/ Occasional | None/ No |
| 1. Inadequate maintenance | 0.0 | 8.9 | 24.4 | 66.7 |
| 2. High cost of maintenance | 0.0 | 22.2 | 13.3 | 64.4 |
| 3. Lack of members cooperation | 0.0 | 15.6 | 4.4 | 80.0 |
| 4. Non availability of water at the canal | 0.0 | 80.0 | 20.0 | 0.0 |
| 5. Poor quality of water | 0.0 | 20.0 | 80.0 | 0.0 |
| 6. Conflict among members about timing of water | 0.0 | 73.3 | 24.4 | 2.2 |
| 7. Conflict among members about quantity of water | 0.0 | 70.0 | 24.4 | 5.6 |
| 8. Conflict among members about pricing of water | 0.0 | 0.0 | 8.9 | 91.1 |
| 9. Inadequate field channels | 0.0 | 82.2 | 17.8 | 0.0 |
| 10. Lack of Government support/funding | 8.9 | 8.9 | 73.3 | 8.9 |
| 11. High cost of electricity | 0.0 | 0.0 | 0.0 | 0.0 |
| 12. Lack of financial support (start-up) | 6.7 | 88.9 | 0.0 | 4.4 |
| 13. High cost of Tube-well repairing | 0.0 | 0.0 | 0.0 | 0.0 |
| 14. Water table receding fast | 0.0 | 0.0 | 11.1 | 88.9 |
| 15. Lack of mechanism to control water use | 0.0 | 4.4 | 91.1 | 4.4 |
| 16. Lack of quality planting materials | 0.0 | 5.9 | 79.4 | 14.7 |
| 17. Lack of consensus in deciding cropping pattern | 0.0 | 16.7 | 14.3 | 69.0 |
| 18. Complaints from tail reach farmers | 0.0 | 71.1 | 28.9 | 0.0 |
| 19. Lack of training to staff/ members | 0.0 | 95.5 | 4.5 | 0.0 |
| 20. Non payment of water charges | 0.0 | 0.0 | 2.6 | 97.4 |
| 21. Lack of investment credit with farmers | 0.0 | 17.8 | 13.3 | 68.9 |
| 22. Problems in devising water distribution rules | 0.0 | 11.1 | 88.9 | 0.0 |
| 23. Lack of member cooperation | 0.0 | 0.0 | 0.0 | 100.0 |
| 24. Problems during the period when water is very scarce | 0.0 | 37.8 | 62.2 | 0.0 |
| 25. The margins earned by the association is too meager | 15.6 | 2.2 | 11.1 | 71.1 |
| 26. Limited control over water flow | 0.0 | 0.0 | 91.1 | 8.9 |
| 27. Lack of leadership | 0.0 | 0.0 | 0.0 | 100.0 |
| 28. Lack of freedom to determine water rates | 0.0 | 13.3 | 8.9 | 77.8 |
| 29.Lack of Member's willingness to take up management Functions | 0.0 | 0.0 | 68.9 | 31.1 |

| Table 8.3: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) :CM | | | | | |
|---|---|---|---|---|---|
| | | Percentage of Reporting Households | | | |
| | Particulars | Very Major | Major | Light/Occasional | None/No |
| 1 | Inadequate maintenance | 4.0 | 57.3 | 10.7 | 28.0 |
| 2 | High cost of maintenance | 24.0 | 33.3 | 8.0 | 34.7 |
| 3 | Lack of members co operation | 1.3 | 6.7 | 64.0 | 28.0 |
| 4 | Non availability of water at the canal | 2.7 | 1.3 | 73.3 | 22.7 |
| 5 | Poor quality of water | 0.0 | 2.7 | 53.3 | 44.0 |
| 6 | Conflicts among members about timing of water | 1.3 | 2.7 | 4.0 | 72.0 |
| 7 | Conflicts among members about quality of water | 1.3 | 2.7 | 20.0 | 76.0 |
| 8 | Conflicts among members about pricing of water | 2.7 | 5.3 | 14.7 | 77.3 |
| 9 | Inadequate Field channels | 9.3 | 48.0 | 16.0 | 26.7 |
| 10 | Lack of Government Support/funding | 4.0 | 50.7 | 17.3 | 28.0 |
| 11 | High cost of electricity | 0.0 | 6.7 | 4.0 | 89.3 |
| 12 | Lack of financial support (start –up) | 6.7 | 41.3 | 6.7 | 45.3 |
| 13 | High cost of Tube-well repairing | 0.0 | 0.0 | 1.3 | 98.7 |
| 14 | Water table receding fast | 0.0 | 2.7 | 8.0 | 89.3 |
| 15 | Lack of mechanism to control water use. | 1.3 | 33.3 | 8.0 | 57.3 |
| 16 | Lack of quality planting materials | 0.0 | 6.7 | 29.3 | 64.0 |
| 17 | Lack of consensus in deciding cropping pattern | 1.3 | 0.0 | 13.3 | 85.3 |
| 18 | Complaints from tail reach farmers | 1.3 | 10.7 | 65.3 | 22.7 |
| 19 | Lack of training to staff members | 1.3 | 53.3 | 10.7 | 34.7 |
| 20 | Non-payment of water charges | 0.0 | 22.7 | 52.0 | 25.3 |
| 21 | Lack of Investment credit with farmers | 12.0 | 32.0 | 24.0 | 32.0 |
| 22 | Problems in deciding water distribution rules | 5.3 | 12.0 | 33.3 | 49.3 |
| 23 | Lack of member co operation | 0.0 | 1.3 | 54.7 | 44.0 |
| 24 | Problems during the period when water is very scarce | 2.7 | 24.0 | 46.7 | 26.7 |
| 25 | The margins earned by the association is too meager | 0.0 | 20.0 | 29.3 | 50.7 |
| 26 | Limited control over water flow | 6.7 | 34.7 | 10.7 | 48.0 |
| 27 | Lack of leadership | 2.7 | 1.3 | 12 | 84.0 |
| 28 | Lack of freedom to determine water rules | 2.7 | 38.7 | 8 | 50.7 |
| 29 | Lack of members willingness to take up management functions | 10.7 | 28.0 | 13.3 | 48.0 |

| Table 8.4: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) :CG | | | | |
|---|---|---|---|---|
| | Particulars | Major | Light /Occasional | None |
| 1 | Inadequate maintenance | 0.0 | 51.1 | 48.9 |
| 2 | High cost of maintenance | 0.0 | 51.1 | 48.9 |
| 3 | Lack of members co operation | 0.0 | 8.9 | 91.1 |
| 4 | Non availability of water at the canal | 0.0 | 73.3 | 24.4 |
| 5 | Poor quality of water | 0.0 | 0.0 | 100.0 |
| 6 | Conflicts among members about timing of water | 0.0 | 44.4 | 55.6 |
| 7 | Conflicts among members about quality of water | 0.0 | 22.2 | 77.8 |
| 8 | Conflicts among members about pricing of water | 0.0 | 2.2 | 97.8 |
| 9 | Inadequate Field channels | 0.0 | 62.2 | 35.6 |
| 10 | Lack of Govt. Support/funding | 0.0 | 35.6 | 64.4 |
| 11 | High cost of electricity | 0.0 | 0.0 | 0.0 |
| 12 | Lack of financial support (start –up) | 0.0 | 37.8 | 62.2 |
| 13 | High cost of Tube-well repairing | 0.0 | 0.0 | 0.0 |
| 14 | Water table receding fast | 0.0 | 0.0 | 0.0 |
| 15 | Lack of mechanism to control water use. | 0.0 | 44.4 | 55.6 |
| 16 | Lack of quality planting materials | 0.0 | 6.7 | 91.1 |
| 17 | Lack of consensus in deciding cropping pattern | 0.0 | 24.4 | 75.6 |
| 18 | Complaints from tail reach farmers | 0.0 | 84.4 | 15.6 |
| 19 | Lack of training to staff members | 0.0 | 26.7 | 73.3 |
| 20 | Non-payment of water charges | 0.0 | 0.0 | 100.0 |
| 21 | Lack of Investment credit with farmers | 0.0 | 33.3 | 66.7 |
| 22 | Problems in deciding water distribution rules | 0.0 | 55.6 | 44.4 |
| 23 | Lack of member co operation | 0.0 | 6.7 | 93.3 |
| 24 | Problems during the period when water is very scarce | 0.0 | 100.0 | 0.0 |
| 25 | The margins earned by the association is too meager | 0.0 | 0.0 | 100.0 |
| 26 | Limited control over water flow | 0.0 | 64.4 | 35.6 |
| 27 | Lack of leadership | 0.0 | 0.0 | 100.0 |
| 28 | Lack of freedom to determine water rules | 0.0 | 8.9 | 91.1 |
| 29 | Lack of members willingness to take up management functions | 0.0 | 2.2 | 97.8 |

| Table 8.5 : Problems Faced by the WUA or its Members on various aspects of the functioning of WUA (as percentage of Households) : TAP | | | | |
|---|---|---|---|---|
| | Very Major | Major | Light/ Occasional | None/ No |
| 1. Inadequate maintenance | 0.0 | 48.0 | 17.0 | 35.0 |
| 2. High cost of maintenance | 0.0 | 50.0 | 18.0 | 32.0 |
| 3. Lack of members cooperation | 2.0 | 50.0 | 15.0 | 33.0 |
| 4. Non availability of water at the canal | 47.0 | 47.0 | 3.0 | 3.0 |
| 5. Poor quality of water | 47.0 | 45.0 | 7.0 | 2.0 |
| 6. Conflict among members about timing of water | 8.0 | 13.0 | 42.0 | 37.0 |
| 7. Conflict among members about quantity of water | 3.0 | 10.0 | 45.0 | 42.0 |
| 8. Conflict among members about pricing of water | 0.0 | 12.0 | 38.0 | 50.0 |
| 9. Inadequate field channels | 5.0 | 37.0 | 13.0 | 45.0 |
| 10. Lack of Government support/funding | 2.0 | 48.0 | 2.0 | 48.0 |
| 11. High cost of electricity | 0.0 | 0.0 | 0.0 | 0.0 |
| 12. Lack of financial support (start-up) | 3.0 | 43.0 | 5.0 | 48.0 |
| 13. High cost of Tube-well repairing | 0.0 | 0.0 | 0.0 | 0.0 |
| 14. Water table receding fast | 0.0 | 8.0 | 5.0 | 88.0 |
| 15. Lack of mechanism to control water use | 0.0 | 22.0 | 30.0 | 48.0 |
| 16. Lack of quality planting materials | 0.0 | 15.0 | 32.0 | 53.0 |
| 17. Lack of consensus in deciding cropping pattern | 0.0 | 30.0 | 20.0 | 50.0 |
| 18. Complaints from tail reach farmers | 0.0 | 50.0 | 0.0 | 50.0 |
| 19. Lack of training to staff/ members | 0.0 | 42.0 | 8.0 | 50.0 |
| 20. Non payment of water charges | 0.0 | 8.0 | 38.0 | 53.0 |
| 21. Lack of investment credit with farmers | 0.0 | 42.0 | 8.0 | 50.0 |
| 22. Problems in devising water distribution rules | 0.0 | 20.0 | 30.0 | 50.0 |
| 23. Lack of member cooperation | 0.0 | 37.0 | 13.0 | 50.0 |
| 24. Problems during the period when water is very scarce | 0.0 | 30.0 | 20.0 | 50.0 |
| 25. The margins earned by the association is too meager | 0.0 | 22.0 | 27.0 | 52.0 |
| 26. Limited control over water flow | 0.0 | 30.0 | 18.0 | 52.0 |
| 27. Lack of leadership | 0.0 | 25.0 | 23.0 | 52.0 |
| 28. Lack of freedom to determine water rates | 0.0 | 28.0 | 22.0 | 50.0 |
| 29.Lack of Member's willingness to take up management Functions | 0.0 | 35.0 | 15.0 | 50.0 |

| Table 8.6: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) : TWG | | | |
|---|---|---|---|
| Particulars | Major | Light /Occasional | None |
| Inadequate maintenance | 0.00 | 35.00 | 65.00 |
| High cost of maintenance | 0.00 | 35.00 | 65.00 |
| Lack of members co operation | 0.00 | 1.67 | 98.33 |
| Non availability of water at the canal | 0.00 | 0.00 | 0.00 |
| Poor quality of water | 0.00 | 16.67 | 83.33 |
| Conflicts among members about timing of water | 0.00 | 5.00 | 95.00 |
| Conflicts among members about quality of water | 0.00 | 36.67 | 63.33 |
| Conflicts among members about pricing of water | 0.00 | 1.67 | 98.33 |
| Inadequate Field channels | 0.00 | 48.33 | 51.67 |
| Lack of Govt. Support/funding | 5.00 | 93.33 | 1.67 |
| High cost of electricity | 100.00 | 0.00 | 0.00 |
| Lack of financial support (start –up) | 0.00 | 100.00 | 0.00 |
| High cost of Tube-well repairing | 91.67 | 8.33 | 0.00 |
| Water table receding fast | 71.67 | 6.67 | 0.00 |
| Lack of mechanism to control water use. | 1.67 | 45.00 | 53.33 |
| Lack of quality planting materials | 0.00 | 50.00 | 50.00 |
| Lack of consensus in deciding cropping pattern | 0.00 | 16.67 | 83.33 |
| Complaints from tail reach farmers | 0.00 | 30.00 | 70.00 |
| Lack of training to staff members | 0.00 | 6.67 | 93.33 |
| Non-payment of water charges | 0.00 | 0.00 | 100.00 |
| Lack of Investment credit with farmers | 0.00 | 70.00 | 30.00 |
| Problems in deciding water distribution rules | 0.00 | 1.67 | 98.33 |
| Lack of member co operation | 0.00 | 1.67 | 98.33 |
| Problems during the period when water is very scarce | 0.00 | 15.00 | 85.00 |
| The margins earned by the association is too meager | 0.00 | 1.67 | 98.33 |
| Limited control over water flow | 0.00 | 5.00 | 95.00 |
| Lack of leadership | 0.00 | 0.00 | 100.00 |
| Lack of freedom to determine water rules | 0.00 | 0.00 | 100.00 |
| Lack of members willingness to take up management functions | 0.00 | 0.00 | 100.00 |

| Table 8.7: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) :RLM | | | | | |
|---|---|---|---|---|---|
| | | Percentage of Reporting Households | | | |
| | Particulars | Very Major | Major | Light/Occasional | None/No |
| 1 | Inadequate maintenance | 0.0 | 0.0 | 53.3 | 46.7 |
| 2 | High cost of maintenance | 4.4 | 13.3 | 60.0 | 22.2 |
| 3 | Lack of members co operation | 0.0 | 0.0 | 40.0 | 60.0 |
| 4 | Non availability of water at the canal | 0.0 | 0.0 | 75.6 | 24.4 |
| 5 | Poor quality of water | 0.0 | 0.0 | 55.6 | 44.4 |
| 6 | Conflicts among members about timing of water | 0.0 | 0.0 | 35.6 | 64.4 |
| 7 | Conflicts among members about quality of water | 0.0 | 0.0 | 37.8 | 91.1 |
| 8 | Conflicts among members about pricing of water | 0.0 | 0.0 | 35.6 | 15.6 |
| 9 | Inadequate Field channels | 0.0 | 2.2 | 6.7 | 0.0 |
| 10 | Lack of Govt. Support/funding | 15.6 | 31.1 | 37.8 | 44.4 |
| 11 | High cost of electricity | 28.9 | 31.1 | 40.0 | 0.0 |
| 12 | Lack of financial support (start –up) | 0.0 | 8.9 | 46.7 | 44.4 |
| 13 | High cost of Tube-well repairing | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | Water table receding fast | 0.0 | 0.0 | 71.1 | 28.9 |
| 15 | Lack of mechanism to control water use. | 0.0 | 0.0 | 60.0 | 40.0 |
| 16 | Lack of quality planting materials | 0.0 | 0.0 | 60.0 | 40.0 |
| 17 | Lack of consensus in deciding cropping pattern | 0.0 | 0.0 | 44.4 | 55.6 |
| 18 | Complaints from tail reach farmers | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | Lack of training to staff members | 0.0 | 20.0 | 77.8 | 2.2 |
| 20 | Non-payment of water charges | 0.0 | 0.0 | 40.0 | 60.0 |
| 21 | Lack of Investment credit with farmers | 0.0 | 0.0 | 66.7 | 33.3 |
| 22 | Problems in deciding water distribution rules | 0.0 | 0.0 | 60.0 | 40.0 |
| 23 | Lack of member co operation | 0.0 | 0.0 | 42.2 | 57.8 |
| 24 | Problems during the period when water is very scarce | 0.0 | 0.0 | 80.0 | 20.0 |
| 25 | The margins earned by the association is too meager | 0.0 | 2.2 | 71.1 | 26.7 |
| 26 | Limited control over water flow | 0.0 | 2.2 | 60.0 | 37.8 |
| 27 | Lack of leadership | 0.0 | 0.0 | 42.2 | 57.8 |
| 28 | Lack of freedom to determine water rules | 0.0 | 0.0 | 48.9 | 51.1 |
| 29 | Lack of members willingness to take up management functions | 0.0 | 4.4 | 46.7 | 48.9 |

| Table 8.8: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) :PPM | | | | | |
|---|---|---|---|---|---|
| | | Percentage of Reporting Households | | | |
| | Particulars | Very Major | Major | Light/Occasional | None/No |
| 1 | Inadequate maintenance | 0.0 | 23.3 | 33.3 | 43.3 |
| 2 | High cost of maintenance | 6.7 | 26.7 | 20.0 | 46.7 |
| 3 | Lack of members co operation | 6.7 | 10.0 | 23.3 | 60.0 |
| 4 | Non availability of water at the canal | 0.0 | 0.0 | 40.0 | 60.0 |
| 5 | Poor quality of water | 0.0 | 0.0 | 33.3 | 66.7 |
| 6 | Conflicts among members about timing of water | 0.0 | 0.0 | 3.3 | 96.7 |
| 7 | Conflicts among members about quality of water | 0.0 | 0.0 | 3.3 | 96.7 |
| 8 | Conflicts among members about pricing of water | 0.0 | 10.0 | 10.0 | 80.0 |
| 9 | Inadequate Field canals | 0.0 | 0.0 | 50.0 | 50.0 |
| 10 | Lack of Govt. Support/funding | 0.0 | 46.7 | 13.3 | 40.0 |
| 11 | High cost of electricity | 50.0 | 50.0 | 0.0 | 0.0 |
| 12 | Lack of financial support (start –up) | 0.0 | 43.3 | 3.3 | 53.3 |
| 13 | High cost of Tube-well repairing | 0.0 | 0.0 | 23.3 | 76.7 |
| 14 | Water table receding fast | 0.0 | 0.0 | 20.0 | 80.0 |
| 15 | Lack of mechanism to control water use. | 0.0 | 0.0 | 10.0 | 90.0 |
| 16 | Lack of quality planting materials | 0.0 | 0.0 | 6.7 | 93.3 |
| 17 | Lack of consensus in deciding cropping pattern | 0.0 | 6.7 | 16.7 | 76.7 |
| 18 | Complaints from tail reach farmers | 0.0 | 0.0 | 6.7 | 93.3 |
| 19 | Lack of training to staff members | 0.0 | 20.0 | 6.7 | 73.3 |
| 20 | Non-payment of water charges | 0.0 | 0.0 | 30.0 | 70.0 |
| 21 | Lack of Investment credit with farmers | 0.0 | 20.0 | 20.0 | 60.0 |
| 22 | Problems in deciding water distribution rules | 0.0 | 16.7 | 10.0 | 73.3 |
| 23 | Lack of member co operation | 0.0 | 3.3 | 23.3 | 73.3 |
| 24 | Problems during the period when water is very scarce | 0.0 | 6.7 | 36.7 | 56.7 |
| 25 | The margins earned by the association is too meager | 0.0 | 0.0 | 23.3 | 76.7 |
| 26 | Limited control over water flow | 0.0 | 0.0 | 10.0 | 90.0 |
| 27 | Lack of leadership | 0.0 | 0.0 | 0.0 | 100.0 |
| 28 | Lack of freedom to determine water rules | 0.0 | 0.0 | 23.3 | 76.7 |
| 29 | Lack of members willingness to take up management functions | 0.0 | 0.0 | 13.3 | 86.7 |

| | Table 8.9: Problems faced by the WUA or Its members on various aspects of the Functioning of the WUA (as percentage of Households) : CDG | | | |
|---|---|---|---|---|
| | Particulars | Major | Light /Occasional | None |
| 1 | Inadequate maintenance | 0.0 | 0.0 | 100.0 |
| 2 | High cost of maintenance | 0.0 | 0.0 | 100.0 |
| 3 | Lack of members co operation | 0.0 | 8.9 | 91.1 |
| 4 | Non availability of water at the canal | 0.0 | 0.0 | 100.0 |
| 5 | Poor quality of water | 0.0 | 0.0 | 100.0 |
| 6 | Conflicts among members about timing of water | 0.0 | 0.0 | 100.0 |
| 7 | Conflicts among members about quality of water | 0.0 | 0.0 | 100.0 |
| 8 | Conflicts among members about pricing of water | 0.0 | 0.0 | 100.0 |
| 9 | Inadequate Field canals | 0.0 | 0.0 | 100.0 |
| 10 | Lack of Government Support/funding | 0.0 | 17.8 | 82.2 |
| 11 | High cost of electricity | 4.4 | 2.2 | 93.3 |
| 12 | Lack of financial support (start –up) | 0.0 | 8.9 | 91.1 |
| 13 | High cost of Tube-well repairing | 0.0 | 2.2 | 97.8 |
| 14 | Water table receding fast | 15.6 | 35.6 | 48.9 |
| 15 | Lack of mechanism to control water use. | 6.7 | 46.7 | 46.7 |
| 16 | Lack of quality planting materials | 0.0 | 22.2 | 77.8 |
| 17 | Lack of consensus in deciding cropping pattern | 0.0 | 35.6 | 64.4 |
| 18 | Complaints from tail reach farmers | 0.0 | 2.2 | 97.8 |
| 19 | Lack of training to staff members | 0.0 | 35.6 | 64.4 |
| 20 | Non-payment of water charges | 0.0 | 2.2 | 97.8 |
| 21 | Lack of Investment credit with farmers | 0.0 | 0.0 | 100.0 |
| 22 | Problems in deciding water distribution rules | 0.0 | 2.2 | 97.8 |
| 23 | Lack of member co operation | 0.0 | 4.4 | 95.6 |
| 24 | Problems during the period when water is very scarce | 6.7 | 40.0 | 53.3 |
| 25 | The margins earned by the association is too meager | 0.0 | 17.8 | 82.2 |
| 26 | Limited control over water flow | 0.0 | 0.0 | 100.0 |
| 27 | Lack of leadership | 0.0 | 4.4 | 95.6 |
| 28 | Lack of freedom to determine water rules | 0.0 | 0.0 | 100.0 |
| 29 | Lack of members willingness to take up management functions | | 22.0 | 78.0 |

## Chapter 9
## The Impact of PIM on the Village Economy and on Different Groups in the Village Society

What is the impact of PIM on the village economy? What is its impact on different social and economic groups in the village? Does PIM and the creation of WUAs help improve the general economy of the area? The preceding chapter showed the effects on aspects such as cropping patterns, input use and yields and water management and this could have implications for the economy, wage rates, employment and subsidiary occupations like dairying. The study sought to examine the impact of PIM on the village economy and its various socio-economic groups.

Findings indicate that CMAP WUAs have had a positive impact on the village as a whole. The benefits accrued have not been confined to a particular class, caste, religious or social group nor to those belong to the head or tail end of the canal (Tables 9.1 to 9.9). A very much similar pattern emerges from the water user association under CMEAP. One major difference under this WUA was that the impact of WUA on the village as a whole was positive in a smaller percentage of cases as compared to CMAP. The WUAs under the canal system in Maharashtra (CM) reported an altogether different picture. The impact on various socio-economic groups ranged from positive to negative to no impact. The negative or non impact responses were more relevant for the people belong to tribals, lower caste, scheduled caste and those who do not have any cropping activity. The study reported that even after the establishment of the WUAs, the benefits are mainly to the farmers and not much to the non-farming groups. The impact of the WUAs on general economy reported by the CG was either substantially positive or positive indicating that it has a favourable impact on all social and economic classes of people in its command. The positive impact of the WUA under the tank system in Andhra

Pradesh (TAP) was not broad based and was confined mainly to the upper income groups in the command. The responses from the WUAs under the RLM and PPM in Maharashtra showed little broad based impact on the general economy of the area. On the other hand the responses from WUAs under TWG and CDG in Gujarat showed a strong and positive impact on various socio-economic classes in the irrigation commands.

| Table 9.1: Contributions of WUA to Economic Development of the Area: CMAP | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 0.0 | 80.0 | 20.0 | 0.0 |
| 2. Any particular religion | 0.0 | 0.0 | 100.0 | 0.0 |
| 3. Any particular caste | 0.0 | 0.0 | 100.0 | 0.0 |
| 4. Any other group | 0.0 | 0.0 | 100.0 | 0.0 |
| 5. Women | 0.0 | 0.0 | 100.0 | 0.0 |
| 6. Poor | 0.0 | 0.0 | 100.0 | 0.0 |
| 7. Middle Income | 0.0 | 63.3 | 36.7 | 0.0 |
| 8. Upper Income | 3.3 | 66.7 | 30.0 | 0.0 |
| 9. Large/medium Farmers | 0.0 | 96.7 | 3.3 | 0.0 |
| 10. Small/marginal Farmers | 0.0 | 96.7 | 3.3 | 0.0 |
| 11. Landless | 0.0 | 0.0 | 100.0 | 0.0 |
| 12.Labour/wage earners | 0.0 | 3.3 | 96.7 | 0.0 |
| 13.Livestock owners | 0.0 | 0.0 | 100.0 | 0.0 |
| 14.Tribals | 0.0 | 6.3 | 93.8 | 0.0 |
| 15.Upper Caste | 0.0 | 43.3 | 56.7 | 0.0 |
| 16. Lower Caste | 0.0 | 33.3 | 66.7 | 0.0 |
| 17. Scheduled Castes | 0.0 | 6.7 | 93.3 | 0.0 |
| 18. Head Reach Farmers | 0.0 | 96.7 | 3.3 | 0.0 |
| 19.Tail Reach Farmers | 0.0 | 90.0 | 10.0 | 0.0 |
| 20.Youth | 0.0 | 0.0 | 100.0 | 0.0 |

| Table 9.2: Contributions of WUA to Economic Development of the Area: CMEAP | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 0.0 | 54.5 | 45.5 | 0.0 |
| 2. Any particular religion | 0.0 | 7.0 | 93.0 | 0.0 |
| 3. Any particular caste | 0.0 | 11.1 | 88.9 | 0.0 |
| 4. Any other group | 0.0 | 0.0 | 100.0 | 0.0 |
| 5. Women | 0.0 | 0.0 | 100.0 | 0.0 |
| 6. Poor | 0.0 | 0.0 | 100.0 | 0.0 |
| 7. Middle Income | 0.0 | 97.8 | 2.2 | 0.0 |
| 8. Upper Income | 0.0 | 97.8 | 2.2 | 0.0 |
| 9. Large/medium Farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 10. Small/marginal Farmers | 0.0 | 100.0 | 0.0 | 0.0 |
| 11. Landless | 0.0 | 0.0 | 100.0 | 0.0 |
| 12.Labour/wage earners | 0.0 | 4.4 | 95.6 | 0.0 |
| 13.Livestock owners | 0.0 | 2.2 | 97.8 | 0.0 |
| 14.Tribals | 0.0 | 0.0 | 100.0 | 0.0 |
| 15.Upper Caste | 0.0 | 95.6 | 4.4 | 0.0 |
| 16. Lower Caste | 0.0 | 93.3 | 6.7 | 0.0 |
| 17. Scheduled Castes | 0.0 | 20.0 | 80.0 | 0.0 |
| 18. Head Reach Farmers | 0.0 | 97.8 | 2.2 | 0.0 |
| 19.Tail Reach Farmers | 0.0 | 97.8 | 2.2 | 0.0 |
| 20.Youth | 0.0 | 0.0 | 100.0 | 0.0 |

| Table 9.3: Contributions of WUA to Economic Development of the Area: CM | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 20.0 | 45.3 | 34.7 | 0 |
| 2. Any particular religion | 0.0 | 1.3 | 68 | 30.7 |
| 3. Any particular caste | 0.0 | 2.7 | 69.3 | 28 |
| 4. Any other group | 0.0 | 1.3 | 69.3 | 29.3 |
| 5. Women | 0.0 | 4 | 66.7 | 29.3 |
| 6. Poor | 0.0 | 10.7 | 60 | 29.3 |
| 7. Middle Income | 0.0 | 10.7 | 64 | 25.3 |
| 8. Upper Income | 0.0 | 13.3 | 61.3 | 25.3 |
| 9. Large/medium Farmers | 6.7 | 86.7 | 5.3 | 1.3 |
| 10. Small/marginal Farmers | 6.7 | 86.7 | 6.7 | 0 |
| 11. Landless | 1.3 | 17.3 | 53.3 | 28 |
| 12.Labour/wage earners | 42.7 | 36 | 21.3 | 0 |
| 13.Livestock owners | 38.7 | 53.3 | 8 | 0 |
| 14.Tribals | 0.0 | 0 | 68 | 32 |
| 15.Upper Caste | 0.0 | 9.3 | 62.7 | 28 |
| 16. Lower Caste | 0.0 | 8 | 64 | 28 |
| 17. Scheduled Castes | 0.0 | 4 | 68 | 28 |
| 18. Head Reach Farmers | 41.3 | 40 | 18.7 | 0 |
| 19.Tail Reach Farmers | 1.3 | 89.3 | 9.3 | 0 |
| 20.Youth | 0.0 | 0 | 69.3 | 30.7 |

| Table 9.4: Contributions of WUA to Economic Development of the Area: CG | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 86.7 | 13.3 | 0.0 | 0.0 |
| 2. Any particular religion | 4.4 | 28.9 | 0.0 | 0.0 |
| 3. Any particular caste | 82.2 | 17.8 | 0.0 | 0.0 |
| 4. Any other group | 0.0 | 0.0 | 0.0 | 0.0 |
| 5. Women | 28.9 | 71.1 | 0.0 | 0.0 |
| 6. Poor | 28.9 | 71.1 | 0.0 | 0.0 |
| 7. Middle Income | 66.7 | 33.3 | 0.0 | 0.0 |
| 8. Upper Income | 66.7 | 33.3 | 0.0 | 0.0 |
| 9. Large/medium Farmers | 66.7 | 33.3 | 0.0 | 0.0 |
| 10. Small/marginal Farmers | 66.7 | 33.3 | 0.0 | 0.0 |
| 11. Landless | 11.1 | 88.9 | 0.0 | 0.0 |
| 12.Labour/wage earners | 51.1 | 48.9 | 0.0 | 0.0 |
| 13.Livestock owners | 71.1 | 28.9 | 0.0 | 0.0 |
| 14.Tribals | 0.0 | 0.0 | 0.0 | 0.0 |
| 15.Upper Caste | 68.9 | 31.1 | 0.0 | 0.0 |
| 16. Lower Caste | 62.2 | 37.8 | 0.0 | 0.0 |
| 17. Scheduled Castes | 11.1 | 88.9 | 0.0 | 0.0 |
| 18. Head Reach Farmers | 66.7 | 33.3 | 0.0 | 0.0 |
| 19.Tail Reach Farmers | 66.7 | 33.3 | 0.0 | 0.0 |
| 20.Youth | 73.3 | 26.7 | 0.0 | 0.0 |

| Table 9.5: Contributions of WUA to Economic Development of the Area: TAP | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 0.0 | 63.0 | 37.0 | 0.0 |
| 2. Any particular religion | 0.0 | 0.0 | 100.0 | 0.0 |
| 3. Any particular caste | 0.0 | 0.0 | 100.0 | 0.0 |
| 4. Any other group | 0.0 | 0.0 | 100.0 | 0.0 |
| 5. Women | 0.0 | 2.0 | 98.0 | 0.0 |
| 6. Poor | 0.0 | 5.0 | 95.0 | 0.0 |
| 7. Middle Income | 0.0 | 62.0 | 38.0 | 0.0 |
| 8. Upper Income | 0.0 | 63.0 | 37.0 | 0.0 |
| 9. Large/medium Farmers | 0.0 | 65.0 | 35.0 | 0.0 |
| 10. Small/marginal Farmers | 0.0 | 67.0 | 33.0 | 0.0 |
| 11. Landless | 0.0 | 2.0 | 98.0 | 0.0 |
| 12.Labour/wage earners | 0.0 | 0.0 | 100.0 | 0.0 |
| 13.Livestock owners | 0.0 | 0.0 | 100.0 | 0.0 |
| 14.Tribals | 0.0 | 2.0 | 98.0 | 0.0 |
| 15.Upper Caste | 0.0 | 57.0 | 43.0 | 0.0 |
| 16. Lower Caste | 0.0 | 53.0 | 47.0 | 0.0 |
| 17. Scheduled Castes | 0.0 | 7.0 | 93.0 | 0.0 |
| 18. Head Reach Farmers | 0.0 | 65.0 | 35.0 | 0.0 |
| 19.Tail Reach Farmers | 0.0 | 67.0 | 33.0 | 0.0 |
| 20.Youth | 0.0 | 3.0 | 97.0 | 0.0 |

| Table 9.6: Contributions of WUA to Economic Development of the Area: TWG | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 80.0 | 20.0 | 0.0 | 0.0 |
| 2. Any particular religion | 66.7 | 33.3 | 0.0 | 0.0 |
| 3. Any particular caste | 66.7 | 33.3 | 0.0 | 0.0 |
| 4. Any other group | 28.3 | 71.7 | 0.0 | 0.0 |
| 5. Women | 25.0 | 75.0 | 0.0 | 0.0 |
| 6. Poor | 6.7 | 93.3 | 0.0 | 0.0 |
| 7. Middle Income | 60.0 | 40.0 | 0.0 | 0.0 |
| 8. Upper Income | 73.3 | 26.7 | 0.0 | 0.0 |
| 9. Large/medium Farmers | 68.3 | 31.7 | 0.0 | 0.0 |
| 10. Small/marginal Farmers | 70.0 | 30.0 | 0.0 | 0.0 |
| 11. Landless | 23.3 | 76.7 | 0.0 | 0.0 |
| 12.Labour/wage earners | 0.0 | 100.0 | 0.0 | 0.0 |
| 13.Livestock owners | 55.0 | 45.0 | 0.0 | 0.0 |
| 14.Tribals | 80.0 | 20.0 | 0.0 | 0.0 |
| 15.Upper Caste | 71.7 | 28..3 | 0.0 | 0.0 |
| 16. Lower Caste | 35.0 | 65.0 | 0.0 | 0.0 |
| 17. Scheduled Castes | 11.7 | 88.3 | 0.0 | 0.0 |
| 18. Head Reach Farmers | 15.0 | 85.0 | 0.0 | 0.0 |
| 19.Tail Reach Farmers | 61.7 | 38.3 | 0.0 | 0.0 |
| 20.Youth | 86.7 | 13.3 | 0.0 | 0.0 |
| Overall | 45.3 | 54.7 | 0.0 | 0.0 |

| Table 9.7: Contributions of WUA to Economic Development of the Area: RLM | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 17.8 | 82.2 | 0 | 0 |
| 2. Any particular religion | 4.4 | 62.2 | 13.3 | 20.1 |
| 3. Any particular caste | 0.0 | 0 | 8.9 | 91.1 |
| 4. Any other group | 0.0 | 0 | 11.1 | 88.9 |
| 5. Women | 2.2 | 53.3 | 11.1 | 33.4 |
| 6. Poor | 0.0 | 57.8 | 26.7 | 15.5 |
| 7. Middle Income | 0.0 | 100 | 0 | 0 |
| 8. Upper Income | 0.0 | 33.3 | 0 | 66.7 |
| 9. Large/medium Farmers | 0.0 | 97.8 | 0 | 2.2 |
| 10. Small/marginal Farmers | 2.2 | 97.8 | 0 | 0 |
| 11. Landless | 0.0 | 64.4 | 35.6 | 0 |
| 12.Labour/wage earners | 8.9 | 91.1 | 0 | 0 |
| 13.Livestock owners | 35.6 | 60 | 0 | 4.4 |
| 14.Tribals | 0.0 | 0 | 2.2 | 97.8 |
| 15.Upper Caste | 0.0 | 32.6 | 0 | 67.4 |
| 16. Lower Caste | 0.0 | 33.3 | 0 | 66.7 |
| 17. Scheduled Castes | 0.0 | 33.3 | 0 | 66.7 |
| 18. Head Reach Farmers | 0.0 | 0 | 0 | 100 |
| 19.Tail Reach Farmers | 0.0 | 0 | 0 | 100 |
| 20.Youth | 0.0 | 0 | 48.9 | 51.1 |

| Table 9.8: Contributions of WUA to Economic Development of the Area: PPM | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 0 | 36.7 | 63.3 | 0 |
| 2. Any particular religion | 0 | 6.7 | 83.3 | 10 |
| 3. Any particular caste | 0 | 0 | 80 | 20 |
| 4. Any other group | 0 | 20 | 70 | 10 |
| 5. Women | 0 | 46.7 | 53.3 | 0 |
| 6. Poor | 0 | 43.3 | 56.7 | 0 |
| 7. Middle Income | 0 | 53.3 | 46.7 | 0 |
| 8. Upper Income | 10 | 40 | 50 | 0 |
| 9. Large/medium Farmers | 36.7 | 60 | 3.3 | 0 |
| 10. Small/marginal Farmers | 36.7 | 63.3 | 0 | 0 |
| 11. Landless | 0 | 46.7 | 53.3 | 0 |
| 12.Labour/wage earners | 26.7 | 66.7 | 6.6 | 0 |
| 13.Livestock owners | 10 | 53.3 | 23.3 | 13.4 |
| 14.Tribals | 0 | 0 | 90 | 10 |
| 15.Upper Caste | 0 | 10 | 80 | 10 |
| 16. Lower Caste | 0 | 0 | 90 | 10 |
| 17. Scheduled Castes | 0 | 0 | 90 | 10 |
| 18. Head Reach Farmers | 10 | 90 | 0 | 0 |
| 19.Tail Reach Farmers | 3.3 | 96.7 | 0 | 0 |
| 20.Youth | 0 | 26.7 | 73.3 | 0 |

| Table 9.9: Contributions of WUA to Economic Development of the Area: CDG | | | | |
|---|---|---|---|---|
| Particulars | Substantially positive | Positive | No impact | Negative |
| | As Percentage of Reporting Households | | | |
| 1. Village as a whole | 84.4 | 15.6 | 0.0 | 0.0 |
| 2. Any particular religion | 2.2 | 64.4 | 0.0 | 0.0 |
| 3. Any particular caste | 82.2 | 17.8 | 0.0 | 0.0 |
| 4. Any other group | 0.0 | 0.0 | 0.0 | 0.0 |
| 5. Women | 26.7 | 73.3 | 0.0 | 0.0 |
| 6. Poor | 33.3 | 66.7 | 0.0 | 0.0 |
| 7. Middle Income | 62.2 | 37.8 | 0.0 | 0.0 |
| 8. Upper Income | 66.7 | 33.3 | 0.0 | 0.0 |
| 9. Large/medium Farmers | 75.6 | 24.4 | 0.0 | 0.0 |
| 10. Small/marginal Farmers | 62.2 | 37.8 | 0.0 | 0.0 |
| 11. Landless | 28.9 | 71.1 | 0.0 | 0.0 |
| 12.Labour/wage earners | 33.3 | 66.7 | 0.0 | 0.0 |
| 13.Livestock owners | 31.1 | 68.9 | 8.9 | 8.9 |
| 14.Tribals | 0.0 | 0.0 | 0.0 | 0.0 |
| 15.Upper Caste | 86.7 | 13.3 | 0.0 | 0.0 |
| 16. Lower Caste | 44.4 | 55.6 | 0.0 | 0.0 |
| 17. Scheduled Castes | 28.9 | 71.1 | 0.0 | 0.0 |
| 18. Head Reach Farmers | 53.3 | 46.7 | 0.0 | 0.0 |
| 19.Tail Reach Farmers | 57.8 | 42.2 | 0.0 | 0.0 |
| 20.Youth | 75.6 | 24.4 | 0.0 | 0.0 |
| | 0.0 | 0.0 | 0.0 | 0.0 |

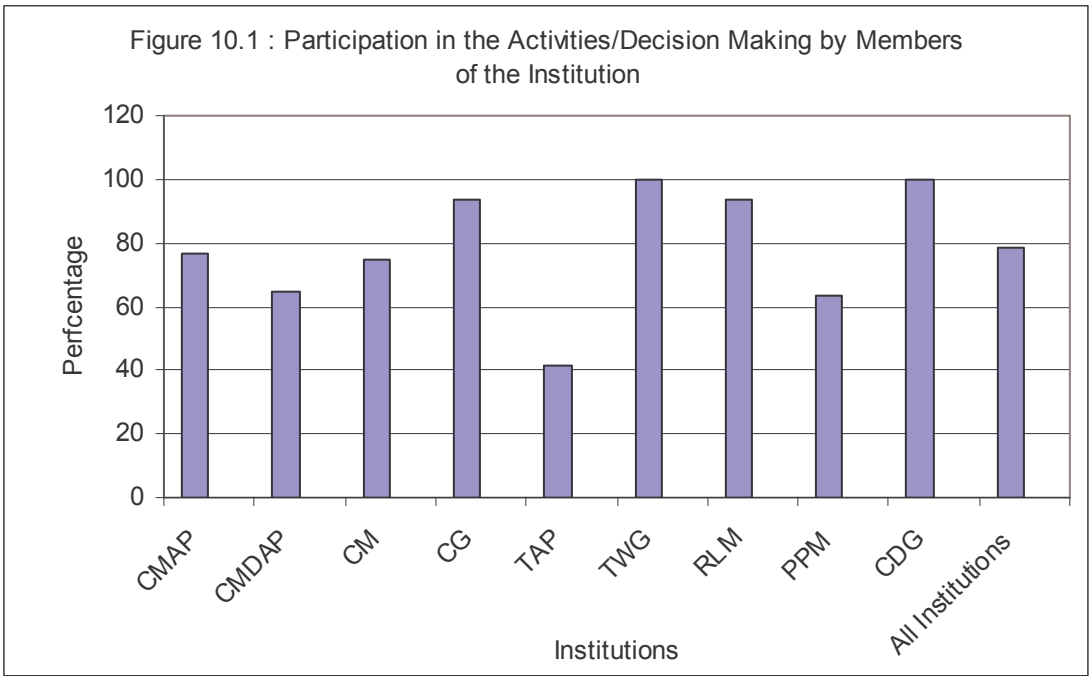
# Chapter 10

## Synopsis of the Results on the Performance and Impact of PIM

This section seeks to provide a synopsis of the disaggregate findings reported above on the performance and impact of PIM. It does this by providing simple aggregates or averages of selected findings as well as providing a comparative picture through figures and tables. Note that these are based on the reports of the state studies and the analysis presented above. Individual household survey observations were not available from the AERCs for the analysis. Broad overall assessment of the WUAs by the farmers of the performance and the financial viability is also covered here.

### 10.1 Participation by Members in the Activities/Decision Making of WUAs

Taking all the types of WUAs into account, the average rate of participation (Active to Very Active) by members in the WUAs was found to be quite high at almost 80 per cent, see Figure below. This shows that the participation by the members in the WUAs is quite high on an average. However, there is considerable variation. Under CDG and TWG the participation by members was almost 100 percent and it was also high under the canal system in Gujarat and the RLM system in Maharashtra. However a low participation rate was observed under tank irrigation system in Andhra Pradesh and Pani Panchayat system in Maharashtra.




## 10.2 Involvement/ Participation of Different Functionaries and Socio-economic Groups

The aggregate picture shown in the Table below indicates that the most active participation (active to very active) was that of the Chairman at 86 percent, followed by the General Body at 60 percent and the Secretary at 58 percent. Whereas 72 percent of the small/marginal farmers on an average were actively involved, only 34 percent of the Panchayats showed active involvement. A look across WUA types showed that the Chairman of the WUA played an active role across the WUAs except in Pani Panchayats in Maharashtra. The involvement of Secretary in various functions and activities of the institutions found to be relatively low under CMAP, CMEAP, TAP and PPM. The village Panchayats have played a passive role except for most institutions in Gujarat studied.

| Table 10.1: Active Role Played by various Functionaries – Percentage Reporting | | | | | |
|---|---|---|---|---|---|
| Institutions | General Body | Chairman | Secretary | Village Panchayat | Small/Marginal farmers |
| 1 CMAP | 66 | 100 | 10 | 6 | 94 |
| 2 CMEAP | 68 | 94 | 14 | 2 | 66 |
| 3 CM | 46 | 90 | 76 | 0 | 48 |
| 4 CG | 100 | 100 | 100 | 100 | 100 |
| 5 TAP | 64 | 74 | 8 | 2 | 50 |
| 6 TWG | 100 | 100 | 100 | 100 | 100 |
| 7 RLM | 80 | 98 | 84 | 0 | 96 |
| 8 PPM | 4 | 24 | 24 | 0 | 0 |
| 9 CDG | 100 | 100 | 100 | 100 | 100 |
| All Institutions | 60 | 86 | 58 | 34 | 72 |

Figure 10.2 : Percentage of Sample Households Reporting Active Participation by General Body

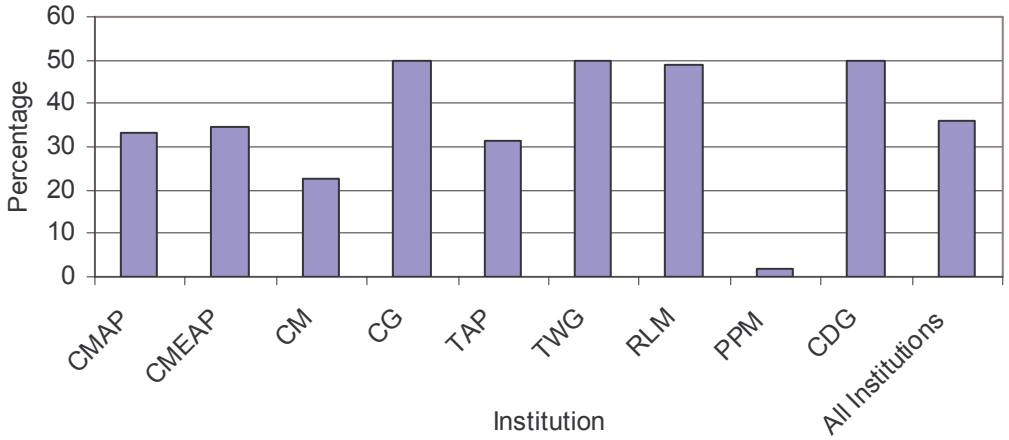



Figure 10.3 : Percentage of Sample Households Reporting Active Participation by Chairman

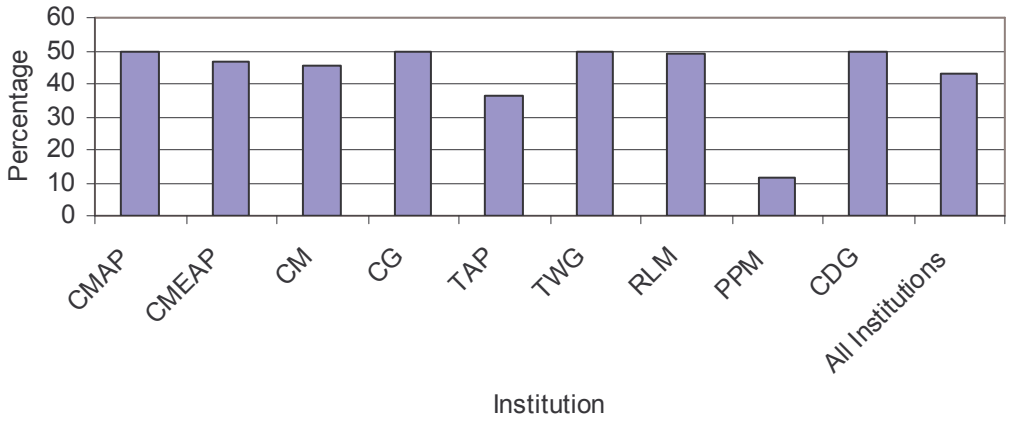


Figure 10.4 : Percentage of Sample Households Reporting Active Participation by Secretary

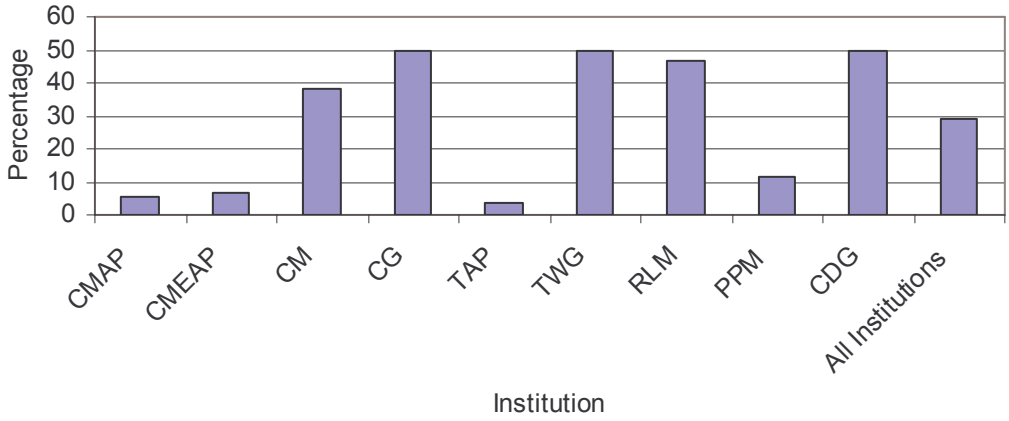
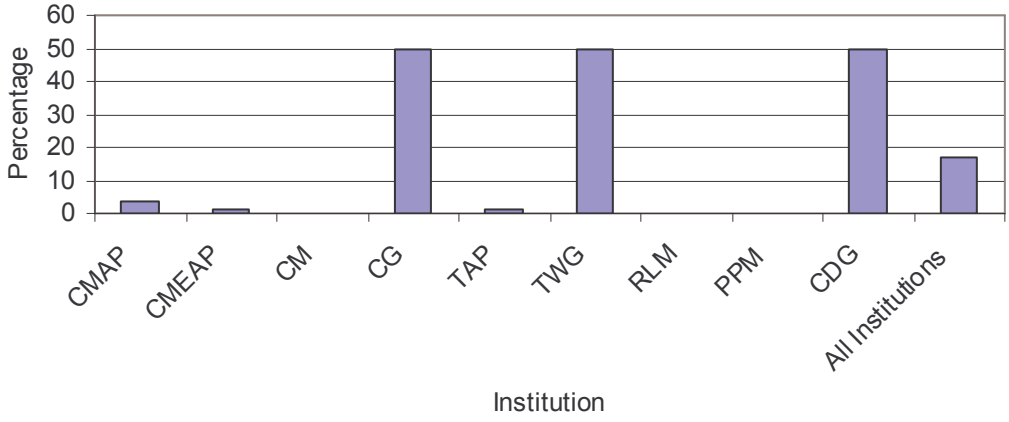
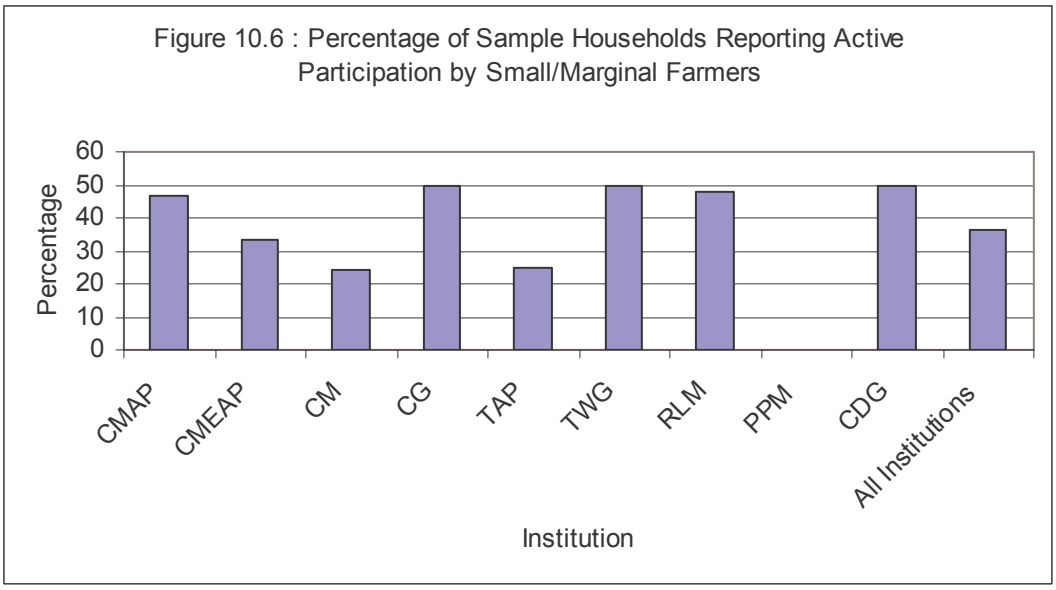



Figure 10.5 : Percentage of Sample Households Reporting Active Participation of Panchayat

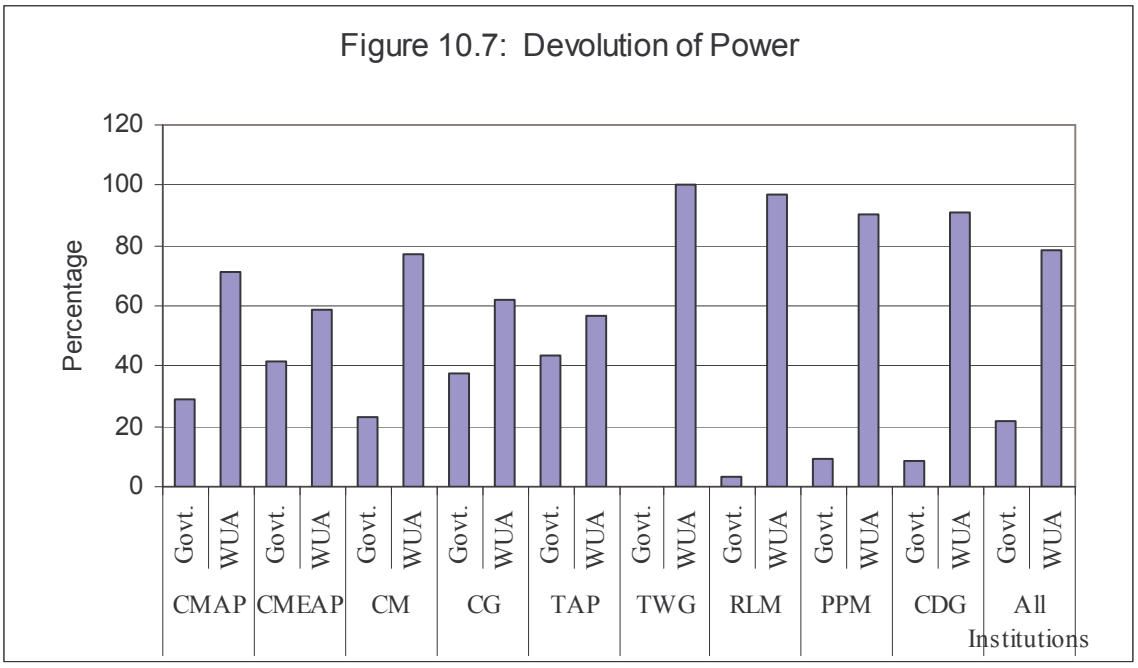





### 10.3 Devolution of Powers and Decision-Making

A key objective of PIM is the devolutions of powers and decision-making to the WUAs. This has been examined through questions on who now makes the decisions regarding several important matters of water resource management. The results based on a simple average across decisions and WUA types indicates that in 78.3 percent of them the decisions are made by the WUAs or Jointly, and only in 21.7 percent of them are the decisions made by the government. This indicates a good degree of devolution of powers. However, there is some variation. The devolution of powers to the WUA was nearly complete in terms of monitoring the distribution of water, maintenance of irrigation structures, monitoring use of water and freedom of choosing the cropping sequence. However the government agencies continues to have greater power in terms of assessment of water availability, pricing of water, collection of dues from the farmers and release of water to the canals. Across WUA types, the devolution is less in TAP and CMEAP, and the greatest in TWG and RLM.

| Table 10.2: Devolution of Power/ Decision-making | | |
|---|---|---|
| Decision/Activity | Government | WUA or Joint |
| 1. Planning for capital investment in irrigation structures | 36.6 | 63.4 |
| 2. Providing resources for investment | 41.3 | 58.7 |
| 3. Actual capital investment in irrigation structures | 40.4 | 59.6 |
| 4. Assessment of water availability | 51.0 | 49.0 |
| 5. Planning for release of water | 44.7 | 55.3 |
| 6. Actual release of water | 49.2 | 50.8 |
| 7. Distribution of water among farmers | 5.0 | 95.0 |
| 8. Pricing of water received | 63.3 | 36.7 |
| 9. Pricing of water distributed to farmers | 38.1 | 61.9 |
| 10.Collection of dues from farmers | 31.1 | 68.9 |
| 11.Decision on maintenance/repair requirement | 5.1 | 94.9 |
| 12.Providing resources for maintenance/ repair | 23.9 | 76.1 |
| 13.Implementation of maintenance/ repair | 3.6 | 96.4 |
| 14.Monitoring use of water | 9.7 | 90.3 |
| 15.Stopping misuse/ waste | 1.7 | 98.3 |
| 16.Action on mis-users | 10.5 | 89.5 |
| 17.Crops to be grown | 1.2 | 98.8 |
| Average | 21.7 | 78.3 |




## 10.4 Impact of PIM on the Agricultural Economy

The impact of the WUAs on farm economy was examined in terms of bringing more area under irrigation, increased use of inputs and better yields. The average results indicate that the cropped area increases by 8.28 percent and the irrigated area increases by 31.43 percent. This indicates a substantial impact of PIM activity. The results indicate a substantial increase in irrigated area in summer season, followed by increase in the kharif season and only a marginal increase in the rabi season. PIM also has a substantial positive impact on increasing the use of yield increasing inputs such as HYV and improved seeds and fertilizers. The input use increase is the highest for CDG. The average crop yield has increased by more than 50 percent except under TAP and CMEAP. The yield increase was the highest for CG and TWG.

| Table 10.3: Average Cropped area per sample Household (Ha.) | | | | | | |
|---|---|---|---|---|---|---|
| Crop Season | At the time of Establishment of WUA | | At present | | Percent Change | |
| | Total Area | Irrigated Area | Total Area | Irrigated Area | Total Area | Irrigated Area |
| Kharif | 2.11 | 1.29 | 2.10 | 1.52 | -0.32 | 17.89 |
| Rabi | 0.92 | 0.97 | 1.02 | 0.98 | 10.71 | 0.69 |
| Summer | 0.31 | 0.31 | 0.50 | 0.49 | 59.86 | 59.50 |
| Total | 3.34 | 2.27 | 3.62 | 2.99 | 8.28 | 31.43 |

| Table 10.4: Average Increase in Various Inputs for Crop production | |
|---|---|
| Inputs | Percent Increase |
| 1. Seed Local | 33.1 |
| 2.Seed HYV | 61.5 |
| 3. Seed Improved | 63.9 |
| 4. Fertilizer | 83.1 |
| 5. Pesticides | 65.1 |
| 6. FYM | 37.8 |
| 7. Bullock Labour | 13.3 |
| 8. Machine Labour | 89.4 |
| 9. Family Labour | 38.2 |
| 10.Hired Labour | 64.2 |
| 11.Irigation Cost | 77.0 |
| 12.Other Costs | 50.0 |
| 13. Others | 5.6 |
| All Inputs | 52.4 |

Figure 10.8: Change in Input use for Crop Production Reported by Sample Households

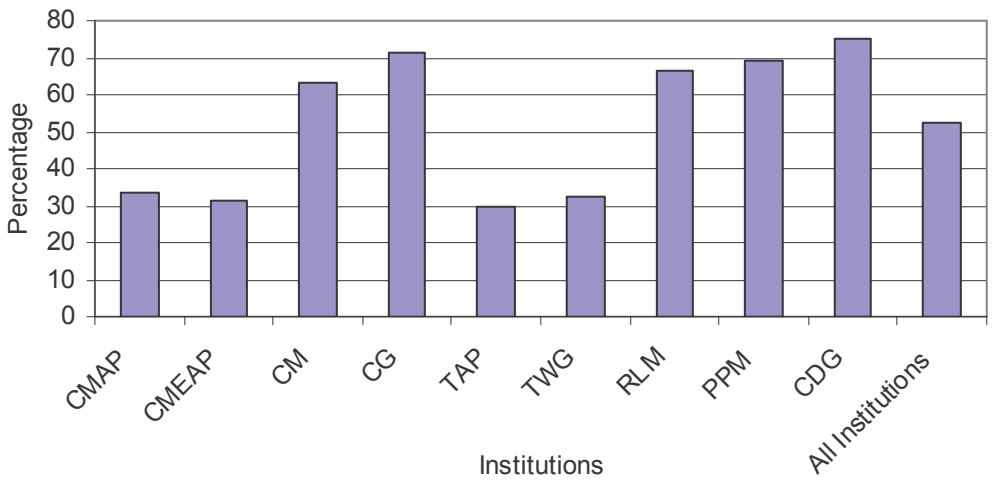
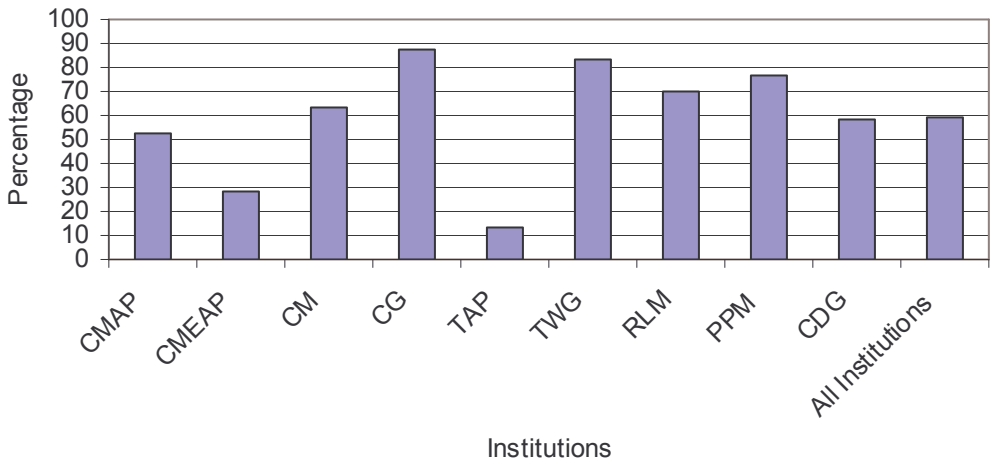



Figure 10.9: Percentage of Sample Households Reporting Increase in Yield under Irrigated Crops since WUA was established



### 10.5 Impact of WUA on Village Economy, Water Use Efficiency, Equity and Empowerment of Users

A positive to highly positive contribution of PIM/WUAs to the village economy as a whole is reported by 78 of the sample households on an average across irrigation system types. It ranges from below 60 percent for PPM and CMEAP to 100 percent for CG, TWG, RLM and CDG. The benefits have been reported positive by equal numbers for both large/medium and small/marginal farmers on an average.

With respect to the impact of PIM on water use efficiency, equity and empowerment of users, a positive to highly positive impact is reported on an average by 78 percent for adequate availability of water, 72 percent for timely availability of water, 76 percent for better maintenance, 85 percent for more equitable distribution, 71 percent for empowerment. However, TAP reports no positive impact on any of these, and the impact is relatively low in CMAP on timely availability of water, CM on better maintenance and empowerment, and TWG and PPM on empowerment was reported by more than 75 percent of the sample except those from Andhra Pradesh.

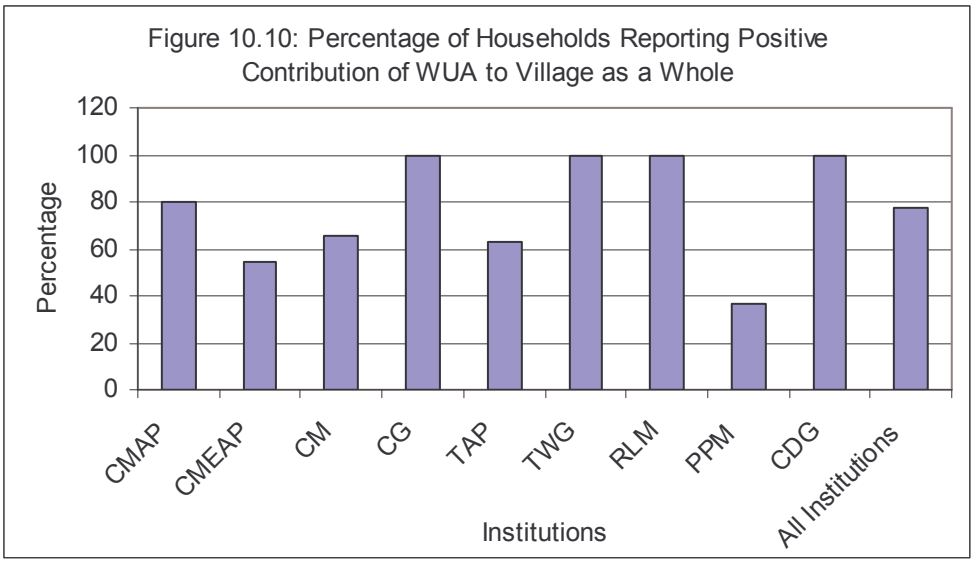


Figure 10.10: Percentage of Households Reporting Positive Contribution of WUA to Village as a Whole
120
100
80
60
40
20
0
Percentage
CMAP
CMEAP
CM
CG
TAP
TWG
RLM
PPM
CDG
All Institutions
Institutions

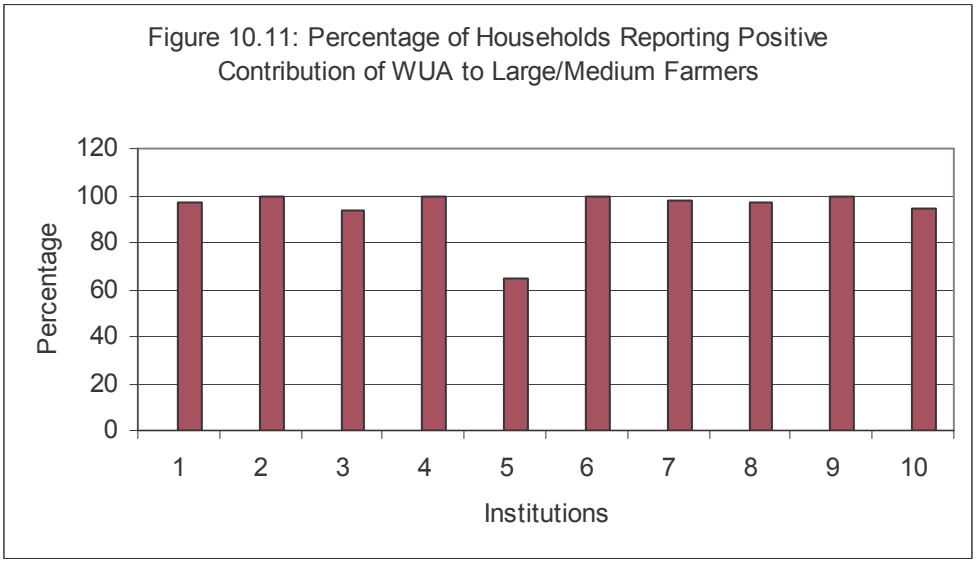


Figure 10.11: Percentage of Households Reporting Positive Contribution of WUA to Large/Medium Farmers
120
100
80
60
40
20
0
Percentage
1
2
3
4
5
6
7
8
9
10
Institutions

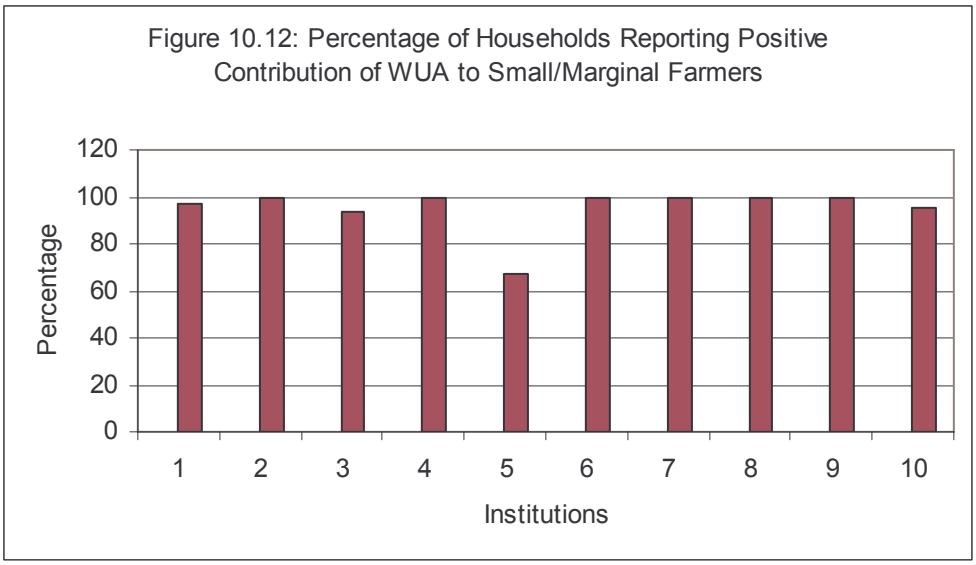



Table 10.5: Positive Impact Reported by Sample Households in terms of impact on Village Economy, and Farm Size Group

| | CMAP | CMEAP | CM | CG | TAP | TWG | RLM | PPM | CDG | All Institutions |
|---|---|---|---|---|---|---|---|---|---|---|
| Village as a whole: Positive | 80 | 55 | 65 | 100 | 63 | 100 | 100 | 37 | 100 | 78 |
| Large/Medium Farmers | 97 | 100 | 93 | 100 | 65 | 100 | 98 | 97 | 100 | 94 |
| Small/Marginal Farmers | 97 | 100 | 93 | 100 | 67 | 100 | 100 | 100 | 100 | 95 |

| Frequency of Positive to Highly Positive Impact of PIM/WUAs on Water Resource Management (Percent) | | | | | |
|---|---|---|---|---|---|
| Institutions | Adequate availability | Timely availability | Better Maintenance | Equitable Distribution | Empowerment |
| CMAP | 100 | 40 | 97 | 90 | 83 |
| CMEAP | 78 | 69 | 89 | 91 | 84 |
| CM | 36 | 95 | 52 | 95 | 64 |
| CG | 100 | 67 | 100 | 100 | 100 |
| TAP | 0 | 0 | 0 | 0 | 0 |
| TWG | 100 | 100 | 100 | 100 | 67 |
| RLM | 100 | 100 | 82 | 100 | 100 |
| PPM | 87 | 93 | 73 | 100 | 50 |
| CDG | 100 | 87 | 93 | 93 | 93 |
| All Institutions | 78 | 72 | 76 | 85 | 71 |

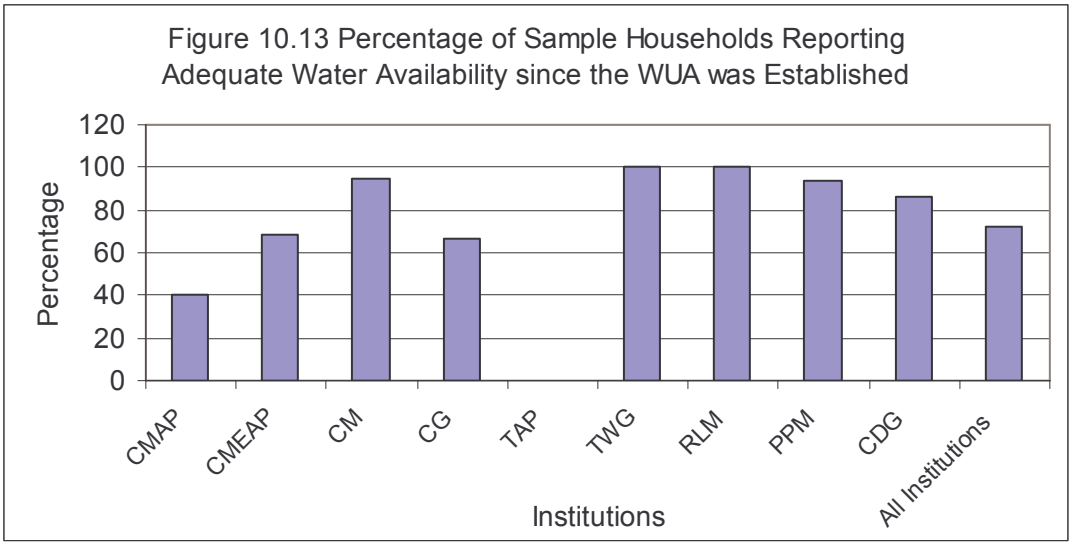


Figure 10.14 Percentage of Sample Households Reporting Timely Water Availability since the WUA was Established

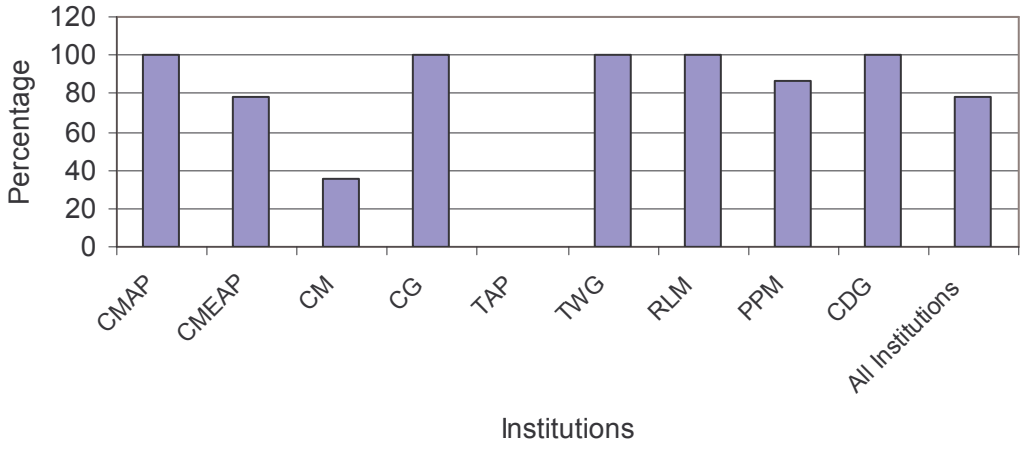



Figure 10.15: Percentage of Sample Households Reporting Better Maintenancey since the WUA was Established

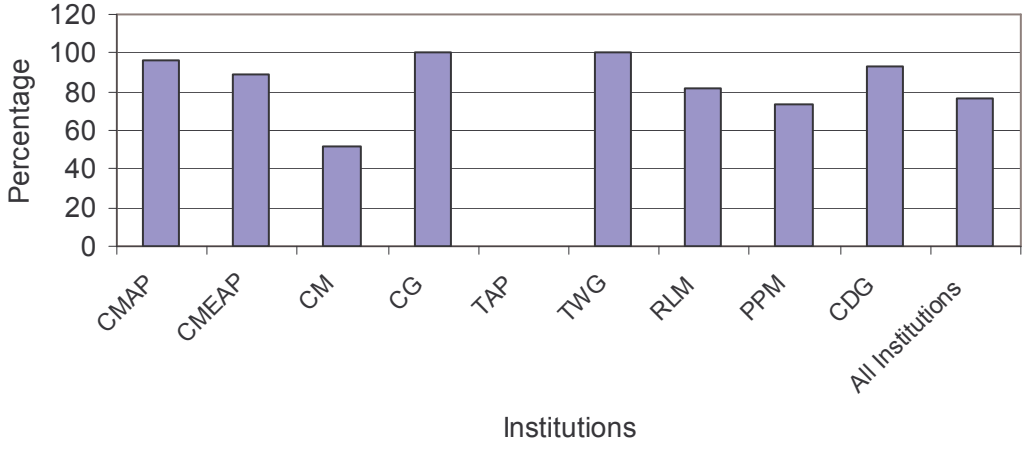


Figure 10.16 Percentage of Sample Households Reporting Equitable Distribution of Water since the WUA was Established

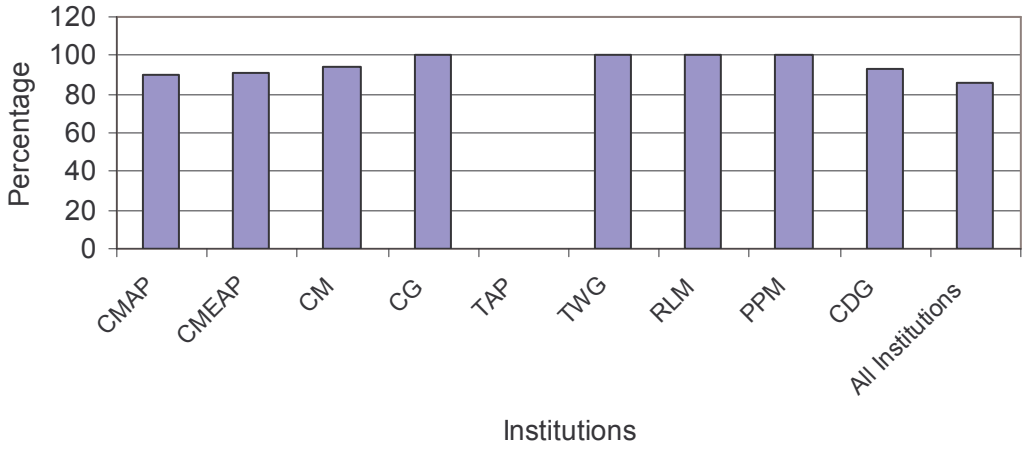
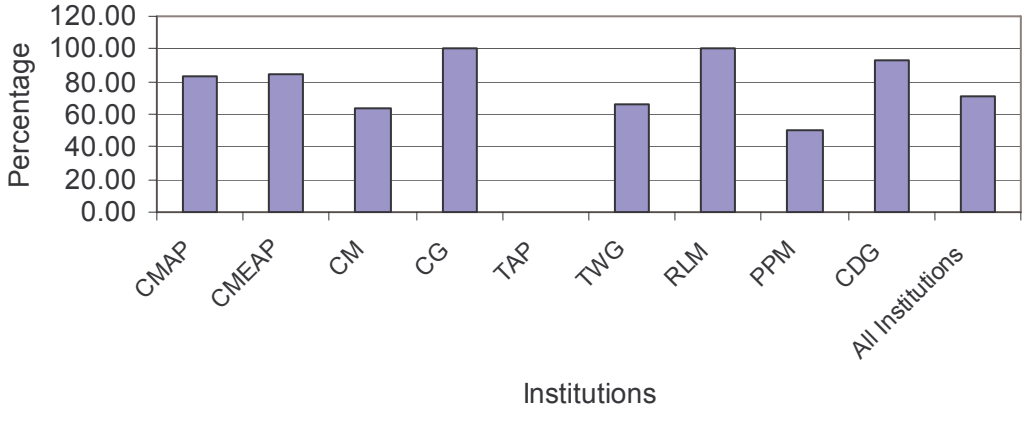



Figure 10.17 Percentage of Sample Households Reporting Empowerment of Farmers in Managing Irrigation Systems since the WUA was Established



**Problems and Difficulties Faced by the WUAs in the Operation of PIM**

On an average across the WUA types, the most important problems and difficulties reported are inadequate field channels, lack of government support or funding, lack of training to members, difficulties in handling extreme water scarcity, high cost of maintenance, high cost of electricity, non-availability of water in the canal, complaints from tail-reach farmers, and lack of freedom in determining water rules. However, these problems vary across the institutions (Graph). For example, inadequate field channels was a major problem for WUAs under canal irrigation in Andhra Pradesh and Maharastra. Inadequate support/funding was a major problem for CMAP, CM, TAP and RLM. Lack of training staff/members are largely reported by members of canal and tank systems in Andhra Pradesh. Conflict among members is a major problem in CMEAP, non-payment of water charges in CM and PPM, and leadership in TAP and PPM.

One of the issues that has not been covered in this study is that of accountability to the users, and some of the problems highlighted here stem from a lack of proper accountability. There is great need for good financial audit as well as social audit of these institutions in order to improve the reliability and confidence of the users. One concern in this context is the observation that WUA presidents in AP frequently play a major role in the execution of works, like contractors. This could result in poor accountability, political interference, anti-social activities, and low member participation. Another problem that has been only partially examined is that of financial viability of these institutions. Inadequate government support/ funding is a problem for a large number of these institutions, and the financial health of most of these institutions is either just satisfactory

or poor. This is indicative of a financial sustainability problem and the need for local or alternate resource mobilization to overcome the problem.

Table 10.6 : Problems Faced by the WUA or its Members on various aspects of the functioning of WUA (as percentage of Sample Households)

| | Item | Percentage |
|---|---|---|
| 1 | Inadequate maintenance | 16.9 |
| 2 | High cost of maintenance | 23.7 |
| 3 | Lack of members co operation | 12.8 |
| 4 | Non availability of water at the canal | 24.4 |
| 5 | Poor quality of water | 13.6 |
| 6 | Conflicts among members about timing of water | 11.6 |
| 7 | Conflicts among members about quantity of water | 10.4 |
| 8 | Conflicts among members about pricing of water | 3.1 |
| 9 | Inadequate Field channels | 33.9 |
| 10 | Lack of Govt. Support/funding | 33.5 |
| 11 | High cost of electricity | 25.8 |
| 12 | Lack of financial support (start –up) | 30.1 |
| 13 | High cost of Tube-well repairing | 11.6 |
| 14 | Water table receding fast | 12.4 |
| 15 | Lack of mechanism to control water use. | 11.6 |
| 16 | Lack of quality planting materials | 4.8 |
| 17 | Lack of consensus in deciding cropping pattern | 14.2 |
| 18 | Complaints from tail reach farmers | 21.3 |
| 19 | Lack of training to staff members | 33.9 |
| 20 | Non-payment of water charges | 6.3 |
| 21 | Lack of Investment credit with farmers | 18.1 |
| 22 | Problems in deciding water distribution rules | 15.2 |
| 23 | Lack of member co operation | 6.8 |
| 24 | Problems during the period when water is very scarce | 25.7 |
| 25 | The margins earned by the association is too meager | 18.9 |
| 26 | Limited control over water flow | 18.6 |
| 27 | Lack of leadership | 6.2 |
| 28 | Lack of freedom to determine water rules | 20.5 |
| 29 | Lack of members willingness to take up management functions | 11.9 |
| | Overall | 17.1 |

Figure 10.18: Percentage of Households Reporting Inadequate Maintenance as a Major Problem

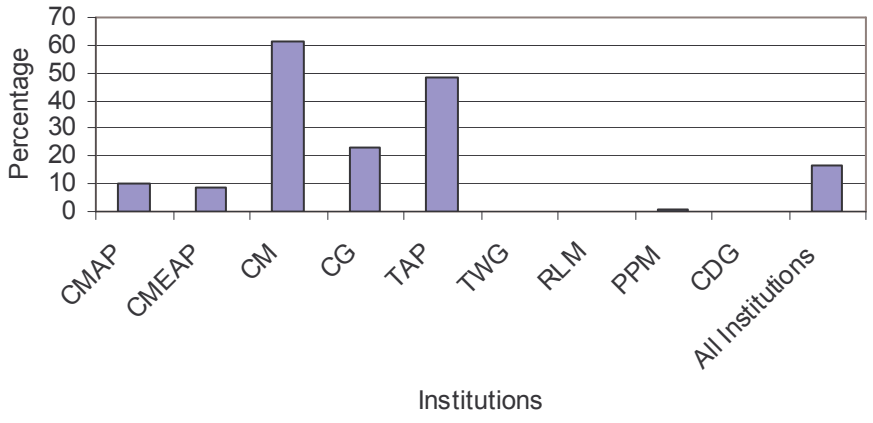



Table 10.19: : Percentage of Households Reporting Inadequate Field Channels as a Major Problem

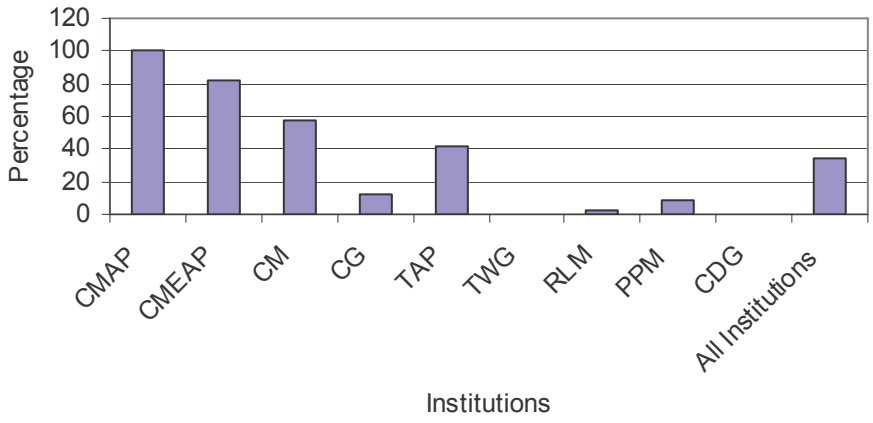


Table 10.20: Percentage of Households Reporting Inadequate Suuport/Fundsfrom FGovernment as a Major Problem

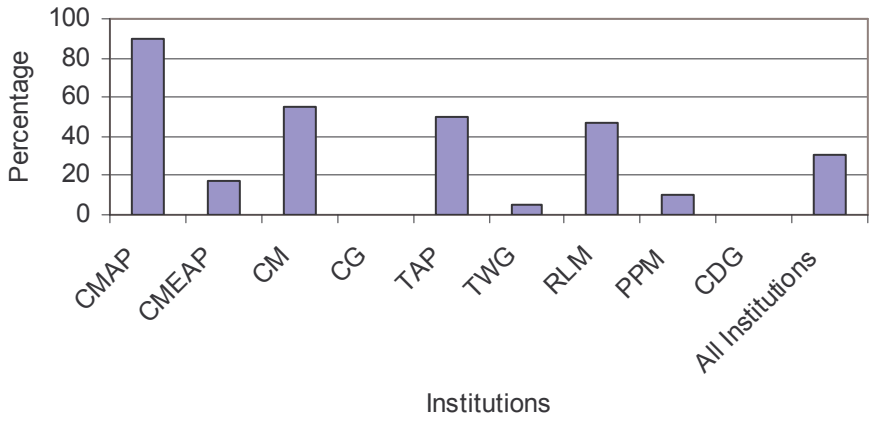



Table 10.21: Percentage of Households Reporting lack of Training to Staff/Members as a Major Problem

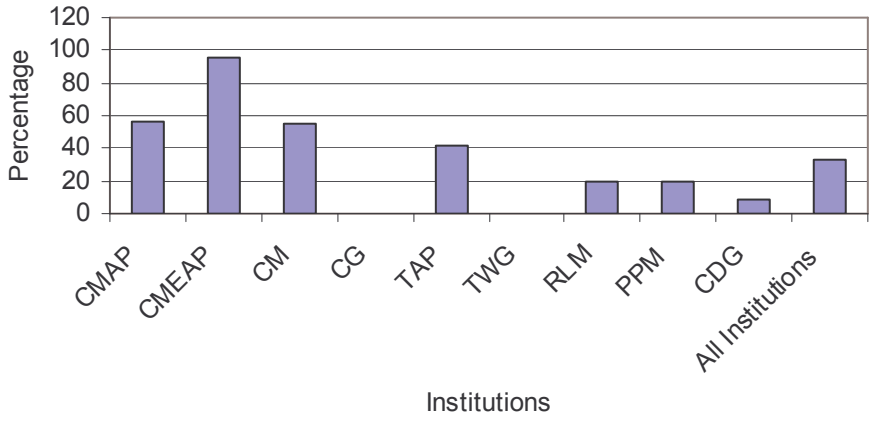


Table 10.22: Percentage of Households Reporting conflicts among members about quantity of water as a Major Problem

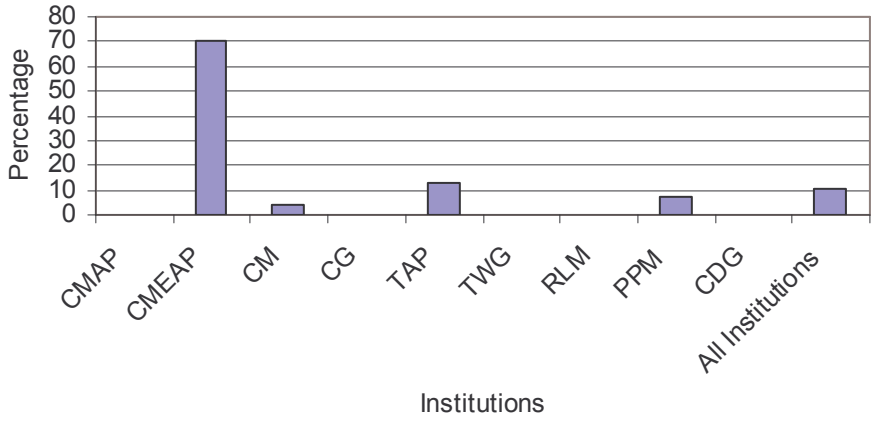
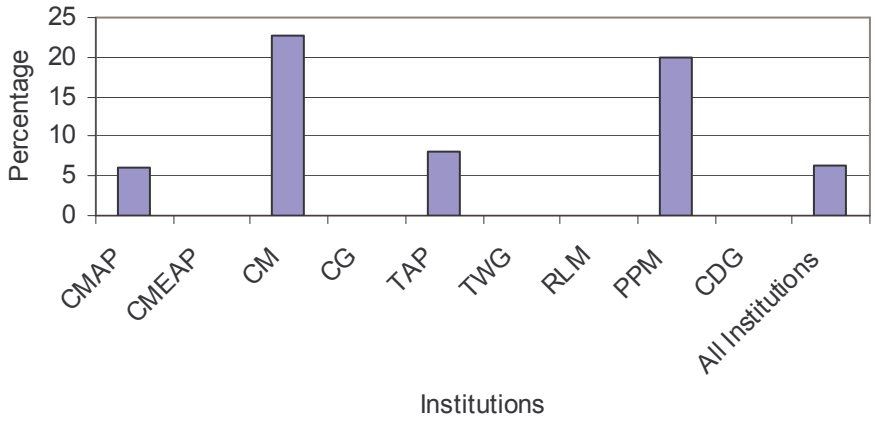



Table 10.23: Percentage of Households Reporting Non-Payment of Water Charges as a Major Problem



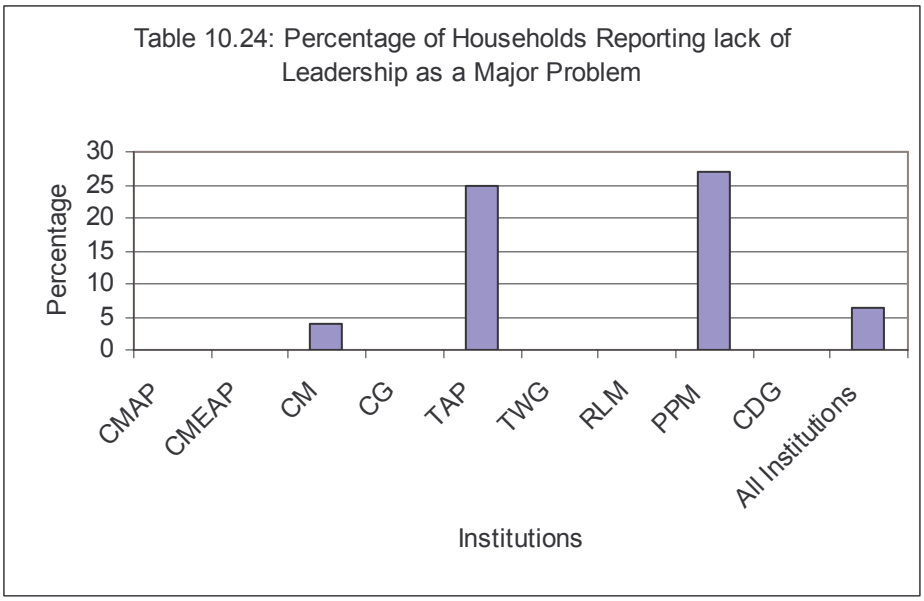
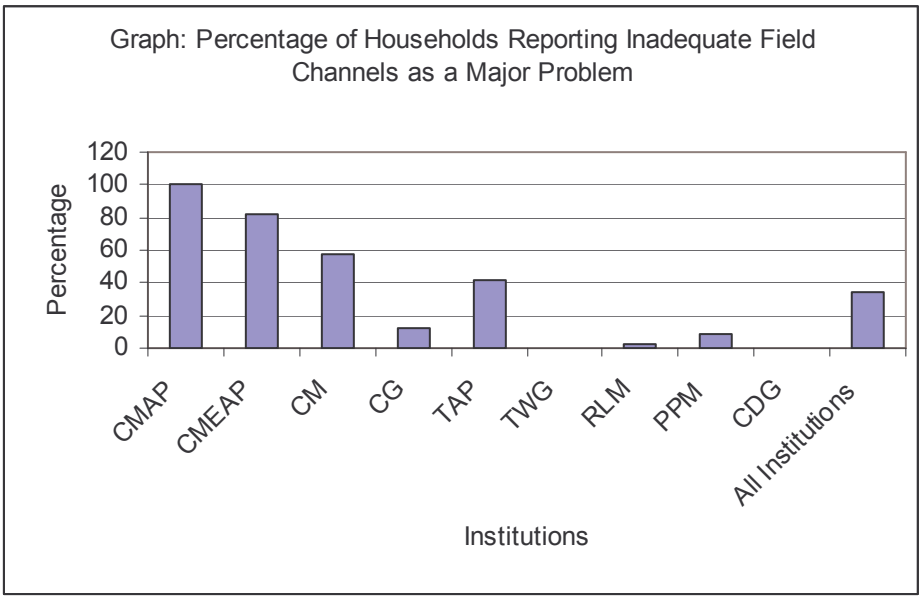


Table 10.24: Percentage of Households Reporting lack of Leadership as a Major Problem
Percentage
30
25
20
15
10
5
0
CMAP
CMEAP
CM
CG
TAP
TWG
RLM
PPM
CDG
All Institutions
Institutions


Graph: Percentage of Households Reporting Inadequate Field Channels as a Major Problem
Percentage
120
100
80
60
40
20
0
CMAP
CMEAP
CM
CG
TAP
TWG
RLM
PPM
CDG
All Institutions
Institutions

For broad overall assessment of performance, the WUAs were rated by the beneficiary farmers on a five point scale as given in Table 10.1. As per the response of the sample farmers, CMAP, CDG, and RLM were rated as the most successful WUAs followed by CG, TWG, CM and CMEAP. The TAP and PPM had a poor rating by a large number of beneficiaries. The rating on the financial health of the selected WUAs showed that CG and CDG were rated as the most financially viable institutions followed by CM, RLM, PPM and TWG. The CMEAP, TAP and to some extent CMAP were rated as having relatively poor financial viability.

Table 10.1: Overall Assessment About the Success and Financial Health of selected WUAs

| Institution | Very Successful | Successful | Satisfactory | Poor | Not Aware |
|---|---|---|---|---|---|
| Assessment About the Success of WUAs | | | | | |
| 1. CMAP | 0.0 | 50.0 | 50.0 | . 0.0 | 0.0 |
| 2. CMEAP | 0.0 | 6.7 | 71.1 | 22.2 | 0.0 |
| 3. CM | 0.0 | 28.4 | 66.2 | 5.4 | 0.0 |
| 4. CG | 0.0 | 18.0 | 82.0 | 0.0 | 0.0 |
| 5. TAP | 0.0 | 1.7 | 33.3 | 65.0 | 0.0 |
| 6. TWG | 0.0 | 24.0 | 70.0 | 6.0 | 0.0 |
| 7. RLM | 6.7 | 46.7 | 46.7 | 0.0 | 0.0 |
| 8. PPM | 13.3 | 36.7 | 13.3 | 36.7 | 0.0 |
| 9. CDG | 0.0 | 80.0 | 20.0 | 0.0 | 0.0 |
| Assessment about the Financial Health | | | | | |
| 1. CMAP | 0.0 | 13.3 | 26.67 | 23.3 | 36.7 |
| 2. CMEAP | 0.0 | 0.0 | 24.4 | 62.2 | 13.3 |
| 3. CM | 0.0 | 2.8 | 93.1 | 4.2 | 0.0 |

| | | | | | |
|---|---|---|---|---|---|
| 4. CG | 0.0 | 52.0 | 48.0 | 0.0 | 0.0 |
| 5. TAP | 0.0 | 0.0 | 23.3 | 76.7 | 0.0 |
| 6. TWG | 0.0 | 24.0 | 70.0 | 6.0 | 0.0 |
| 7. RLM | 2.2 | 20.0 | 77.8 | 0.0 | 0.0 |
| 8. PPM | 0.7 | 12.9 | 74.1 | 12.2 | 0.0 |
| 9. CDG | 0.0 | 80.0 | 20.0 | 0.0 | 0.0 |

# Chapter 11
# Summary and Conclusions

There is a growing crisis in water resource management in India and this is becoming increasingly serious as development accelerates. The management of water distribution across the vast areas of the country, and amongst millions of users, in a sustainable manner is becoming a major challenge. There are serious problems both in surface water as well as in ground water management. The technical and economic solutions to these problems are typically known and often simple, but their institutional management in a participative political economy framework is becoming very difficult and is posing a serious challenge. This research study has been undertaken on the request of the Ministry of Agriculture, Government of India, in partnership with Agro Economic Research Centres (AERCs) in the states of Andhra Pradesh, Maharashtra and Gujarat. This report consolidates the research of the whole project.

Research on the shortcomings of the conventional irrigation management in the country indicates a lack of meaningful involvement of the farmers in decision making, planning and various activities. A change in irrigation management whereby farmers are involved and even take over part of the operation and maintenance while government agencies mainly focus on developing and improving the management of water at the main system level has been proposed in Participatory Irrigation Management (PIM). PIM implies the involvement of irrigation users in different aspects and levels of management of the water resource including planning, design, construction, maintenance, and financing, but particularly in distribution. It generally involves a grouping of farmers into bodies or institutions, often called Water Users' Associations (WUA) for the purpose of

managing a part or more of the irrigation system. The primary objective of PIM is to achieve better utilization of available water through a participatory process that endows farmers with a major role in the management decisions over water in their hydraulic units.

Implementation of PIM in India seeks to address several objectives. These include: improve efficiency of irrigation systems, ensuring sustainability of irrigation systems, improving the performance of irrigated agriculture, reducing pressures on government finances and involving the farmers to play a greater role in water management. The PIM policy of the Government of India covers the management of different water resources through a participatory approach. This includes involving users, other stakeholders and governmental agencies in the decision making covering various aspects such as planning, design, development and management of the water resources. Necessary legal and institutional changes should be made at various levels to make this possible. This would create a sense of ownership of water resources and the irrigation system, and promote economy in water use and preservation of the system, improve delivery through better operation and maintenance, achieve better utilization of available resources through better methods, and achieve equity in water distribution.

Has PIM worked? To what extent has PIM resulted in benefits such as better availability of water for irrigation, greater efficiency in water use, better recovery of water charges, and better operation and maintenance of the irrigation structures? The study begins with examination of the evolution of PIM in states of Andhra Pradesh, Gujarat and Maharashtra. It then examines the role and functions of WUAs, devolution of powers to the WUA, impact of WUA on farm economy, impact of WUA on the village

economy, equity, efficiency and social justice, and the major problems faced by the farming households with respect to the functioning of WUA.

The examination of the evolution of PIM indicates that a number of factors contributed to the inefficiency of public surface irrigation systems in the Andhra Pradesh including inequality in the distribution of water between head and tail end farmers, deterioration of irrigation infrastructure, poor cost recovery, and lack of involvement of local institutions. The Andhra Pradesh Farmers' Management of Irrigation Systems Act (APFMIS Act) 1997 was a revolutionary step since it was the first of its kind in India seeking to bring a paradigm shift towards participation in irrigation management. Some of the major features of this Act include: broad provisions relating to the types of irrigation schemes, tiers of farmers organizations, elections, functions resources and penalties for offenses, provides linkage between irrigation department and farmers' organizations thorough appointment of officers as competent authorities. After the enactment of the APFMIS Act, the process of formation of WUAs was initiated across the whole state. Each district administration under the District Collector was mobilized and WUAs were formed with democratic processes. As of now as many as 10,292 WUAs and 174 DCs have been formed covering a total command area of 4.80 million hectares.

The Government of Gujarat had also adopted a policy to encourage the management of irrigation projects on participatory basis by mid 1990s. The policy proposed that in Gujarat: The farmers' association shall be registered under the Co-operative Act/Societies registration Act/Indian Company Act. The ownership of head of canal and other structures shall be with the state government. The farmer members will be involved in planning, administration, operation and management. Government will

provide financial assistance depending on the nature of work, rights as per the present legal provisions. Maharashtra has a long history with regard to PIM and farmers managed irrigation systems with long standing old irrigation cooperatives. PIM in the new form started only after the mid-eighties since the announcement of the National Water Policy in 1987. Significant progress has taken place since 1992 as the irrigation department has been encouraging the farmers to form WUAs. In terms of formation of WUAs the state has made rapid progress over the last one decade. In order to give legal recognition to the WUAs the state has enacted an Act known as Maharashtra Management of Irrigation System by Farmers Act, 2005

This study examines PIM in various types of irrigation systems viz., canal, tank, river lift, tube well, pani panchayat and check dams. In all, a sample of 29 WUAs have been studied in these systems. The sample includes: canal: 13, tank: 4, tube well: 4, river lift: 3, pani panchayat: 2, and check dams: 3. In all a sample of 435 beneficiary farmer households were interviewed across these WUAs for the in depth analysis.

Taking all the types of WUAs into account, the average rate of participation (Active to Very Active) by members in the WUAs was found to be high at almost 80 per cent. This shows that the participation by the members in the WUAs is quite high on an average. Asian Development Bank (2008) also finds that 300 to 400 farmers attend the general body meeting when major water resource problems are discussed in Bihar. The present study finds that under CDG and TWG the participation by members was almost 100 percent and it was also high under the canal system in Gujarat and the RLM system in Maharashtra. However a low participation rate was observed under tank irrigation system in Andhra Pradesh and Pani Panchayat system in Maharashtra. Gulati, Meinzen-

Dick and Raju (2005) find that farmers do mobilize substantial resources for irrigation activities in Rajasthan and Karnataka.

Findings on participation, involvement and activity levels of different functionaries and groups indicate that the chairman and/or secretary in particular and the managing committee in general are actively involved in the affairs of almost all the WUAs studied here except PPM where they play only a marginal role. The aggregate picture indicates that the most active participation (active to very active) was that of the Chairman at 86 percent, followed by the General Body at 60 percent and the Secretary at 58 percent. Whereas 72 percent of the small/marginal farmers on an average were actively involved, only 34 percent of the Panchayats showed active involvement. A look across WUA types showed that the Chairman of the WUA played an active role across the WUAs except in Pani Panchayats in Maharashtra., The involvement of Secretary in various functions and activities of the institutions was found to be relatively low under CMAP, CMEAP, TAP and PPM. The village Panchayats have played a passive role except for most institutions in Gujarat studied. While the role of government officials was greater under the canal systems WUAs but the local institutions such as village panchayat have played only a passive role.

The farmer member households irrespective of their farm size have been actively involved in WUAs. The landless labourers play an active role mainly under the CDG system compared to other irrigation systems. On the whole the role played by various socio-economic group in the WUAs indicate the active participation of people with the respective WUAs across economic and social divisions.

A key objective of PIM is the devolutions of powers and decision-making to the WUAs. This was examined through questions on who now makes the decisions regarding

several important matters of water resource management. The results on a average across decisions and WUA types indicates that in 78.3 percent of the decisions are made by the WUAs or Jointly, and only 21.7 percent of the decisions are made by the government. This indicates a good degree of devolution of powers. However, there is variation. The devolution of powers was nearly complete in terms of monitoring the distribution of water, maintenance of irrigation structures, monitoring use of water, and freedom of choosing the crops. However the government continues to have more power in terms of assessment of water availability, pricing of water, collection of dues from the farmers and release of water to the canals.

Across WUA types, the devolution is less in TAP and CMEAP, and the greatest in TWG and RLM. As far as the investments are concerned, the decision-making is reported to be mostly joint by the WUA and the government authorities. Under the TWG system all powers are with the WUA. This is because the TWG either have completely handed over structures and equipment or own them entirely. Under RLM except for pricing of water the WUA has the sole power with respect to carrying out various functions as and when required. Under the PPM system, except in pricing and collection of due from the users, the devolution of powers to the WUA is nearly complete. Under the check dam system the powers rested with the government only for release of the investment subsidy. Thus as far as the devolution of powers to the WUAs are concerned, the devolution appears to be substantial. The government agencies continue to have more powers under the canal systems in terms of pricing of water, collection of dues from the farmers and release of water to the canals. For the other decisions, the devolution is substantial and the WUAs studied here have significant powers over the management of the water resource. Gulati, Meinzen-Dick and Raju (2005) find good existence of formal

irrigation organizations in Rajasthan and Karnataka which reflect both the effort on part of the government agencies as well as receptivity from the farmers.

The impact of the WUAs on farm economy was examined in terms of bringing more area under irrigation, increased use of inputs and better yields. The average results indicate that the cropped area increases by 8.28 percent and the irrigated area increases by 31.43 percent. This indicates a substantial impact of PIM activity. The results indicate a substantial increase in irrigated area in summer season, followed by increase in the kharif season and only a marginal increase in the rabi season. PIM also has a substantial positive impact on increasing the use of yield increasing inputs such as HYV and improved seeds and fertilizers. The input use increase is the highest for CDG. The average crop yield has increased by more than 50 percent except under TAP and CMEAP. The yield increase was the highest for CG and TWG. Asian Development Bank (2008) finds that after WUAs, crop yields increase by 15-25 percent even in the tail-end in Andhra Pradesh..

Under CMAP, although there was a marginal increase in irrigated area during the kharif and summer seasons, a decline in the irrigated area during the rabi season, and a marginal decline in overall irrigated area. On the contrary under CMEAP there was an increase in irrigated area during all seasons. Note that the findings are influenced by the conditions prevailing in the survey year, and the farmer ability to recall of the position in the pre-PIM time. Under the CM, the irrigated area during the kharif and summer seasons went up by almost 50 percent on an average. The expansion in irrigated area under canal system in Gujarat (CG) has also been very dramatic. The performance of the tank system in Andhra Pradesh (TAP) was very poor and this could be attributed to inadequate rainfall and no water in the tanks. Under the TWG, the households were cultivating

without irrigation until the WUAs came into existence and then almost two-thirds of the cropped area has received irrigation. Under RLM except during the summer there was only a small addition to the irrigated area since the establishment of the WUA. The most dramatic increase in irrigated area was under CD where there was a seven fold increase in irrigated area after the check dams have been constructed.

Under CMAP there was no major change in the cropping pattern since the formation of the WUA. However, under CMEAP the irrigated area under fruits and vegetables during the kharif season and the cultivation of pulses under irrigation during the rabi season showed an increase. Under CM there was a very significant increase in irrigated area under vegetables and oilseeds during the kharif and rabi seasons. Under CG, both the cropped area and irrigated area under cash crops like cotton and castor and area under irrigated wheat have registered a significant increase. But no major shift in cropping pattern was observed under TAP. Under TWG, the cropped area under tobacco and wheat as well as the area irrigated under them have increased significantly. Under RLM the cultivation of vegetables under irrigation increased during the kharif and rabi seasons, and of oilseeds during the rabi season since the establishment of the WUA. Under PPM the cultivation of foodgrains under irrigated conditions became more common among the sample households. Under CD a marked shift in cropping pattern in favour of high value cash crops like cotton away from bajra and jowar and cultivation of fodder crops during the rabi and summer have been the major changes noticed.

Another aspect examined here was the change in the input use since PIM and establishment of WUAs. It is found that irrespective of the irrigation system, there have been a decline in the use of local varieties of seeds and the use of bullock labour. However, the use of improved and high yielding varieties of seeds, other modern inputs

such as fertilizers and pesticides, and the use of farm machinery have show significant increases.

Under CMAP there was noticeable increase in yields of major crops such as paddy, banana, and pulses since the devolution of power to the WUA. However under CMEAP, none of the households reported large increase in yield, but a majority of them reported increase in yield. Since no change in the yield of unirrigated crops were reported by the sample households, the results indicate a positive impact on yields after the introduction of WUAs. This was also true for other irrigation systems studied here.

With respect to the impact of PIM on water use efficiency, equity and empowerment of users, a positive to highly positive impact is reported on an average by 78 percent for adequate availability of water, 72 percent for timely availability of water, 76 percent for better maintenance, 85 percent for more equitable distribution, 71 percent for empowerment. However, TAP reports no positive impact on any of these, and the impact is relatively low in CMAP on timely availability of water, CM on better maintenance and empowerment, and TWG and PPM on empowerment was reported by more than 75 percent of the sample except those from Andhra Pradesh. Asian Development Bank (2008) find that after the activities of WUAs, water flows to the tail end in 50 percent of the cases. Under CMAP the major positive factors stands out under the efficiency parameters are timely water availability, and better maintenance; under the equity considerations, three factors that stands out are more equitable distribution of water, empowerment of farmers and all land owners becoming member of the WUA. Beginning of a sense of ownership and active involvement of all member farmers stood positive and highly positive. Other factors that are positive to highly positive are deciding the quantum of water to be used, and transfer of power to the WUAs. More or less a

similarly views were expressed by the sample farmer households under CMEAP with the exception that the active involvement of all member farmers was not as strong as it was under CMAP. Positive impacts of the WUA for the sample under CM are: adequate water availability, better maintenance of the irrigation system, equitable distribution of water, empowerment, freedom to raise resources, more farm employment and diversified economic activities. The farmers of CM reported positive impacts with respect to all the factors considered here except adequate water availability, reduction in cost of maintenance, volumetric pricing and transfer of power to the WUA in deciding water charges. Under TAP, except some marginal positive impacts on diversified economic activities no other major positive impact was reported by the sample households under. Under TWG, the WUA could not make much dent on empowerment of farmers to manage the irrigation system, all land owners becoming members, year round availability of water and choice of deciding irrigation timings. The overall impact of RLM was positive except those related to diversified economic activities. Whereas under PPM and CDG all sample farmer households reported a strong and positive impact on most indicators of equity, efficiency and social empowerment.

On an average across the WUA types, among the most important problems and difficulties reported are inadequate field channels, lack of government support or funding, lack of training to members, difficulties in handling extreme water scarcity, high cost of maintenance, high cost of electricity, non-availability of water in the canal, complaints from tail-reach farmers, and lack of freedom in determining water rules. However, these problems vary across the institutions. For example, inadequate field channels was a major problem for WUAs under canal irrigation in Andhra Pradesh and Maharastra. Inadequate support/funding was a major problem for CMAP, CM, TAP and

RLM. Lack of training staff/members are largely reported by members of canal and tank systems in Andhra Pradesh. Conflict among members is a major problem in CMEAP, non-payment of water charges in CM and PPM, and leadership in TAP and PPM.

Under CMAP the major problems that are stated are inadequate field channels, lack of start-up financial support from the government, lack of consensus on deciding the cropping pattern and the lack of freedom to decide on the water rates. However, the major problems faced by the WUAs under CMEAP are very different and they include non-availability of water, conflict among members about timing of water, complaint from tail-end farmers and lack of start-up financial support from the government. The farm households under CM reported few very major to major problems but these included inadequate maintenance, high cost of maintenance, inadequate field channels, lack of government support and little raining to staff members. The farmer households under CG reported only light to occasional problems namely inadequate maintenance, high cost of maintenance, non availability of water at the canal, inadequate field channels and complaints from the tail-end farmers, particularly when there is acute scarcity of water in the canal. Some of the major problems reported by the farmers under TAP are non-availability and poor quality of water in the tank, high cost of maintenance, lack of member cooperation, and complaints from tail end farmers on non-availability of water. Under TWG three major problems have been stated by the farmers viz., high cost of electricity, high cost of repairing, fast receding water table in the wells. The major problems faced by the members of WUA under RLM are high cost of maintenance, high cost of electricity, lack of government support, while under PPM the major problems faced by the farmers were lack of financial support from the government and high cost of

electricity. Under CDG problems such as receding water table, lack of mechanisms to control water use, and lack of training to members were the prominent problems reported.

A positive to highly positive contribution of PIM/WUAs to the village economy as a whole is reported by 78 of the sample households on an average across irrigation system types. It ranges from below 60 percent for PPM and CMEAP to 100 percent for CG, TWG, RLM and CDG. The benefits have been reported positive by equal numbers for both large/medium and small/marginal farmers on an average. Findings indicate that CMAP WUAs have had a positive impact on the village as a whole. The benefits accrued have not been confined to a particular class, caste, religious or social group nor to those belong to the head or tail end of the canal. A very much similar pattern emerges from the water user association under CMEAP. One major difference under this WUA was that the impact of WUA on the village as a whole was positive in a smaller percentage of cases as compared to CMAP. The WUAs under the canal system in Maharashtra (CM) reported an altogether different picture. The impact on various socio-economic groups ranged from positive to negative to no impact. The negative or non impact responses were more relevant for the people belong to tribals, lower caste, scheduled caste and those who do not have any cropping activity. The study reported that even after the establishment of the WUAs, the benefits are mainly to the farmers and not much to the non-farming groups. The impact of the WUAs on general economy reported by the CG was either substantially positive or positive indicating that it has a favourable impact on all social and economic classes of people in its command. The positive impact of the WUA under the tank system in Andhra Pradesh (TAP) was not broad based and was confined mainly to the upper income groups in the command. The responses from the WUAs under the RLM and PPM in Maharashtra showed little broad based impact on the general economy

of the area. On the other hand the responses from WUAs under TWG and CDG in Gujarat showed a strong and positive impact on various socio-economic classes in the irrigation commands.

For broad overall assessment of performance, the WUAs were rated by the beneficiary farmers on a five point scale. As per the response of the sample farmers, CMAP, CDG, and RLM were rated as the most successful WUAs followed by CG, TWG, CM and CMEAP. The TAP and PPM had a poor rating by a large number of beneficiaries. The rating on the financial health of the selected WUAs showed that CG and CDG were rated as the most financially viable institutions followed by CM, RLM, PPM and TWG. The CMEAP, TAP and to some extent CMAP were rated as having relatively poor financial viability.

The study indicates that there has been considerable progress in bringing participation and devolution of powers in irrigation management in the three states but substantial further efforts are required and will help improve performance. It is found that increased participation commonly brings significant benefits to performance in water resource management but some kinds of WUAs have performed better than others. Many of these institutions require not just setting-up but also inputs in institution design, institution building, and training in order to make them strong and sustainable. Greater accountability also needs to be incorporated through proper financial audit, performance evaluation, and social audit, and the financial viability and sustainability of these institutions needs to be enhanced through local resource mobilization as well as external development support.

# Acronyms Used

1. PIM = Participative Irrigation Management
2. WUA = Water User Association

*WUA Types*

3. CMAP = Canal ( Major) in Andhra Pradesh
4. CMEAP = Canal ( Medium)) in Andhra Pradesh
5. TAP = Minor (Tanks) in Andhra Pradesh
6. CG = Canal System in Gujarat
7. TWG = Tubewell System in Gujarat
8. CDG = Check Dam in Gujarat
9. CM = Canal System in Maharashtra
10. RLM = River Lift System in Maharashtra
11. PPM = Pani Pachayat in Maharashtra

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