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Assessment of Irrigation Water Distribution Mechanisms and Governance System at Deder District of East Hararghe Zone, Oromia Region, Ethiopia

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ABSTRACT

Effective irrigation water governance is important to provide water for livelihood and economic growth as well as maintaining a sustainable environment. Irrigation water users associations are mandated to ensure good governance and fair distribution of irrigation water among users. However, there is a top down approach in the establishment of IWUAs bylaws and determination of the responsibilities of users and existing associations are not empowered for self-governances. This in turn affects irrigation water governance and distribution among users. Hence, this study was conducted to assess irrigation water distribution mechanisms among users and to evaluate irrigation water users' association performance in irrigation water governance and distribution. Two stage sampling procedures were used for the selection of sample respondents. First, out of the total irrigation user kebeles of the district, four sample kebeles were randomly selected. At the second stage, 76 sample respondents were selected using cluster sampling, probability proportion to size and simple random sampling method. A cross-sectional survey method was used and data were collected through interview schedule, focus group discussion and key informant interview. Descriptive statistics and narrative analysis were used for data analysis. The analysis shown that there is a rotational irrigation water distribution system with implementation limitations. It was also reported that there is weak performance of the water committees in schemes governance and water distribution, indicated a prevalence of unfair distribution of irrigation water among users. Therefore, context of user participation needs to be emphasized since irrigation involves multiple stakeholders with varying interests.

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1. INTRODUCTION

In Ethiopia, Institutions for irrigation water management are generally diverse, but not well developed in their nature and functions. As explained by Yami (2013), interventions of external bodies in the establishment of Irrigation Water Users Associations bylaws and determination of the responsibilities of users as well as IWUA committees contributed to a low level of users' participation. Yami (2013) further argued that the way participatory approaches are used in developing interventions and the lack of understanding of power distribution among different actors and local institutional arrangements have reduced the effectiveness of the approach in the planning and implementation of irrigation projects. This can also be comprehended from the fact that many institutions locally established by the water users themselves are working much better (Tilahun et al., 2011). There is a top down approach and existing associations are not empowered for self-governances (Yami, 2013). Context of user participation needs to be emphasized since irrigation involves multiple stakeholders with varying interests (Dessalegn and Merrey, 2014).

The tasks of irrigation water user associations in Ethiopia are often limited to providing irrigation services and activities. FDRE (2014) suggests that IWUAs are mandated to the operation and

maintenance of the irrigation infrastructure within the hydraulic boundaries of the irrigation systems, decision-making to facilitate the operation and maintenance and decision-making on finance. Ghazouani et al. (2012) stated that water governance is a range of political, socio-economic and administrative system established for the development and management of water resources and water services in irrigation schemes. It includes establishing the rules, responsibilities, operating mechanisms, policies and users, and official accountability systems. Ghazouani et al. (2012) also emphasized that effective governance is that which provides water for livelihood and economic growth, yet maintains a sustainable environment.

The operational management of IWUAs includes the day-to-day activities to ensure good functioning of the irrigation scheme. The activities include planning, implementing and monitoring of water distribution works. Tasks related to maintenance planning and implementing are also part of operational management. One of the major operational mandates of irrigation associations is to ensure the fair allocation of water to farmers based on either a pre-scheduled arrangement or on-request (FDRE, 2014 and Lempériere et al., 2014). Non-conformity of the water distribution to arranged delivery schedules needs to be corrected in the process of operational decision-making (Haileslassie et al., 2016). Hence, this study was conducted to assess irrigation water distribution mechanisms among users and to evaluate irrigation water users' association performance in irrigation water governance and distribution.

2. METHODOLOGY OF THE STUDY

2.1. Description of the Study Area

2.1.1. Location

The study was conducted in East Hararghe Zone of Oromia National Regional State which covers an area of about 90,620 square kilometers with an altitude ranging between 700 and 3,400 meters above sea level, and mean annual rainfall ranges between 315 and 1040mm. The land holding per household ranges roughly between 0.3 and 1.5hectares. Deder district is one of the 20 districts of East Hararghe administrative zone which contains 37 rural kebeles and 3 urban kebeles. Geographically, the district is located in eastern part of Oromia National Regional State between 9°09'N – 9°24'N latitude and 41°16'E – 41°32'E longitude. It is bordered by Meta district in east, West Hararghe zone ('xulo' district) in west; Malka-balo district in south, Bedeno district in south east and Goro-gutu in north. The capital town of the district is Deder town, which located 112km west of Harar town, and 12km from the main road that takes from Harar to Addis Ababa (DANR, 2018).

2.1.2. Topography and Climate

The district is characterized by undulated and rugged landscape. Agro-climatically, it encompasses highland (33%), midland (50%) and lowland (17%) with altitudes ranging from 1200 to 3138 meters above sea level. The temperature of the area ranges from 14°C Min. to 29°C Max. Consequently, annual average rainfall ranges from 600mm in the lowland to nearly 1200mm in the highland. The district gets biannual rain fall: the belg (short season, from the end of February to the middle of May) and Meher (long season, from July to the end of September). The average precipitation is generally considered adequate for rain fed agriculture. But uneven nature of its distribution, especially in the lowland and midland of the district, has resulted in frequent crop failure (DANR, 2018).

2.1.3. Population

The total estimated population of the district is 244,638. Out of these, 124,129 are male and 120,509 are female. Out of 39742 total household of the district, 36,924 (93%) are male headed and 2818 (7%) are female headed. About 90.5% of the district population are living in rural areas while the remaining are living in urban areas. Those population living in rural areas depends on crop production and livestock rearing, which is commonly known as mixed farming system, to support their livelihoods.

2.1.4. Land Use Pattern and Soil Type of the District

According to the data collected from the wereda agriculture and natural resource office, out of the total 67428ha land; 39.3% is used for cultivation, 0.7% for grazing, 21.4% for forest plantation, bush and shrubs, 17.7% for residential and 20.9% is Rugged and mountains.

Table 1. Land use pattern of the study area

No	Land use pattern	Land size in Hectare
1	Cultivated land	26499.2
2	Grazing land	472
3	Forest, Bush & shrubs land	14429.6
4	Residential land	11934.7
5	Rugged &mountains	14092.5
Total		**67428**

The soil types of the district are 5% sandy, 20% loam and 75% sandy loam with 75% black color, 20% reddish brown and others 5% (DANR, 2018).

2.1.5. Economic Activity

Agriculture is the major economic activity in the rural area, mixed farming system being a common practice in all agro-climatic zones (highland, midland and lowland). Accordingly, crop production and livestock

rearing are the main sources of livelihoods of rural population. About 169553 cattle, 57364 sheep, 148673goat, 25291 donkey, 703 mules, 2019 horses, 109814 local poultry and 11872 improved poultry are being kept in the district. Maize is a staple crop in the district followed by sorghum. Wheat and barley are also the second major category of food crops produced in the highland part of the district. Legumes such as haricot bean and faba bean are grown usually intercropped with maize and sorghum. But during a year with abnormal rainfall, growing sweet potato is a common practice in the district. Khat and coffee are the two dominant cash crops grown in the district. Khat grows almost in all agro-climatic zones of the district while coffee is in the midland and low land (DANR and DLA, 2018).

Besides rain fed agriculture, irrigation agriculture is being practiced in the district. Deder district has a wide range of water sources which are underutilization for both traditional and modern irrigation systems. Traditional irrigation systems have a long history in the district. However, modern irrigation systems were introduced during the Derg period, in the 1970s. Currently, there are a number of traditional and modern irrigation systems in the district. The modern scheme has cemented main irrigation canals which help to reduce water loss through seepage. There are 9771ha total irrigation coverage with 21437 irrigation user households in the district. 2165 households which are about 11% of total users have been using modern irrigation schemes. These cover only 554ha land which are 6.7% of total irrigation land. Traditional irrigation systems cover 89% in terms of users and 93.7% in terms of area coverage. The main sources of the district irrigation water are river and spring water. Galan Sedi, Laga Geba and Burqa Galeti rivers are found in the district. They are used for irrigation within the district except for Burqa Galeti which serves other districts also. The major vegetables and fruits produced under irrigation are: potato, sweet potato, papaya, banana, tomato, carrot, cabbage, coffee, khat, sugarcane and garlic (DIDA, 2018).

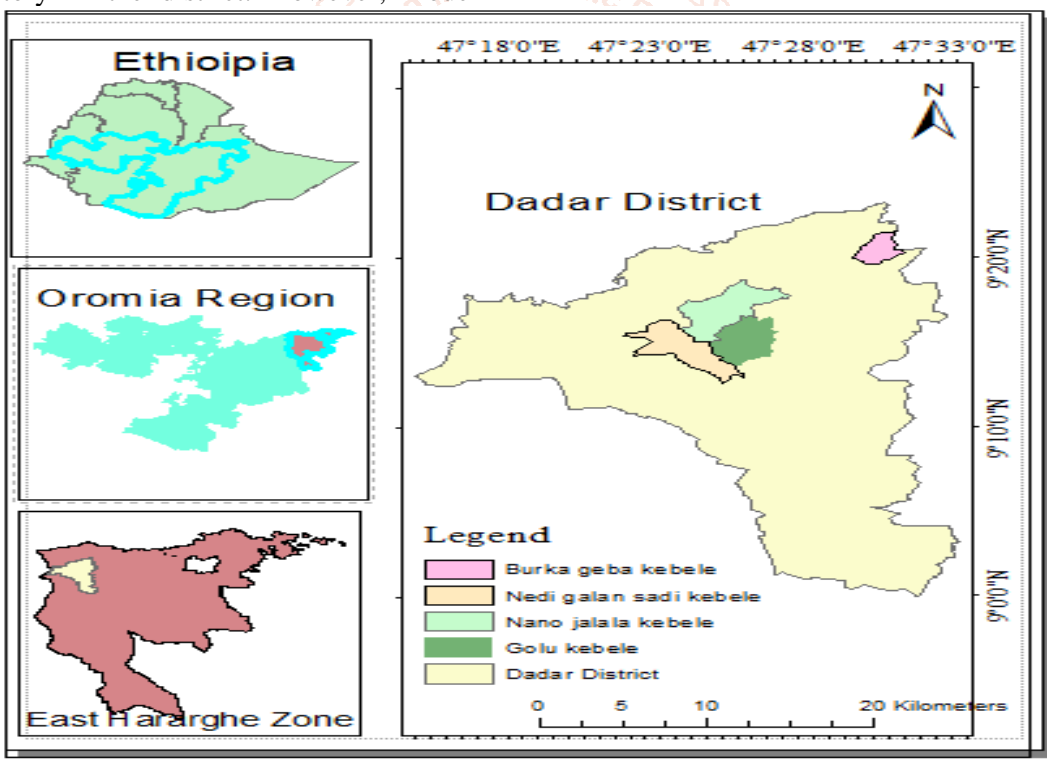

Fig 1. Map of the study area
Source: Own Sketch from GIS (2018).

2.2. Sample Size and Sampling Method

In this study, two stage sampling procedures were used for the selection of sample respondents. In the first stage, out of 37 rural kebeles that are found in Deder wereda, 28 irrigation user kebeles were purposively identified. Then, due to resource limitations, only four kebeles were selected out of irrigation user kebeles using simple random sampling method. In the second stage, first the household heads in the four sampled kebeles were identified and clustered in to two: irrigation users and non-users. The sample size regarding each kebeles were determined using probability proportional to size of the identified user households of the selected Kebeles. Then the sampled respondents were selected only from users cluster using simple random sampling technique. Total sample of 76 rural households were drawn from users through probability proportional to size of the identified

user households in each of the selected Kebele. Table1 shows the proportional sample distribution across the selected Kebeles.

Table 2. Distribution of sample respondents by Kebele

Kebele	Total households	Clusters		Sample selected	
		Users	Non-users	N	%
Nedi galan sedi	1561	1155	406	37	48.7
Golu	1342	624	718	20	26.3
Nano jalala	1060	343	717	11	14.5
Burka geba	719	250	469	8	10.5
Total	4682	2372	2310	76	100

Source: Computed from own data (2018).

2.3. Data Type, Source and Collection Methods

Both quantitative and qualitative data were collected from primary and secondary sources. Secondary data were obtained from District Office of Irrigation Development Authority (DIDA), District Agriculture and Natural Resource Office (DANR) and District Livestock Agency (DLA) as well as documentary sources such as published and unpublished documents. The primary data were obtained from primary data sources such as sampled household heads, participants of focus group discussions and key informants. A cross-sectional survey method was used to collect primary data through a carefully designed semi structured interview schedule. Prior to actual data collection, orientation was given to the enumerators to develop their understanding regarding the objectives of the study, the content of the interview schedule, how to approach the respondents and conduct the interview. A total of four enumerators were employed to conduct the survey through active involvement and close supervision of the researcher. Development agents in each Kebele were used as facilitators.

In addition, key informants interview, Focus group discussion and direct observation were used to collect qualitative primary data. Field note, audio and visual record were used in qualitative data collection processes archive. In key informant interview, individuals who were considered knowledgeable and rich in experiences about irrigation activities and rural livelihood in the study area were identified and interviewed. These were experts from District Office of Irrigation Development Authority, Chairperson of irrigation water management committee and farmers. Accordingly, 2 experts, 4 chairpersons, and 4 farmers were included in key informant interview. Discussion was conducted with a total of 6 focus group consisting 10 individuals per group (Elder, 2009). The discussion was facilitated by the researcher together with one enumerator; one as facilitator and the other as reporter so that group members were encouraged to talk freely during the discussion.

2.4. Methods of Data Analysis

2.4.1. Descriptive Statistics

Descriptive statistics such as percentage and frequency of appearance were used to summarize data that was collected from sample respondents. It was used to explain the desired characters of sampled households in order to draw some important conclusions.

2.4.2. Qualitative Data Analysis Approach

Narrative analysis method was used to analyze qualitative data related to organizational performance in water governance and mechanisms used to distribute the irrigation water among users. Specifically, it was used to analyze the data related to management system in communal irrigation schemes. The performance of farmer organizations in irrigation management was analyzed in terms of irrigation water management activities such as water use activities, structural activities and organizational activities based on Norman Uphoff (1986).

3. RESULTS AND DISCUSSION

This chapter presents the main findings of the study regarding assessment of irrigation water distribution mechanisms among users and evaluation of irrigation water users' association performance in irrigation water governance and distribution. The results are presented and discussed in two main sections based on the objectives of the study. Section 3.1, presents descriptive statistical results on indicators of water management and distribution. Tools such as frequency and percentage are used under this section. Section 3.2 presents and discusses results of farmers' organizational performance in irrigation water management activities.

3.1. Descriptive Results

Sample respondents were composed of both male and female household heads. Out of 76 irrigation user households, 22.4% are female headed and the remaining 77.6% are male headed. 77.6% of them are practicing traditional irrigation type while 22.4% are using modern irrigation. 86.8% of sample respondents are getting

water for irrigation through scheduled rotations and about 13.4% are getting on request. Regarding structural activities, 65.8% of sample respondents have responded that canals are well maintained while 34.2% of them responded that canals are not well maintained. About 59% of sample respondents have no access to adequate water for irrigation. On other hand, 80.3% of sample respondents are not getting water for irrigation at required time. 75% of the respondents witnessed that there is no fair distribution of irrigation water among users. To sum up, there are conflict cases over resources and 72.4% of the respondents have responded that conflict cases are suspended.

Table 3. Descriptive statistical results

Variables	Values	Sample respondents (n=76)	
		Frequency	Percent
Sex of sample respondents	male	59	77.6
	female	17	22.4
Type of irrigation under practice	traditional	59	77.6
	modern	17	22.4
Irrigation water distribution mechanisms	On request	10	13.2
	Scheduled rotations	66	86.8
Maintenance of canals	Not well maintained	26	34.2
	well maintained	50	65.8
Conflict resolution	Suspended	55	72.4
	Immediately solved	21	27.6
Access to adequate water for irrigation	No	45	59.2
	yes	31	40.8
Access to irrigation water at required time	No	61	80.3
	yes	15	19.7
Fair distribution of irrigation water	No	57	75
	yes	19	25

3.2. Organizational Performance in Irrigation Water Management Activities

The organizational performance in irrigation water management was analyzed in terms of the three broad categories of small scale irrigation management activities such as water use activities, structural activities and organizational activities based on Uphoff (1986). According to Uphoff (1986), activities related to water use are: acquisition of water, allocation of water, distribution of water and drainage of excess water; Structural activities are: Design of structures, Construction of structures, Operation of structures, and Maintenance of structures; organizational activities include: Decision making, Resource mobilization, Conflict resolution and communication. Due to time and resource limitations, only water distribution, maintenance of structures, conflict management and resource governance systems were considered under this study. Performance in distribution of irrigation water was analyzed in terms of the most important performance indicators such as adequacy, timeliness and equity in the supply of water (World Bank, 2000).

3.2.1. Irrigation Water Governance and Distribution Mechanisms

Irrigation water governance is a range of political, socio-economic and administrative system established for the development and management of water resources and water services in irrigation schemes. It includes establishing the rules, responsibilities, operating mechanisms, users, and official accountability systems (Ghazouani et al., 2012). In this context, irrigation water governance refers to the day to day activities to ensure good functioning of the irrigation scheme. Water distribution refers to the fair allocation of water to users based on either a pre-scheduled arrangement or on-request (Lempériere et al., 2014).

According to the Proclamation to Determine Irrigation Water Users Association of Oromia Regional State Proc. No. 204/2017, an individual right to irrigation water is recognized only indirectly through land rights. Hence, a farmer who use land within command area of the irrigation water can have a right to use the irrigation water, and this depends on the potential of water sources. The size of irrigable area is determined by the local beneficiaries (founders committee) with the support of wereda experts based on the potential of water sources.

According to information obtained from key informants at all study sites (Nedi gelan sedi, Golu, Nano jalela and Burqa geba), the water committee consists seven members and 'malaqa' (local name used for father of water) are responsible to coordinate

and control water distribution among users. They are responsible to develop the rotational system by setting sequential irrigation turn of users starting from the upstream. The rotational system was arranged for upstream users to use water during day time and for downstream users to use water during night time in order to reduce evaporation and seepage loss. Rotational irrigation is the application of irrigation water in a given amount at a given time and in proper order, so that all farmers get enough water to irrigate their fields. However, practically the 'malaqa' is in charge of water allocation and coordination of rotational water distribution. He is also responsible for keeping turn and protecting water theft. All study sites assumed implementing rotational system in which secondary canals receive water by turns and the individual farmers within a given area receive the water at the pre-set time.

The problem was that the implementation of water allocation and rotational schedule has limitations. The focus group discussion revealed that rotational schedule is not in advance (not in written) and implementation of water allocation is based on malaqa's awareness. Most beneficiaries do not know when to irrigate their farm due to poor communication about whose turn is next. As a result, farmers come to irrigate their farm after their turn is passed. Moreover, amount and time of water supply are not defined with the water requirement of different crops grown and area of irrigable plots managed by households. This resulted in a major problem in the implementation of rotational distribution of irrigation water. Few individuals of focus group said that they are getting enough water when needed for their irrigation land. However, the majority responded that they could not get enough water for their farm when they need. They mentioned water scarcity, poor coordination of water distribution by the water committee and water theft as the most significant problems that constrained the supply of adequate water when needed. The group members further articulated that declining level of the water source potential, seepage loss, inappropriate coordination of water distribution and increasing number of water users are the major factors responsible for water scarcity in the study area.

Focus groups and key informants also reported that there is a prevalence of unfair distribution of irrigation water which means certain socioeconomic groups obtains more water for their farm activities than others. As a result, the users could not fully and equally benefit from the water as it had been expected. According to the informants, those farmers who are relatives and friends of 'malaqa', farmers found at upstream, farmers with large number of boys and rich farmers obtained more water because of their social status and proximity. As a result of these, poor farmers who have no relation with malaqa and found at downstream are suffering from shortage of irrigation water. The information obtained from the water committee chairperson confirmed the existence of those problems. As he said, special emphasis is given to any farm covered with vegetables to irrigate whenever the plant required water without following the rotation.

According to performance indicators which are adequacy, timeliness and equity in the distribution of irrigation water designed by World Bank (2000), the water committee were found to be inefficient and poorly managing the water distribution and scheme. Moreover, during the focus group discussion the beneficiaries also indicated their unsatisfactory experience that the performance of the scheme has been declining over the past years. These problems were happened due to the weak performance of the water committees in schemes governance and water distribution. Majority of group members reported that Sanctions are not imposed against illegal water users i.e. irrigators that extracted and used more water by abusing turns. As they said, the illegal water users are intimate friends or relatives of the water committee members and sanctions are not be imposed on them. This implies the absence of institutional enforcement and the prevalence of free-riders, which means that individuals run to maximize short-term, self-centered benefits, rather than achieving collective benefits at social optimum. This causes problems that when many individuals decide to "free ride", others may stop contributing to the collective good. If more and more actors pull out, eventually no one contributes to resource management and sustainable resource use will be under question. This in turn, leads to the absence of a joint benefits.

3.2.2. Maintenance

Canals are frequently damaged by floods due to topographical nature of the study areas and needs maintenance. According to the regional IWUAs proclamation 204/2017, Canal maintenance and canal cleaning when filled with wastes are the responsibility of irrigation water users association. Therefore, from control structure activities, maintenance is considered as an important parameter to analyze organizational and institutional performance in irrigation water governance; even though the extent of their responsibility in canal maintenance is not clearly specified.

The focus group discussion for all study sites revealed that maintenance of the canals is undertaken by mass

mobilization annually; usually in October. However, canal cleaning program is undertaken three to four times per year depending on the grass and silt accumulation in the canals under the leadership and coordination of the water committee. Most of the time, users contribute their labor for maintenance activities. They contribute money if needed only at the time of maintenance. According to their by-law those users who are absent from the maintenance work will be penalized up to 50 ETB (Ethiopian Birr) based on the wage of daily laborer. Key informants reported that the irrigation users submit major maintenance works that require input of expert skills and industrial product (e.g. cement) to the government agencies to do it for them. Because, it is difficult for them to achieve this responsibility due to the low financial and technical capacity of the associations.

Majority of the focus group members were responded that maintenance of the irrigation scheme is in a good condition. Some group members said that maintenance of the scheme is poor, mentioning poor imposition of sanctions on reluctant users, absenteeism of some members on maintenance days and poor coordination of maintenance activities as some of the major causes. As observed by the researcher, the main canal which is concrete is relatively performing in a good condition; but the secondary canal is not in a good condition.

Fig 2. Scheme and canal structures.

The focus groups also complain that the water management committees are not fulfilling their responsibility to manage the scheme and their main roles which are protecting the infrastructure from being damaged, facilitating scheduled water use by the irrigation users and monitoring any attempt involving violation of established regulations by users. This indicates that irrigation water users associations in the study areas are not well developed and capacitated, both financially and technically, to manage and maintain the small scale irrigation infrastructures.

3.2.3. Conflict Resolution

Both focus group members and key informants explained that conflicts over irrigation water are common among users. They mentioned water scarcity, water theft, lack of proper control of water distribution and competition among water users as the prominent factors for conflict. Informants expressed that lack of enforcement of bylaws in water distribution is also one of the most important reason that led to unnecessary water disputes. As they said, conflict over irrigation water is severe as we go from upstream to downstream.

According to the regional IWUAs proclamation 204/2017, article 13/1 management bodies of an association shall be the general assembly, management committee, the control committee and the dispute settlement committee. However, at all study sites the management committee is the only management bodies of an association except for Nedi gelan sedi which has dispute settlement committee. As the name implies, dispute settlement committee is responsible for conflict resolution. But, since this body is not in place, the issue is being treated in different ways according to their weight. Simple cases are being solved by 'malaqa' and the complex ones are going to water management committee for solutions. Some of the focus group members responded that the water committee takes immediate actions on cases to resolve conflicts as they occur.

However, majority of them said that the water committee suspended cases. Key informants revealed that water management committee submits cases which are beyond their capacity to the Kebele social court and the court always demands witnesses for the crimes done. They also reported that when individual farmers who had seen the criminals in action are asked to stand as witnesses; they are not willing to cooperate. Because of these bureaucratic problems, cases are being suspended. This makes things to be difficult so that the committee often finds itself ineffective to ensure performance of the regulations set for the irrigation water management. This shows that the irrigation water users associations in the study areas have no clear way of conflict resolution and enforcement mechanisms.

4. Conclusion and Recommendation

Irrigation water governance, distribution, canal maintenance and conflict resolution are some of the irrigation activities which needs users' participation in order to implement collective action as a tool to overcome the common pool resource problems. The analysis revealed that there is a rotational irrigation water distribution system among users' with implementation limitations. There is a prevalence of unfair distribution of irrigation water among users. The conflict over irrigation water is also common among irrigators. These indicate that there is weak performance of the water committees in irrigation water governance and water distribution. Therefore, the respective government and non-government organizations should invest on capacity building to improve managerial capacity of irrigation water users associations. On the other hand, more than 75% of sample respondents are practicing traditional irrigation system; indicating the need for intervention of concerned bodies to modernize the irrigation system of the study areas. Operation and maintenance are clearly stated as IWUAs tasks in the written by-laws and the regional manual, but, it is not clearly stated what level of maintenance is expected to be accomplished by users. Therefore, there should be clear task division between IWUAs and government agencies to participate in canal maintenance activities.

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