

# Community-based Irrigation Water Management System: the Case of Deder District, East Hararghe, Ethiopia

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## Abstract

This study assessed the local level irrigation water management and its effectiveness in managing communal irrigation schemes in the districts of Deder District, Ethiopia. Results were based on data collected from a survey of 100 irrigation users in the command areas using descriptive statistics and group discussions. The study revealed that corrupt and rent-seeking behavior of WUAs committee members' aggravated variation in contribution for scheme post maintenances. This activity was extremely severe at the tail-end where turn outs are far apart and less amount of water is distributed. It was reported that lack of enforcement of existing bylaws (55%), which is followed by misuse (over or under utilization) (25%), has been the most important source of conflict than mere water scarcity (9%). Therefore, the study recommended that it needs building the capacity of WUAs committee members in terms of incentives is more critical for achieving irrigation management goals.

**Key words:** Irrigation, Community, Management, Deder, Ethiopia.

## 1. Introduction

Community-based Irrigation Water Management or CBIWM focuses on the collective management of irrigation water to improve human well-being and poverty reduction. It aims to devolve authority of irrigation water management to the local (community) level, thereby empowering communities to manage their own resources without permanently damaging, depleting or degrading them. CBIWM, therefore, requires strong investments in capacity development and the development of local institutions and governance structures. More recently, CBIWM has come under strong criticism for its failures to deliver real benefits to communities and for the high incidence of collapse of CBIWM initiatives (Fabricius, 2004; Magome & Fabricius, 2004). It needs strong qualitative assessment to highlight its management failures and collapse of these initiatives based on existing system's local institutional arrangements and governance structures. This can be more expressed and understood by the idea of commons dilemma as it can be categorized under common pool resources. Two characteristics of the common pool resources – non-trivial exclusion costs and subtractability - raises a cooperation dilemma. If exclusion cannot be achieved by some institutional design then the problem of free riding arises. No rational actor would want to contribute to the provision or maintenance of a resource if non-contributors can gain the same benefits as the contributors without making any contributions. Similarly, the subtractability attribute generates strong incentives for rational actors to maximize appropriation from a common pool hence speeding up the process of resource depletion (Ostrom, Gardner, 1993). Irrigation like all other common pool resources (CPR) faces this fundamental problem.

It is well agreed that if one were to get the institutions and governance structures right then resources can, indeed, be used wisely (Acheson, 2000). The unresolved point, however, is what these institutions ought to be. Based on evidence from both the field and experimental settings, one thing is known for certain, that without effective institutions, irrigation water will be underprovided and overused (Ostrom, Gardner, and Walker, 1994). What is less certain, and what generates the controversies is how such problems ought to be remedied. There are those who believe that rational actors cannot extricate themselves from a “commons” dilemma and, therefore, an external “Leviathan” is required to prevent a “tragedy of the commons”. Such a theoretical perception that governments are necessary to supply and organize collective action has resulted in actions such as the nationalization in supplying irrigation water. Similarly, proponents of Privatization are also influenced by the same models and believe that the best way to avoid a “commons dilemma” is to impose a system of private property rights (Shiwakoti and Ostrom, 2002). Again, this position is based on the premise that an absence of secure property rights results in high transaction costs, mal-distribution and over-exploitation of resources, and the presence of private property rights provide incentives to owners of resources to protect them (Acheson, 2000). A common theme that unites these two policy prescriptions is that institutional change must come from outside and must be imposed on the actors.

An alternate competing idea that is emerging strongly is that of self-governance. Rejecting the assumption that external factors can easily design optimal institutional solutions and enforce rules at low costs, it is argued that users of a “commons” are better equipped to resolve the cooperation problem as the solutions tend to be conditional and situation specific (Ostrom, 1990). The question “*what could these conditions be*” has driven a voluminous amount of research work and the results emerging from this work indicate that self-governance in many instances can indeed be a viable policy alternative. What impact would asymmetries such as differences in economic and political assets and physical relationships have on their abilities to enhance output or distribute output equitably are issues that have not been fully understood and is the focus of much contemporary research (Varughese and Ostrom, 2001). Therefore, this paper tries to examine the existing local institutional arrangements and management practices. It aimed to understand the real resource governance structures applicable in the system. It also attempts to explore some of their relationships through the analyses of community Managed Irrigation Systems in the Deder district Ethiopia.

## 2. Theoretical Works

CBIWM as community based natural resource management is derived from participatory management, a movement that for three decades has been sweeping across many parts of Asia, Africa and industrialized nations (Mam1996; Carson1999). Unique to its parent approach, which sees the government as key in facilitating participatory planning and decision making, CBIWM puts its core focus on local communities, which, according to ken(2005) the central role in identifying resources, defining development priorities, adapting technologies and implementing management practices. This involves devolving management power to the community and designing adaptive resources institutions and self governance structures by themselves without the intervention of outside actors. Theoretically, CBIWM aims to ensure livelihood security of local people by giving them easy, equitable and timely access to irrigation water, and at the same time promote resource sustainability from one generation to another through social sanction in the command area (Li 2002; Armitage 2005; Hibbard & Lurie 2006).

At least three assumptions underlie CBIWM (Li, 2002; Child & Lyman 2005). First, it is assumed that local people, who live closer to irrigation sources, have more interest in their sustainable use and management than do governments and distant actors, because their directly livelihoods depend on it and they bear the consequences of mismanagement. This can be solved through clearly defining rules and regulations based on pre-existing by-laws. Second, local people have comprehensive knowledge about irrigation water and understand the context better than outsiders, which is essential for the design of workable water appropriation. Finally, the local community is usually spatially small and ethnically and culturally homogeneous, which enables its people to interact with one another frequently and with ease, and lowers the cost of collective action. Due to necessity to fulfill these assumptions, the initiative of the establishing an association and defining its community could be either bottom-up or top-down; some are initiated at the

grassroots by local communities that want to improve their access to resources (Ballabh et al. 2002), and some by government or non-government organizations, which are usually spearheaded by multilateral funding agencies, bilateral donors and international NGOs (Kellert et al. 2000; Armitage 2005).

### 3. Empirical Reviews

A study analyzed by Deriba, (2010) on the institutional and organizational arrangements of irrigation water management identifies the determinants of collective action and its effectiveness in managing communal irrigation schemes in the districts of Atsbi Wemberta (Tigray region) and Ada'a (Oromiya region), Ethiopia. The result of the study reveals that each irrigation scheme is a common property resource that is owned and managed by the community. In addition, water users form groups at each outlet (block) level for administrative purposes, which are managed by group (block) leaders. The findings also imply that community irrigation water management can contribute to a more sustainable irrigation water use and Collective action for irrigation water management may be more beneficial and more effective in areas with intermediate number of beneficiaries, in areas that are close to market access, in groups that have longer years of experience in irrigation water use, groups with larger family sizes, in communities with greater number of local organizations, and in schemes where there was participation of beneficiaries during construction of the scheme. This suggests policy intervention is needed to encourage the participation of women in farm, forum and at leadership level in water users association and in conflict resolution committee. In addition, effort should be made to change the wrong perception of the society towards gender inequality.

A research conducted by Beyene, (2010) on collective action and informal institutions by taking the Case of agro pastoralist of Mieso in Eastern Ethiopia has largely indicated that indigenous water well maintenance and government initiated rainwater harvesting are two important collective actions common among these communities. With the aim of examining collective action institutions in both cases, they collected data from different stakeholders and individual members. Theoretically, low level of physical assets (action resource) limits participation of an individual in collective action. In our case, other factors such as environmental uncertainty and lower level of dependence on the resource have been found to be more significant in limiting membership than limitation of assets. Poor agro pastoralists depend on their informal networks to have access to other assets. This enables them to maintain their membership. Moreover, there is a difference between self-organized and imposed collective action in terms of rule enforcement and sanctioning. Institutions also produce different incentives in that free riding leads to automatic exclusion in water harvesting, whereas poor members who continue free riding can benefit from the water well. In evaluating the success, we conclude that technical capacity of members in benefiting from their collective action is limited and deserves more attention than their ability to develop effective collective action institutions. Technical capacity development of user groups needs to be central in policy and programs addressing this.

### 4. Research Methodology

#### 4.1. The study site

This district is located in eastern part of Oromia regional state (between  $9^{\circ}09'N - 9^{\circ}24' N$  latitude and  $41^{\circ}16'E - 41^{\circ}32'E$  longitude). It is located at about 430 km East of Addis Ababa. Rainfall in the study area is characterized by a bimodal and erratic distribution pattern, which gives two cropping seasons of *Meher* (from July to the end of September) and the *Belg* (end of February to the middle of May). The annual average rain fall ranges from 600mm to 1200 mm. This district has an estimated total population of 236,236, out of these populations; about 90.5% live in rural area while the remaining lives in urban area. Deder district has a wide range of water sources, both traditional and modern irrigation systems. Traditional irrigation system has a long history in the district. However, modern irrigation system is a recent phenomenon started during the Derg period, 1970s'. Currently, there are a number of traditional and modern irrigation systems practiced in the district. Even though, the total potential area for irrigation was

not exactly known, about 15,275 hectare is currently under irrigation with a total beneficiary of 16,590 households. Babiali is one of the spring based modern small-scale irrigation schemes which cross both the Burqageba and Gelan-Sadi Peasant Associations (*Kebels*) at a distance of 20 km from district's capital town Deder.

#### *4.2. Sampling Procedures, Data sources and Analysis Method*

In view of the constraints of both fund and time available for the study, it was decided to take up about one project for study and to select about a total of 100 irrigation user households for a detailed study. In view of the limited number of associations to be studied as well as need to examine motivational, organizational, functional and other qualitative aspects of WUAs, it was felt by the Committee of Direction of this study project that it would be useful to follow group discussions, key informant interviews and descriptive statistics. Information for each was obtained from both secondary as well as primary sources. State wise information was obtained mainly from secondary sources. In addition to published material, considerable information was also obtained from unpublished sources by the Project team contacting officers of Irrigation Department. Interview schedules were used for collection of primary data from water users in both command and control areas. Besides, guide points for discussion with project authorities had also been prepared. A two stage stratified random sampling method was followed for selecting the sample in both the command and control areas. In the first stage, both the command and control areas were divided into head, middle and tail reaches and then farmers of different socioeconomic groups were selected at random from each reach. Data was analyzed through descriptive statistics and interpretations.

## **5. Result and Discussion**

### *5.1. Organizational Set-up of Water User Associations*

After the construction of the study scheme the WUAs were formed and each beneficiary has been member of the WUAs. Currently, there are about fourteen WUAs consisting of 30-35 members in each group based on irrigation scheme layout. WUAs are considered as the legally recognized body responsible for overall irrigation management activities by enforcing informal customary laws and formal bylaws as a subsidiary regulation.

Informal and subsidiary regulations were expected to be closely linked and greatly depend on each other. But, it was remained only in the form of informal customs and conventions for water sharing. These informal bylaws had largely been seen independent. However, experts of District Agriculture and Rural Development Office (DARDO) tried to give special attention and effort to create a link between the informal and formal bylaws. This was mainly due to with the understanding that the link could provide very valuable insights. Moreover, it was expected to bring adaptive institutional environment that are needed for filling the organizational vacuum existing at grassroots level of water management.

Therefore, the formal bylaws of the WUAs were initially prepared by the experts of DARDO, and endorsed by the WUAs, their committee and the General Assembly. The WUAs committee is assumed accountable to the General Assembly. The main roles of organizational structure of the irrigation scheme include resource mobilization, operations and maintenances and conflict management as stated in bylaws. This general organizational set-up of managing the irrigation water scheme was indicated in the following figure.

As shown in the figure, the General Assembly was the highest body in WUA committee which makes the final decisions based on the bylaws. The composition of the General Assembly has Chairman, a Secretary, Auditors, Operations and Maintenance committees. An Executive Committee consisting of six members was responsible for overall operation and maintenance of the irrigation systems. The executive committees were further decentralized in to three branches depending on the layout of the scheme. These sub-executive committees comprising two members in each were in charge of control of water distribution and

coordination of maintenance activities and conflict resolutions. As a rule, they were accountable to the executive committee and expected to report to the board when regulations in the water distribution bylaws are perhaps violated.

### *5.2. Operational Management and Maintenance system*

Irrigation water management activities include three dimensions. These are control- structural activities (design, and post-maintenances of the physical structures), water use activities (allocation and distribution) and organizational activities (communication and conflict management) (Byrnes, 1992).

#### *5.2.1. Control Structures Activities*

Dry season is more appropriate for irrigation canal cleaning and scheme post-maintenances. The contribution for these activities was in terms of labor as some experiences financial constraints and others suspect corrupt behavior of water committee members. This shows that the financial capacity of the beneficiaries determines the type of contribution. Maintenance committee with the assistance of extension or development agents takes a coordinating role. Variation in labor contribution is however inevitable. But, corrupt and rent-seeking behavior of committee members further aggravated this variation. The existing mediatory bylaws were also interpreted and dominated by such groups. This has resulted in significantly adverse impact on management outcome.

Design related failures, where turnouts are unevenly distributed, were also a source for scheme damages by illegal users. These technical failures show limited active participation of beneficiaries during project initiation. Large active family members steal irrigation water during night and market days when majority of irrigators off the site. This activity was extremely severe at the tail-end where turn outs are far apart and less amount of water is distributed. In this case, we can understand that the demographic factors also threaten the safety and sustainability of irrigation schemes. These offenders were not held accountable through legal means due to existing local institutional failures. In this regard, the survey shows that grass and silt accumulation (48%) and breakage of gates by illegal users (20%) were the main damaging factors.

#### *5.2.2. Water Use Activities*

Clearly defined water right easily determines water requirements of each different crops and measurement of yearly water supply. Appropriation was based on rotational schedule with limited knowledge and skills on amount of water required for different crops. Water was distributed through irrespective to soil type and time but counting dates and complaints. This shows that there was over or under utilization of irrigation water. Head-end user takes water at mid day time but tail-ends takes at night time due to evaporation problems. Socio-economically power full groups resist the actions of water users' associations committee to clearly enforce the existing bylaws. Turn outs were released to the follow tail-end farmers once their fields' have been saturated. In this case, they produce market oriented cash crops but others produce staples. Experiences show that social relations of power resisted exercising explicit legal frameworks and kept the status quo. This shows that heterogeneity within and between groups significantly affect water distribution system in terms of social and financial asset possessions. This situation further deepens inequality and difficulty in irrigation water governance in the study area.

The survey reports also shows that the main causes for water distribution failures range from limited technical support (48%) to turn abuse by illegal users (9%). Others were weakness of water distributors (25%) and rent-seeking behavior of committee members (18%). On the other hand, allocation of water has been formally approved for those who have land rights. Water also allocated by the number of family available in the house during allocation season in the study area. This has a further impact on limited land holding due to population pressure.

#### *5.2.3. Organizational Activities*

Conflict is highly inevitable phenomena in irrigated areas. Conflict arising from water distribution was rampant within groups and between groups. The conflict management committee was expected to

administer it with help of local leaders or *kebele* courts. However, they were unable to control and penalize illegal water users due to social inconsistency (power relations). It was reported that lack of enforcement of existing bylaws (55%), which is followed by misuse (over or under utilization) ( 25%), has been the most important source of conflict than mere water scarcity (9%). Illegal abstraction through pumped uptake (16%) was also the other prime factors for water disputes. This shows that institutional failures were more significantly indicates a source for conflict than hydrological factors.

## 6. Conclusion

The study revealed that dry season is more appropriate for irrigation canal cleaning and scheme post-maintenances. The contribution for these activities was in terms of labor as some experiences financial constraints and others suspect corrupt behavior of water committee members. But, corrupt and rent-seeking behavior of committee members further aggravated this variation. Appropriation was based on rotational schedule with limited knowledge and skills on amount of water required for different crops. Socio-economically power full groups resist the actions of water users' associations committee to clearly enforce the existing bylaws. It was reported that lack of enforcement of existing bylaws (55%), which is followed by misuse (over or under utilization) ( 25%), has been the most important source of conflict than mere water scarcity (9%). Therefore the study concluded that raising economic capacity of WUAs and institutional capacity of irrigation management taken as a prime activity in irrigation development.

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**Attachments: Figures and Tables**

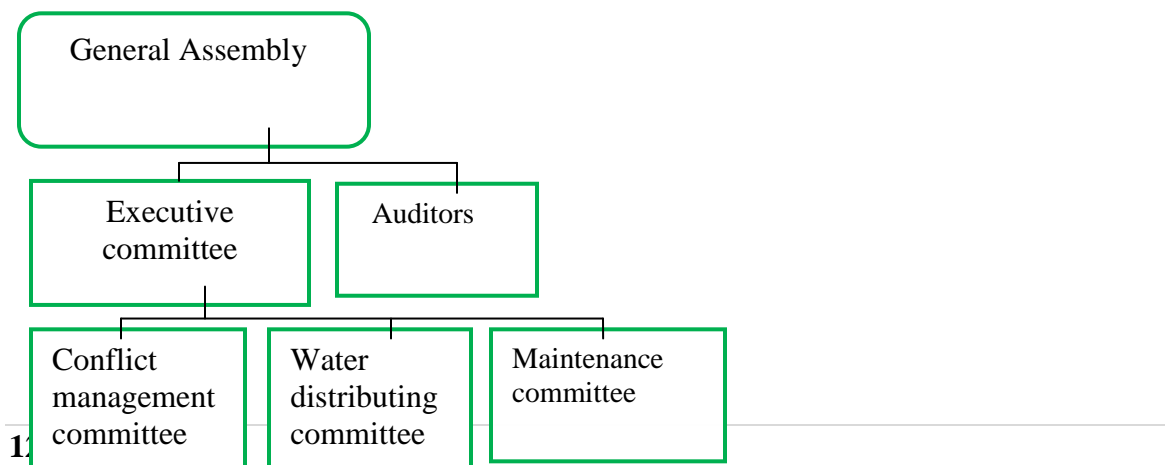


Figure 2. Organizational set-up of WUA in the study scheme

Table.1. Causes for physical structure damages of the study scheme as perceived by users.

NO	Description of the causes	Users	
		No.	%
1	Damage by drinking animals	11	11
2	Grasses and silt accumulation	48	48
3	Seepage losses due to old age	8	8
4	Due to erosion problems	13	13
5	Breakage of gates by illegal users	20	20
Total		100	100

Source: Survey result, 2010

Table.2. Problems related to water distribution as perceived by the users

NO	Description of the problems	Users	
		No	%
1	Weakness of water distributor or “ <i>Melak</i> ”	23	23
2	Rent-seeking of the WUAs executive committee	25	25
3	Limited technical support by experts	31	31
4	Unfair water distribution	10	10
5	Turn abuse by illegal users	11	11
Total		100	100



Source: Survey result, 2010

Table.3. Sources of the conflict in the study irrigation system

NO	Description of the sources	Users	
		No.	%
1	Water theft (illegal abstraction)	16	16
2	Water scarcity due to misuse of water	20	20
3	Lack of enforcement of by-laws	45	45
4	Non -users animal drink	10	10
5	Mere water scarcity from the source	6	6
6	Unequal maintenance contribution	3	3
Total		100	100

Source: Survey data, 2010

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