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Collective Action by Traditional Water Users' Association for Successful Management of Irrigation Schemes in Amaro Special Woreda of the Southern Nations Nationalities and Peoples' Regional State, Ethiopia

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ABSTRACT
The native people of Amaro wereda (i.e. the 'Koore' nation) are known by their enriched experience of using traditional irrigation practice that is managed and administered by a traditional water users' association locally referred as 'Watsi-Qoro' in which members of the apex committee are elected in a democratic and decentralized manner. The objectives of this study were to assess the roles played by each functional units of the association, to analyze enforcing rules and their role on conflict management and to identify the determinants of household's membership of traditional water users' association. The study examined that the traditional water users associations contributed a lot for successful operation and maintenance of traditional irrigation schemes, to handle and manage intra and inter group conflicts over irrigation water, and for the sustenance of the agricultural extension service in the study woreda. The result of the binary logit model also showed that five of the fourteen explanatory variables including sex, age, extension contact, distance to the water source and inputs use were found statistically significant in determining household's membership in traditional water users' association.
Keywords: Conflict resolution, Institutions, Irrigation, Water Users' Association,
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1. INTRODUCTION

1.1. Background of the Study

Agriculture is the main livelihood strategy for majority of the rural population in Ethiopia. It has contributed a lot for the macro and micro economies of the country by absorbing a huge rural labor and providing significant amount of food both for rural and urban citizens and generating significant share of the country's GDP. However, its production and productive is challenged by several climatic and institutional constraints like erratic rain fall pattern, frequently recurring drought, pests, crop and livestock diseases, soil erosion, inadequate input and technology use, inadequate extension services to *and market related constraints (Bezabih et al., 2014; Yenesew et al., 2015). To reverse the adverse impact of such climatic and institutional constraints on the growth of the agricultural sector, both governmental and non-governmental organizations have promoting several development interventions including construction of small to large scale irrigation schemes, strengthening input delivery systems, introduction of improved agricultural technologies, provision of extension services, launching of soil and water conservation and watershed development programs and infrastructure development and fulfilling* market facilitates (Gebru *et al*., 2018).

Farmers also attempted to minimize the risk posed by these adverse calamities through implementing conventionally practiced mitigation measures one of which is the traditional irrigation practice. Besides these, spate irrigation has been practiced traditionally in Southern Tigray and in some semi-arid areas in Oromia region to harvest water from flush floods flooded from larger catchments at upper stream sides (Mehari *et al*., 2011; MoA, 2011a). There are also localities like Amaro special woreda of the SNNPRS where the native people i.e the '*Koore*' nation are known by their enriched experience of using traditional irrigation system either by retaining run off (In-situ water harvesting) or by diverting water from locally flowing rivers and streams to their farm land (Ex-situ water harvesting technique) although simple river diversion developed by GOs and NGOs is a considered as a dominant irrigation systems in Ethiopia.

The native people of Amaro *i.e* the '*Koore*' people are known by their experience in using traditional irrigation system as supplementary source of water to the locally precipitated rainfall. The local farmers divert the locally flowing rivers and streams to their farm land using their' own knowledge and skill that they inherited from their ancestors. Their innovations stretch from designing and development of diversion structures to canal excavation, crossing of big gullies, developing appropriate cropping systems, equitable sharing of water, and conflict management issues. The local irrigators manage irrigation water (i.e their common property resource) by establishing a Water Users' Association locally referred as '*Watsi-Qooro' which is led by a commonly agreed and unwritten rules and regulations.* Evidences from local elders showed that the native people of Amaro (i.e. the '*koore'* nation) have more than three to four centuries of experience in using traditional irrigation practice.

Currently, almost all the locally flowing rivers and streams are fully diverted and utilized for irrigation purpose. The diversion structures are made from locally available construction materials such as stone boulders and wood logs and water is conveyed to the farm by means of earthen canals. The way how farmers of Amaro locality share irrigation water resource among members and the way how their unwritten bylaw is respected and implemented by all members of the water users' association with own management of conflicts and disputes can be considered as a live example for the modern irrigation schemes that tend to collapse due to lack of proper management system. However, the existing institutional arrangements of the traditional WUA, the roles and responsibilities of each functional unit in the institutional framework and the extent to which their enforcing rules help for sustainable irrigation water management were not studied and documented empirically in the earlier time. Former studies also failed to examine and document the existed rules and regulations of the unwritten by law and how these rules and regulations help to resolve disputes and conflicts among members of the traditional water users association. This study therefore attempted to assess the roles played by each functional unit in the institutional frame work, and the contribution of the enforcing rules and regulations for sustainable water management and conflict resolution

1.2. Objectives of the Study

1.2.1. General objective

The general objective of this study was to assess the role of traditional Water Users' Association for successful operation and management of traditional irrigation schemes in Amaro special woreda.

1.2.2. Specific objectives

- To analyze the institutional arrangement and role of each functional units of the traditional water users' association in the study area
- To assess the roles of enforcing rules and regulations for water and conflict management
- To analyze the determinants of households membership of the traditional water users association

2. LITERATURE REVIEW

2.1. Definition and Theories on Collective Action

Collective action as can be defined as an action taken by more than one person so as to achieve a common goal or satisfy a common interest Robert Wade (1988). It is organized if greater benefit is expected by joining a group than acting individually (Schlager, E 1992). Vermillion (1999), also defined collective action as "a coordinated behavior of groups towards a common interest or purpose". Collective action is an action taken by members of a group in order to meet shared interests (Marshall (1998)". Thus the main goal of collective action according to these authors is to satisfy the common interest of members of the group for a given common pool resources. However, the most important challenge in collective action is how to find individuals acting collectively in an environment where they face a dilemma about one another's action (Hardin 1982). Another challenge in collective action is the problem of excluding the free riders. Free riders who want to benefit from the collective action without making any contribution to its success (Mancur Olson, Jr 1965). To avoid these dilemmas in collective actions Ostrom (1997) suggested three core individual cooperative behaviors including Trust, Reciprocity and Reputation.

Trust refers to what someone expected about others' behavior. Reciprocity refers to a norm that generally reflects an attribute that an individual is inclined to react positively to the positive actions of others and vice versa (Fehr Schmidt, 2004). Reciprocity can be either positive or negative based on the responses of the actors involved in it. It is governed by moral rules; a benefit granted to one party only upon an implicit condition that will be returned some other time in the future. Reputation refers to the general view of others towards a person. Thus, collective action cannot be effective without developing institutions to constrain behavior and to overcome the problem of free-riding and shirking. Such institutions are developed by the collective itself. Hence, one cannot disentangle institutions and collective action" (Ostram, 1990).

2.2. Water Users' Associations

A Water User Association (WUA) comprised of group individuals such as irrigators who organize their financial, technical, material, and knowledge/skill to operate, maintain and manage an irrigation scheme to fairly use the water resource (Mejia Abel, 2005). Similarly Wang *et al*. (2012) defined WUAs as "local organizations which are worthwhile to realize users' participation in irrigation management through collective action". Therefore, the principal objective of WUAs according to these authors is managing irrigation system through collective action. On contrast to this the government supported irrigation schemes focused more on the advancement in technology than institutional factors and social capital (Deribe, 2012). A study conducted by Yordanos B.(2012) in Tigrai region also supported this idea in that, the irrigation schemes constructed by governmental and non-governmental organizations handed over to Water Users Associations (WUAs) for their management; operation and maintenance have faced sustainability problems due to capacity limitations of the committee

members to properly implement the enforcing rules and regulations. Traditional Water Users' Association (Watsi-qoro') in Amaro woreda provides an opportunity for the involvement of stakeholders and beneficiaries in the corporate management of water resources and resolution of water related conflicts, promotion of water conservation practices as well as in promoting catchment conservation measures to improve quality and quantity of water.

3. STUDY METHODOLOGIES

3.1. Description of the Study Area

Amaro is a special *woreda* under the hierarchical structure of the SNNPRS, with a total land cover of 170980 ha of land that is further sub divided in to thirty three rural kebeles and one urban administration. The *wereda*'s main town, Kelle is located at about 210 km to the South East of the Regional capital i.e. Hawassa. The landscape of Amaro is characterized by steeply sloping mountains (25%), hills (20%), undulating (25%), and gentle to plane land features (30%) where elevation above sea level ranges from 900 to 3600m above sea level. According to the information from Amaro *woreda* FEDO (2020) the current population of Amaro is estimated to be 372548 of whom 182640 are females. Among this total population 91% live in rural areas mainly depending on agriculture that involve mixed crops-livestock production system and the rest 9% are urban dwellers(Amaro Woreda ANRDO, 2020).

This locality receives an erratic and bimodal type of rainfall that unevenly distributed vary spatially and temporally in terms of its amount and intensity. The mean precipitation varies spatially from 650mm to 1450mm per annum. Therefore, based on mean annual rainfall and range in altitude difference, Amaro is classified in to three agro climatic zones, namely '*dega*' (temperate or cold climate), '*woina–dega'* (intermediate or warm climate) and '*kolla*' (tropical or hot climate) zones with their respective shares of 32%, 30%, and 38% of the total area of this specific locality.

According the information from the *wereda*'s ANRDO (2020), agriculture that involves mixed crops livestock production system is the main economic stay where majority of rural households of Amaro have been engaged in. Crops grown include coffee, *enset*, barley, wheat, maize, *teff*, *chat*, vegetables, and fruits. However, the locally precipitating rain fall is characterized by its erratic nature, uneven distribution pattern, spatial variability in terms of its amount and intensity. More over frequently recurring drought coupled with other environmental catastrophes such as soil erosion, nutrients depletion, crops and livestock diseases, pest prevalence and low level of input use adversely affected the growth of agricultural production and productivity in the study area (Amaro wereda ANRDO, 2020). To reverse the adverse impacts of erratic rain fall and frequently prevailing drought, the local farmers particularly those who reside in the lowland ('*kolla*') and mid-altitude ('*Woina-dega*') agro-climatic zones are known by their enriched experience of using traditional practices locally referred as '*Angure*'.

This enriched experience and indigenous knowledge of the local farmers on traditional irrigation practice is inherited from their ancestors. Although the exact time irrigation started in Amaro *woreda* is not well known, it is certainly believed that traditional irrigation is a unique and ancient practice for the '*Koore*' people where their livelihood mainly depend on it. The irrigators accustomed to use irrigation as supplementary source of water through diverting the locally flowing rivers and streams using locally available construction materials like stone boulders and wood logs to construct a diversion structure (head work) and an earthen canal for conveying water to their farm lands. The diversion structure is placed at a point where the water comes with its full energy to irrigate the recommended farm land at the lower catchment areas. The local farmers construct earth canals either by excavating the ground or by cut and fill method especially if the ground is not convenient to dig out ditches. Canal alignments following contour lines are done perfectly using the minimum slope differences. It is very surprising and difficult to believe whether it is done by farmers without using the necessary engineering equipment. Big gorges, gullies and canals are crossed using flumes or hollow loges as water pipes. Water diverted from the river is transported to the farm land by means of gravity. Division boxes that help to let water to flow from the main canal to the secondary canals also constructed by using locally available construction materials such as stones, brush wood, mud and '*chid*' or '*teff*' straw. 'Angure' in the high land part of Amaro *woreda* also serve as a solvent to dilute farm yard manures while fertilizing homestead perennial crops.

According to the information from the *woreda*'s ANRDO (2020), Amaro has a total of 211 traditional irrigation schemes /locally referred as 'Angure's / that built by the own knowledge farmers and without having any external support from the concerned experts. Among of these only 9 (nine) were upgraded by governmental and non- governmental organizations. According to the 2020 annual report of the *Woreda*'s ANRDO, this locality has a total of 18406 ha of potentially irrigable land of which only 6500ha is under irrigation (including 5870 ha that irrigated by traditional irrigation schemes and the rest 670 irrigated by the recently constructed modern small scale irrigation schemes).

3.2. Research Design

3.2.1. Sampling and sample size determination units

Among the thirty kebeles of Amaro woreda three kebeles namely 'Kore biko', 'Kobo' and 'Derba menena' were selected using simple Random sampling technique. The existing water sources for traditional irrigation practice in these three sample kebeles are 'Duano', 'Kondilcho' and 'Molle' rivers respectively.

The total population this kebeles comprised of both irrigation user and non-user households. To determine the sample size needed for this study Yemane (1967) equation at 95% confidence interval was employed and a total of 290 households were selected using simple random sampling method

$$\text{i.e.} \quad n = \frac{N}{1+N(e)2}$$

Where, N- total number of households in the study kebeles
n- sample size,
e – level of precision at 0.05.

Accordingly, $n = \frac{1150}{1+1150(0..5)2}$

$$n = \frac{1150}{1+1150(0.0025)}$$

$$n = \frac{1150}{1+2.875}$$

$$n = \frac{1150}{3.875}$$

$$n = 296$$

hence , n=290 is considered

To determine the number of sample households from each kebele proportional probability Sampling (PPS) technique was employed. The number of sample households from each kebele was calculated by using the below formula.

$$n = \frac{ns*N}{Ns}$$

where n = number of samples drawn from a given kebele
ns = number of sample households from the three kebele =290
N= total population of a specific kebele
Ns= total population of the three kebeles

Table 1. Number of sample households from each kebele

Kebele	Total population of the kebele (N)	Sample size where ns=290	Number of sample households from each kebele
Kore	480	n_1=480*290/1150	n_1 = 122
Kobo	345	n_2=345*290/1150	n_2 = 87
Derba-menena	325	n_3=325*290/1150	n_3 = 81
Total	1150	n = n1+n2+n3 n	n = 290

Source:- own survey result, 2020

3.2.2. Data types and source

Both qualitative and quantitative data were collected from their relevant sources. Primary data were collected directly by the researcher while interviewing the sample respondents and while conducting the FGD along with the concerned key informants whereas secondary data were collected by reviewing published and unpublished documents that are available at *woreda* and *kebele* levels.

3.2.3. Data Collection Methods

Primary data for this research were collected by using survey questionnaire. A total of 9 enumerators (three for each kebele) with skill of speaking the local language were recruited and then provided with a two days long training on the contents of the survey questionnaire and how to fill it. The field data collection task took a total of 21 days. Focus group discussion was also conducted in each of the three sample *kebeles* along with the concerned knowledgeable stakeholders (totally 10 members) of the study area including 3 extension agents, 1 *kebele* administrator, 1 water father and 5 water distributors. This method was employed to gather valuable information on the management aspect, structural set up and by law of the traditional water users' association. Secondary data were also taken from published and unpublished sources found at *woreda* and *kebele* levels.

3.3. Data Processing and Analysis

Those quantitative data collected by employing household survey questionnaire were coded, cleaned, and verified before running the computer statistical analysis and then processed using descriptive statistics. On the other hand Qualitative data interpreted and summarized in a form of narration and discussion. More over the binary logit model was employed in order to identify determinants of household's membership in traditional water users

association as shown below.

- **The binary logit model**

The dependent variable for this study i.e household's membership in traditional water users' association is a dichotomous variable that took a value 1 if a household member of the traditional water users; association (*Watsi-qooro*) during the survey and 0 otherwise. Thus the logit and probit models are the two commonly used statistical tools for dichotomous type of dependent variable. For this study however, the logit model is preferred over the probit model in that the logit is simpler computationally and assumes logical distribution of error of terms whereas the probit assumes normal distribution (Nahayo *et al*., 2017 and Kidane *et al.*, 2018). The equation for the logit model is

$$\frac{prob(y_{i=1})}{prob\,(y_i=0)} = \frac{p_i}{1-p_i} = e^{\beta_0 x_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots\ldots + \beta_k x_{ki}} \quad (1)$$

Where pi= the probability of households membership in traditional WUA,1-pi is household's non-membership in traditional WUA and e = exponential constant.

By computing log on two sides of equation (1), we can get

$$L = \ln\left(\frac{p_i}{1+p_i}\right) = \beta_0 x_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots\ldots + \beta_k x_{ki} \quad (2)$$

Where, L = logit model, β_0= intercept term; β_1- β_k of independent variables, and $X_{1i}X_{ki}$ = independent variables shown in Table 1below .

Besides this, the marginal effect was calculated to show the actual impact of each variable on the probability of household's decision to be a member of the WUA. The marginal effect captures changes in the predicted probabilities as the binary independent variable changes from 0 to 1 when all other variables equal their means. Moreover, it shows how much a unit change in one continuous independent variable changes the response variable maintaining other independent variables constant.

Table 2. Description of explanatory variables and their expected signs of outcome.

Dependent variable :- Household's membership in traditional WUA (dichotomous that took a value 1 if the HH is member and 0 otherwise)			
Independent Variable and Description		Type	Signs of outcome
SEX	Sex of the HH (1 if the HH head is male and 0 otherwise)	Dummy	+
AGE	Age of the household head in years	Continuous	-
EDCN	Education level of the household head in schooling years (0=illiterate; 1= read and wright; 2= elementary /grade 1-8/; 3= high school /9-12/; 4= certificate and above);	Categorical	+
LAND	Land holding in hectare	Continuous	-
DISWTR	Distance to the water source in Kms (1 if HH is irrigation user and 0 otherwise)	Continuous	-
DSMKT	Distance to the nearest market in kilometer	Continuous	-
FAMSZ	Number of family members	Continuous	+
TRNG	Training on irrigation (1 if the HH head got trained and 0 otherwise)	Dummy	+
CRDT	Access to credit (1 if the HH head got credit and 0 otherwise)	Dummy	+
LVSTK	Livestock holding in TLU	Continuous	-
DAVST	Frequency of DA visit (0if never, 1= if sometimes/ , 2= if frequently	Categorical	+
FRMEXP	Farm experience	Continuous	+
TRNG	training on irrigation (1 if the HH got training and 0 otherwise)	Dummy	+

4. RESULTS AND DISCUSSION

4.1. Socio-Demographic Characteristics of Sample Households

The socio demographic characteristics of sample households were including sex, age , education level and land holding were discussed based on the result of table 3 below.

Gender

Empirical studies showed that Gender has its own impact on adaptation of new technologies in agricultural production. Most of such studies show mixed evidences regarding the different roles that men and women play in agricultural and non-agricultural activities. Gender also has its own effect on households' access to services offered by governmental and non-governmental organizations including access to extension services, access to information, access to credit, access to trainings etc (Awulachew et.al, 2001). Similarly Gender of the household heads irrespective of his/her age is an important variable in influencing the participation decision of that household

to practice irrigation development activities. This is because male headed households hardly faced labor shortage for both irrigation and rain-fed farming activities due to physical, technological, socio-cultural and psychological fitness of farm instrument to males than females

Similarly table 3 also showed that, among the 242 irrigation user households, 237 (98%) are male and only 5(2%) are females whereas from the 48 non-user households, 12 (25%) are males and the rest 36(75%) are females). The chi square test also showed that there is significant difference between irrigation user and non-user households in terms of their sex.

Age

Age is an important variable in influencing households' participation in irrigation development activities. Irrigation often is a labour demanding activity. Accordingly, as a household gets older and older, he/ she become un able to perform tedious activities. Similarly the statistical result in table 3 showed that majority of the irrigation user households 93% are under the age category 15- 60 years which is of active working group whereas among the non-user ones 89.6% are above 64 years of age and only 10.4% are under the working age group (between 14-64 years). The chi square test also showed significant difference between irrigation user and non-user households in terms of their age.

Education

Several studies showed that education is a very important factor in the development of any country's economy. Education is not only an important determinant of adoption of innovations but also a tool for successful implementation of new innovation in a given society. It creates awareness and helps for better innovation and invention. Similarly the statistical result in table 3 showed that there is significant difference between irrigation users and non-user households in terms of their education level.

Table 3. Demographic characteristics of sample households

Variables	Category	Irrigation users (n=242)		Non-users (n=48)		X^2	P value
		Number	%	Number	%		
Sex	Male	237	98	12	25	20.48	0.005**
	Female	5	2	36	75		
	Total	242	100	48	100		
Age	≤ 14 years	-	-	-	-	2.09	0.903
	15-60 years	225	93	5	10.4		
	≥65 years	17	7	43	89.6		
	Total	242	100	48	100		
Education	Illiterate	44	18.2	30	62.5	32.28	0.046*
	Read and write	61	25.2	15	31.2		
	Elementary (grade 1-8)	107	44.2	3	6.3		
	High school (grade 9-12)	30	12.4	-	-		
	Certificate and above	-	-	-	-		
	Total	242	100	48	100		

Source: Own survey result, 2020

4.2. The Institutional Arrangement of the Traditional Water Users Association in Amaro Woreda

The local irrigators in this locality manage the water from the traditional irrigation system by establishing a traditional water users' association which locally referred as '*Watsi Qoro'*. The traditional Water Users' Association *('Watsi- qoro'*) in Amaro wereda is governed by an agreed bylaw (which is unwritten). It stands for the main purpose of equitable distribution and wise use of irrigation water with own management of conflicts arise between local irrigators. The structural set up comprised of five functional units along with their respective role and responsibilities. These are :-

1. **General Assembly** :- all farmers who use irrigation water from a given river/ stream
2. '**Watsi Maaga' (Water father)** :- 1 per river (Water source)
3. '**Qoro' (Water distributors)** :- their number is proportional to the number of main Canals /'Angure's/ or diversions points.
4. '**Chimate' /Elders /** :- Each main canal /'Angure'/ has at least one elder man.
5. **Irrigators =** Consists of all irrigators who use water from a single canal ('Angure')

The 'watsi-Qoro' is led by a locally elected chief person locally named *'Watsi – maaga'* (water chief or water father) and whose vice ones are the '*Qoro*'s (water distributors), who have been elected by the general assembly in a participatory and democratic manner. Each river has at least one '*Watsi- Maaga*' who is responsible to coordinate the *'Qoro's.* These *'Qoro's* are responsible to distribute water to the users as per the schedule drafted

by the *'Watsi-maaga'* and other committee members.

The '*Watsi-maaga'* is an individual who is influential, be trusted by other group members, well respected and heard, a role model for others, loyal, able to exercise the rules fairly and without partiality, free from corruption and/or rent seeking behavior, and took full responsibility and accountability whenever he/she is violating the rules. He is accountable to the general assembly and is responsible to design an irrigation schedule giving priority to those whose irrigated land located at the lower catchment area of the watershed, to controls whether water distribution is distributed as per the schedule or not, to resolve disputes/conflict as per the rules and regulations along with the elderly men /'*Chimate*'/, to pass penalties such as fines and ostracization, and even now a days he along with the kebele chairman and other elites is responsible to put in prisons / jail / temporarily those who frequently violated the agreed rules and regulations. The '*Watsi- Maaga'* is also responsible to collect fines. Each river has one '*Watsi Maaga'* (water father*)* and several '*Qoro*'s (water distributors). The number of '*Qoro*'s) will exactly be equal or proportional to the number of the diversion structures or main canals (locally refered as '*Angures*').

The committee members including the '*Watsi- maaga'* and the '*Qoro*"s can be re-elected again and again as far as they respect the rules and regulations of the bylaw, found loyal, interested to serve the group members , and be healthier or strong enough to perform their roles and responsibilities. Besides the '*Qoro*'s, there is an elder man locally referred as '*Chima*' who is responsible to resolve any intra-conflicts (i.e conflict between irrigators themselves as well as disputes between the '*Qoro*' and the local irrigators). Any dialogue beyond the capacity of these two committee members (i.e the '*Qoro*' and the respective local elder) will be taken to the '*Watsi- Maaga'* for further treatment and final decision. Besides the intra-disputes (conflicts between irrigators under the same 'qoro' as well as between a '*Qoro*" and his followers), this person i.e the 'Watsi- maaga" is also responsible to resolve inter-disputes (conflict between irrigators under two independent '*Qoro*'s and/or conflict between two or more '*Qoro*'s). The '*Watsi Maaga'* can ask any form of support from the Kebele chairman whenever he faced disputes that need to be treated by the formal laws of the court.

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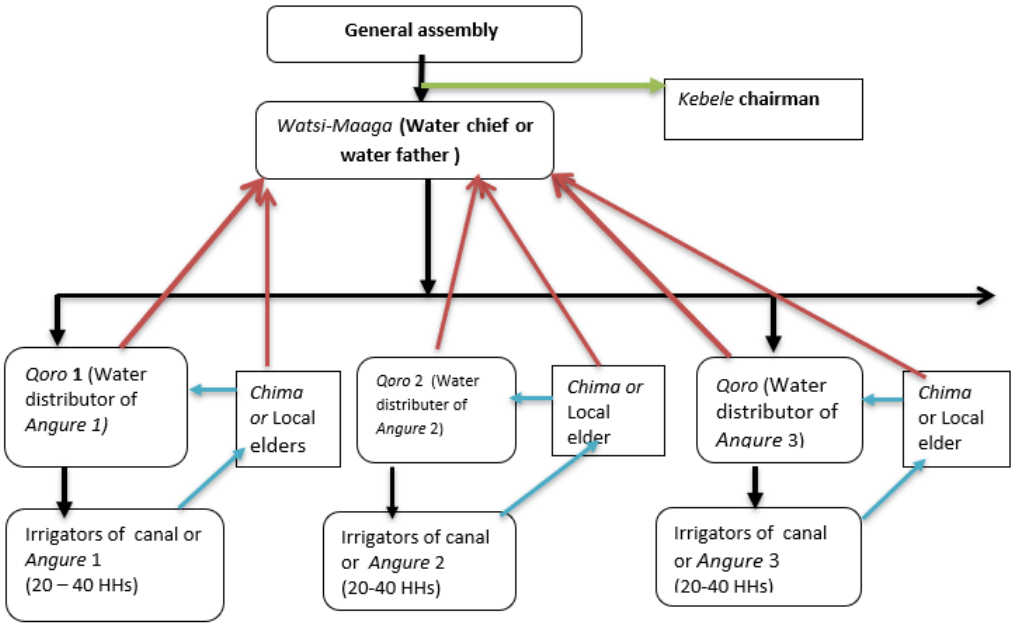
The '*Watsi Maaga' along with other committee members* is also responsible to design an irrigation schedule giving priority to those whose irrigated land located at the lower catchment area of the river basin. Whereas the 'Qoro's being accountable to the „*Watsi-Maaga'* are responsible to distribute water to the local irrigators as per the agreed schedule. The '*Watsi-Maaga'* and/or the 'Qoro's are elected by the general assembly in a participatory and democratic manner. Election is done at least once in every year.

The '*Watsi-Qoro'* system also contributed a lot for the agricultural extension system in that those input users are given priority to irrigate their farm land after the extension agents and the WUAs committee members thoroughly discussed and reached to common consensus. Such decisions encourages farmers not to restrain themselves from using agricultural inputs being in fear of risk associated with moisture stress and thus strengthens the rapport, mutual trust and credibility between farmers and extension agents. The structural set up each functional units of 'Watsi Qoro' is shown in figure1 below

Figure 1. Organogram of the Water Users Association ('Watsi-qoro') in Amaro wereda



Source: - Sketched based on the result of the focus group discussion , 2020

4.3. Enforcing Rules and regulations of the WUA in Amaro wereda

The '*watsi- qoro'* system in Amaro wereda has its own agreed rules and regulation which can be taken as unwritten bylaw. Some rules have the nature of constitutional rules, and other seems collective choice rules and others serve as operational rules. Although they are not written and documented, some of them are stated below as agreed conventions of the unwritten bylaw.

- Each and every irrigator shouldn't keep water on his farm (should not stay for long) beyond the time limit allowed for him and should also respect the time scheduled or allocated for others to irrigate their respective farm lands.
- A person who stole water in turn of others will be made to pay restitution either in cash or in labor form for the one who lost his turn. Again the guilty person will be cancelled from the schedule and his turn will be given to the disappointed or plaintiff one. Besides this, the guilty person (the blame worthy) will be obliged to pay up to birr 300 for the association. If h/she has repeated records in violating the rules and regulations, h/she will be ostracized from the group members and even will be excluded from any social affairs in the community.
- A free rider person who is absent during canal construction and maintenance will be punished or penalized up to birr 100 for the first time and up to birr 200 if for the second time. Again h/she will not be allowed to use water in the next time unless he/she is paying the money to the '*Watsi- Maaga'*. According to the information from few key informants, such fines recently are collected by the kebele rather than by the '*Watsi maaga'*. This implied the interference of the government structure that attempted to replace the informal rules by the formal ones which is not acceptable by majority of the local irrigators. The key informants also agreed that the informal laws are more powerful than the formal ones in enforcing those who violated the rules and regulations of the institution. This is because, recently few people deliberately violet the rules and irrigate their farm particularly their coffee farm analyzing that the cost that they incurred by violating the rule which is a maximum of Br 500 is by much lower than the amount that they will lose in return of not irrigating their coffee or it is by much lower than the income they will earn from the sale of the surplus produce that they obtain by virtue of irrigating their coffee farm without keeping their turn. Besides this, these violators / guilty persons / may not face social sanctions, if they are judged by the formal rules. This however, doesn't mean that, conflicts or cases that lead to individuals' affray and death will not be taken to the police station or wereda court to be treated by the formal laws of the country.
- Each and every irrigator should participate or contribute what is needed from him during scheme maintenance and construction.
- The young aged sons and/or the son in law of a women headed households and elderly persons can irrigate his mother's or father's and/or his mother or father in law's farm land respectively.
- Female irrigators are not obliged to involve in labor demanding and tedious campaign activities such as canal excavation. Rather they participate in easier tasks such as cutting or uprooting grasses from the canal bed,

cooking food for the males who are at work.

- All farmers have equal right to use water from traditional irrigation schemes irrespective of age, sex, clan, religion.
- Each and every irrigator should respect and be governed by the agreed rules and regulations of the unwritten bylaw.
- Money collected from penalty will be used for the purchase of hand tools that to be used for further scheme construction and maintenance activities.
- Each and every member of the WUA (*'Watsi-qoro'*) has equal right to elect others or to be elected as a '*Watsi-Maaga'* and/or as a '*Qoro*' as far as he/she is willing to serve others as well as being loyal or be trusted by others, strong enough (not getting too old) to move from place to place to control the whole operations, respecting others and being respected by others, able to mobilize others during schemes construction and maintenance, free from corruption (impartiality), able to Settle or manage all sorts of disputes/ conflicts among irrigators , integrity in giving priority based on the crops" situation, being free from shirking behavior and willing or Striving to respect rules and regulations of the by law.
- Any conflict between irrigators (Intra-group conflicts) will be resolved primarily by the '*Qoro*' and the village elder man and if it is beyond their capacity the case will be sent to the '*Watsi-Maaga'* for further treatment.
- Any dispute on the '*Qoro*' will be presented to the local elder who is responsible to judge such type of disagreements. If the 'Qoro' is found having shirking behavior, the local elder will report to the '*Watsi Maaga'* to call a general meeting along with those users who organized under /led by/ that particular 'Qoro', and then he will be made to abdicate or handover his power to the newly elected one.
- Inter- group conflicts (i.e disputes between two '*Qoro's* and/or conflicts between irrigators under two independent *'Qoro's* will be treated by the '*Watsi-Maaga'*. Therefore the '*Watsi-maaga'* is responsible to resolve two kinds of conflicts or disputes including intra-conflict and inter-conflicts.

4.4. Determinants of Household's membership in Traditional WUAs

Among the fourteen hypothesized variables only five variables including sex, age, distance to the water source, /Extension contact /DA visit/ and input use were found statistically significant in determining household's membership in traditional water users' association.

Table 4. Determinants of households' membership in traditional WUA

Variables	Coefficient	Marginal effect
SEX	0. 006	0.000***
AGE	0.031*	0.004
EDCN	1.424	0.341
LAND	1.574	0.374
DISWTR	-0.022**	-0.008
DSMKT	-1.134	-0.276
FAMSZ	1.052	0.938
TRNG	0.871	0.214
CRDT	0.320	0.180
LVSTK	-0.125	-0.206
DAVST	0.021**	0.001
FRMEXP	0.767	0.189
INPUT	0.424*	0.054
TRNG	1.140	1.721
Constant -	-4.347**	-1.086
modelX^2	156.722**	
Hosmer-Lemeshow test (X^2):	7.963	
Percentage correctly predicted:	0.744	
Nagelkerke R^2	0.541	
-2 log likelihood	354.657	

*, ** and *** significant at 10%, 5 % and 1 %, respectively.

Source:- 0wn survey result, 2020

Sex

Table 2 above revealed that sex has positive and significant factor that determine households membership in traditional WUAs implying that male headed households are more favored from irrigation water being member of the WUA in the study area compared with the female headed ones. The result of the FGD also assured that although the bylaw of their association gave equal right to both men and women, Females are unable to exercise their right due to socio-cultural and economic barriers and lesser access to institutional supports such as training, credit and

extension supports.

Age

As shown in table 2 above age of the household head significantly and positively influence household's membership in traditional WUA. The result also implied that as the age pof the household increases by one year, the likelihood of households' membership in traditional WUAs also increases by 0.4 %. This result coincides with the findings of with Adong *et al.* (2013) and who reported that older people were 0.9 % and o.5 &% times more likely to participate in collective action (membership in WUAs) than the younger ones. the result of the FGD also showed that Young people aspire to be government officers and traders than being farmers and their parents support such aspirations.

Distance to water source

Table 2 above showed that distance to water source or relative proximity of the farm land to the water source significantly and negatively influence households' membership in traditional WUA. As the distance of the farm land increases by one kilometer from the water source the likelihood of household's membership in traditional WUA decreases by e8% implying that those whose farm land is closer to the water source are more privileged in using irrigation water than those whose land is relatively far apart from the water source. The result of the FGD also revealed that those in the upper stream side of the diversion point are unable to use water from the source due to inconvenience of the relative location of their farm land to convey water. Participants also suggest other alternative water conveyance mechanisms such as water pumps to be accessed by governmental and NGOs for the non-user ones.

DA Visit

The binary logit result in table 2 above revealed that frequency of DA visit or Extension Contact positively and significantly influence household's membership in traditional WUA. As the number of visits by a DA increases by one round the likelihood of household's decision to be member of WUA will increase by 1%. This is because DAs expected to provide meaningful information to farmers on the benefits of irrigation and other technologies to boost agricultural production and productivity and the information intern will motivate farmers to make their genuine decision.

Input use

The result of the logit model in table 2 above showed that irrigation and farmers' utilization of agricultural input has positive correlation. According to the result of the FGD, most of irrigation non-user households are input non-users because of fear of yield loss due to moisture stress. Similarly those with access to irrigation are not in fear of yield loss due to moisture stress.

5. CONCLUSION AND RECOMMENDATIONS

The performance deficiency of several government-managed irrigation systems has increased through time due to lack of support from the concerned stakeholders and lack of strong institutional arrangements. This centralized approach to water resource management has proven to be unsustainable because it has neglected incentives for users to participate in system funding and management and to provide services based on what users want and are willing to pay for.

On contrast to this the traditional Water Users' Associations (i.e the '*Watsi-qooro'*) played significant role for sustainable management of irrigation water and watershed development activities with own management of conflict and disputes in the study locality. The institutions also contributed a lot for the sustenance of the agricultural extension service in this specific area. The enriched experience of these local irrigators on water management and dispute resolution can be considered as a model to be scaled up to other areas where modern irrigation schemes have been failed due to lack of sense of ownership and self-belongingness. The way how farmers share the water resources among members and how the unwritten bylaw is respected and implemented by all water users with own management of conflicts and disputes can be considered as a live example for the modern irrigation schemes throughout the country

The 'Watsi-Qoro' system also contributed a lot for the agricultural extension system since those input users are given priority to irrigate their farm land after the extension agents and the WUAs committee members thoroughly discussed and reached to common consensus. Such decisions encourages farmers not to restrain themselves from using agricultural inputs being in fear of risk associated with moisture stress and thus strengthens the rapport, mutual trust and credibility between farmers and extension agents. Thus, understanding and sharing the experience of this institution and its enforcing rules and regulations will provide readers, GOs, NGOs and other interested groups with an important insight on how collective action helps to manage irrigation water in a sustainable manner and how this experience help them to establish an irrigation users' associations elsewhere. .

Therefore, the locally functioning Governmental and NGOs should support the irrigators either through upgrading the existing traditional irrigation structures or constructing more improved ones. GOs and NGOs should introduce the local framers with efficient and modern water application techniques such as furrow irrigation, basin irrigation, drip irrigation and border irrigation techniques. All concerned stakeholders are expected to provide

capacity building trainings on book keeping, accounting and leadership for the committee members and skill enhancement training for the irrigators on modern irrigation methods. The local irrigators on the other hand should focus on high value and marketable cash crops. To realize this development actors are expected to facilitate credit, inputs and other relevant technologies. '*Watsi-qoro'* should be licensed and registered as a civic organization so as to ensure legal protection and better access to loan and credit services. Moreover**,** stakeholders should strive for the registration of the '*Watsi-qoro'* system by international organizations such as UNESCO as a non- material culture of the '*Koore*' people since it is an ancient practice and heritage for this particular society.

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Abbreviations

ANRDO	Agriculture and Natural Resource Development office
DA	Development Agents
GOs	Governmental Organizations
NGOs	Non-Governmental Organizations
RDAE	Rural Development and Agricultural extension
SNNPRS	Southern Nations Nationalities and Peoples Regional State
WUA	Water Users' Association