Assessment of Women Participation in Agricultural Water Resource Management: The Case of Godino Village, Ada'a District, Oromia Region, Ethiopia

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This is to certify that the thesis prepared by Mulunesh Dargaso Dando entitled: Assessment of Women Participation in Agricultural Water Resource Management in Rural Areas of Godino village Ada'a District, Oromia Region, Ethiopia", submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Water Resource Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

Agricultural Water Resource Management (AWRM) is a base for agricultural system across the country of the world. It needs different stakeholders participation especially women participation for collaborative management of agricultural water (AW). However, different factors affect women participation in AWRM. The study aimed to assess women's participation in AWRM in rural areas of Ada'a District East Shoa zone Oromia Region. Questioner, focus group discussion and key informant interview are used to collect date. A simple random sampling procedure was employed to draw 166 sample household heads from the selected kebele. The data is analyzed using qualitative, descriptive statistics and regression analysis. Binary logistic model was employed to analyze socio economic factors that affect women participation. The result of the binary model revealed that family size is significant and is negatively associated with the probability of women participation, while household headship shows being male, the high probability of participation than being female. Again, As the regression model result *indicates that being married of household head, the greater the chance of participation* than being un married household head and *the, education of household head statistically significant shows the greater chance of literate household head participation than illiterate household head, average annual income of household head and credit access of household head are found to be significant and positively correlated with the probability of women participation. Social challenges like deviant group in the community that affect women participation found significant and are negatively associated with the probability of women participation in agricultural water resource management (AWRM). The opportunity of technical support are also to be found significant and are positively associated with the probability of women participation. The socio cultural factors like attitudes of community toward participation, community value toward women participation, women are incapable to make decision and culturally women are not favored to involve in management highly influenced women participation in the study area In conclusion women in the study area are excluded in all dimensions of participation. They do not include in planning, implementation and monitoring of AWRM. The study recommended that the intervention of government and other stakeholders organizations either private or charity is required in the area in order to create empowered and active participant women who are responsible for the proper management of the scarce resource of agricultural water.*

Keywords: *Agricultural water resource management, women `participation,* Godino Village, Ada'a District

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For the most, I magnify and glorify the Lord Jesus Christ, The everlasting Father, The Prince of Peace, who for being my savior. He is always with me to lead and encourage me when I give up. All situations I have been passed through and come to this point are in His capacity, protection and grace. So, my soul praise, adore and lift up His Holy name until the end of my life here on the earth. Glory to you Almighty God!!

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Abbreviations

AWM	Agricultural Water Management
AWRM	Agricultural Water Resource Management
AW	Agricultural Water
DA	Development Agent
EWRMP	Ethiopia Water Resource Management Planning
FGD	Focus Group Discussion
FHH	Female household head
GOE	Government of Ethiopia
KII	Key Informant Interview
IGA	Income Generation Activity
IW	Irrigation Water
IM	Irrigation Management
IWMI	International Water Management Institute
MHH	Male household head
PAWRM	Participatory Agricultural Water Resource Management
SMWRA	Sustainable Management of Water Resources in Agriculture
UN	United Nation
UNW	United Nation Water
USA	United States of America
USAID	United States of America International Development
WM	Water Management
WUA	Water Users Association
WUC	Water User Committee

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

Agricultural water resource management (AWRM) covers a wide range of agricultural systems and climatic conditions across countries, drawing on varying water sources including, surface water, groundwater, rainwater harvesting, recycled wastewater, and desalinated water (USAID, 2015). It also operates in a highly diverse set of political, cultural, legal and institutional contexts, encompassing a range of areas of public policy including agriculture, water and environment, energy, economic and social. Future policies to address the sustainable management of water resources in agriculture will be greatly influenced by climate change and climate variability, including seasonality problems, such as changes in the timing of annual rainfall patterns (USAID, 2015). Thus, world-wide there is an enormous challenge to produce almost 50% more food up to 2030, and double production by 2050. This will probably have to be achieved with less water, mainly because of pressures from growing urbanization, industrialization and climate change (FAO, 2011).

Globally, there are high expectations for the potential of improved water management to drive agricultural growth and poverty reduction (Mollinga, A. 2007). These expectations are understandable; the regions where there are high levels of poverty and stunting correspond with those characterized by soil nutrient depletion and land degradation (Leakey, B. 2009) and include major farming systems in South Asia, the Sahel, and eastern and southern Africa, where there is a high probability of drought affecting large areas of cultivation (Hyman, W.S. 2008). The millions of people whose livelihoods and nutritional status depend on these major agricultural systems provide a glance of the extensive impact that improved AWM. Thus, it includes irrigation, it is not simply about applying water; it includes soil, land, and ecosystem conservation practices, such as drainage and watershed management, fisheries management and technologies for lifting, storing, and conveying water (Nagayets, O. 2005).

Agriculture has for a long time been dependent on rainfall (Chamberlins, J. 2008) which is not all year round. In view of the need to feed the ever growing population in the midst of the challenge of addressing the recent water scarcity global. Ethiopia, like other developing countries, is pursuing irrigation farming. Irrigation is the artificial application

of water to the soil usually to assist the proper growth of crops in dry arrears and in times inadequate rainfall (Hillel, P. and Vlek, D. 2005). While this is considered appropriate control the challenges associated with rainfed agriculture, irrigation farming is not without questions in Ethiopia. Successive governments instituted some irrigation schemes to provide livelihood for both men and women without giving preference to a particular gender. It was envisaged that both men and women would participate and have access to AWM facilities while at the same time contributing to decisions regarding the operation and management of the scheme.

According to the FAO (2011) women plays very crucial roles in agriculture because they continue represent a large proportion of labor force in the world. Women in Sub-Saharan Africa contribute about half of the agricultural labor force and play the role as farmers, laborers and entrepreneurs. Therefore, the community participation especially women participation required for the management of AWR to keep its sustainability as it is scarce resource. Thus, central part that women play in the provision, management and safeguarding of water and water has an economic value in all its competing uses and should be recognized as an economic good (ICWE,1992). They have been acknowledged as key players in the management of water resources as they are the end users of the resource.

The nature of gender roles has helped them to accumulate considerable indigenous knowledge about the resource and they have discovered indigenous ways of telling the proximity and location of a water source, how to assess the water quality and how to improve it if need be and also devising ways of storing their water safely, (Al Naber S, 2004 & VanWijk-Sibjema, C.1998). Thus, women's involvement in the planning, implementation and monitoring of water management could actively enhance sustainability since they are the end users of such resource (Rydhagen, B. 2002). So, governments as well as international and local agencies realize the important role played by women in water management (Davis, J. 1996). In opposition, most evidences regarding to AWM experiences comes from the Asian and African countries the less participation of women in AWM. Thus, one of the common assumptions made regarding farmers, male are predominant for AWM and usage and; which leads to the assumption that farm household resources and labor are effectively controlled and allocated by males

(Zwarteveen, M. 1997).

The majority of rural dweller women in Ethiopia are among the poorest in the country, with limited power to agricultural water use and management. So, involving women in AWRM is very important. Because they participate in management of AW, they will raise the gender issue in relation to irrigation. However, the predominantly controlled AW and land for male farmers neglected female farmers.

Despite significant efforts by the Government of Ethiopia (GOE) and other stakeholders including communities especially women, improving agricultural water management is hampered by constraints in capacity, integration, and participatory managements at the local level. However, the Ethiopia MoWR policy beautifully stated the participation of women in AWRM (MoWR, 2000). Addressing these constraints is vital to encourage women participation in AWRM. However, regardless of the illustrated point above, major efforts aimed at improving and managing AW and extending access to productive use of water and improved sanitation tend to undermining women (Francis, J. 2003). To a larger extent, efforts are overlooking the central role of women and the significant contribution they can offer to the water management in Ada'a in East Shewa of Oromia region. Therefore, this study attempt to assess dimension of women's participation in AWRM, factors that affect women participation, challenges and opportunities of women in AWRM in the study area.

1.2. Statement of the problem

The Ethiopian WRM Policy sets guidelines for water resources planning, development and management. The policy includes fundamental principles pertaining promotion of the participation of community management of all stakeholders and user communities, particularly women's participation in the relevant aspects of WRM (MoWR, 2000). Accordingly, AWRM which includes different type of water resources incorporated in the national policy of the country; and irrigation managed under the policy of EWRMP. It is one of the sub sectors included in the EWRMP promoting women participation in its management. As a result, both men and women are involved in irrigation farming.

However, women are not perceived as the direct stakeholders of agricultural water user and farmer (Zwarteveen, M. 1995).Thus, irrigation farming has been categorized as men’s work in rural area. According to this justification, irrigation has mainly focused on

men; and due to this all Irrigation Management (IM) issue controlled by men. Due to this women are being ignored from IM, not allowed access to bodies aimed at decisions-making that concerning water use and irrigation farming, there is also limited information, in terms of literature on women participation in irrigation to allow for systematic analysis and policy decisions of women in irrigation WM (Mehra, R. and Esims, S.1998).This undermining women's participation and decision-making power in such AWM schemes is critical and worthy of study as it links to what is happening globally. Whereas, the new system of irrigation management (IM) encourages participatory IM based on gender lines among others, and the approach perceived as opportunity for a more equitable access to use and management of water, they have often excluded women in management positions (World Bank, 2004).

Further the low representation of women in AWRM at root level decision-making position had retarded the progress of many nations. This has been a serious concern to international and local institutions in many countries of the modern world. The Global trend about women's participation in the public sphere led to various efforts towards increasing women's participation in public office and decision-making. The 1995 Beijing Conference Plat form for example, called for equal gender balance in decision-making as a necessary condition for achieving equality, development and peace (Mukhopadhyay and Meer, 2004). Thus, still the specific roles, tasks, and functions of women have neglected in AWRM.

As evidences highlighted above, the majority of women are not actively engaged in AWM decision making activity in agricultural water use that require water access for economic development benefit through irrigation involvement is not very clear. Thus, most of the time the agricultural water use and supply management lack women participation at local level. Because of the different gender roles, men and women accepted by society and the value attached to them, women are excluded from function of management; and decision making is mainly left to the male dominated. The cultural barriers are another problem that stagnated women participation in AWM (Mesay, 2012 and Amleset G/egziabher 2011). In general, participation of women in AWRM not yet considered properly at local level as the WM principle of Dublin 1992 number three set the participatory approach management that include women, as the country of

Ethiopia adopted it for WM and as the (MoWR, 2000) of Ethiopia promoting the participation of women in WRM. Due to this women lack different opportunities and vulnerable to poverty (ICWE, 1992). Adoption and implementation of the policy at the root level was not yet properly managed; and women are being marginalized in AWM issues at local level. All of these the above constraints are problems of women participation in AWRM.

Finally, there are researches conducted by (Amleset, 2011, Mesay, T. 2012 and Kalkidan, F. 2016) about role of women in WRM, role of women in agriculture and the role of gender in small-scale irrigation. They have seen the roles of women deeply in WRM and agricultural production side. Three of them used both qualitative and quantitative methods in triangulated way to see the variables critically. Their findings are the socio-cultural barriers, the triple household level responsibilities and burdens that affect the role of women with the regard of agricultural production through irrigation and WRM. The studies were focused on the roles of women in WRM, irrigation and agricultural production side only. Participation of women in AWRM in different dimension and water users committee (WUC) was not focused by three of the researchers. Therefore, this study was focused to assess the participation extent of women in AWRM in different dimension and in WUC in order to evaluate women participation status in water management. Beside, as I tried more to find, there is no study that directly linked with women participation in AWRM specifically. Therefore, studying women participation in AWRM which includes variety of water resources with regard of management side in Godino village Ada'a district Oromia Region is very important to fill the gap as the study area community survivals depend on it.

1.3. Objectives of the study

General Objective

The major objective of the study is to examine the determinants of women's participation in AWRM in Godino Village of Ada'a District Oromia Region.

Specific objective

The specific objectives of the study are:

- To evaluate women's participation in planning, implementation and monitoring of agricultural water resource management and to determine participation dimension in the study area.
- To examine the socio-cultural and socio-economic determinants of women's participation in agricultural water resource management in the study area.
- To assess the challenges and opportunities of women participation in agricultural water resource management in the study area.

1.4. Significance of the study

The study was aimed to increase awareness about women's participation in AWRM and assessing the opportunity of women. Access and control of resources of water is highly gender specific and may vary considerably for different non productive water users. Thus, this study focus is to create recognition about women participation in AWRM for all communities in the study area, specifically for women and to make them participant in AWRM at community level. Moreover, it gives an insight for other researchers who are interested to study it more. Finally, as this study deals with the contribution of women participation in AWRM and its implication on women empowerment, it triggers the rural communities to consider women's participation in decision making position that urge to attain the performance in development.

1.5. Scope and limitation of the study

This study mainly focused in Godino village of Ada'a district of East Shewa zone of Oromia region. It addresses the extent and level of participation of women from the very inception of the planning to monitoring stages.

The major limitation in under taking in this study was the conceptual and methodological knowledge gap which are lack of related research and unavailability of sufficient secondary data needed to supplement the primary data when the research carry out.

1.6. Organization of the study

The study is divided into five chapters. Chapter one contains the introduction part which constitute statement of the problem, general and specific objectives, significance, scope and limitation of the study. Chapter two provides review of related literature, concepts and definitions gender and participation, theories and empirical review. Chapter three

contains research methodology and materials. Chapter four contains data analysis and presentation, and chapter five contains conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1. Definition of Basic Terms

2.1.1. Gender

Gender is socially constructed set of roles and responsibilities associated for women and men. The roles of gender vary greatly in different societies, cultures and historical periods as well as they depend also on socio-economic factors, age, education, ethnicity and religion. That, deeply rooted, gender roles can be changed over time, since social values and norms are not static. However, sex it is biological and being girl and boy. (http://reports.weforum.org/global, 2014)

According to Scott, (1988), gender is constitutive of social relationships based on perceived differences between sex and it is a primary way of signifying relationships of power. She argues that changes in the organization of relationship always correspond to the representation of power but the direction of changes not necessarily one way. Gender relation of power between men and women are difficult to understand because this interaction requires both material and ideological aspect that is found in nature. The material is not only disclosed in the roles played by men and women and the distribution of resources between them but also through ideas and representation ascribing men and women in different abilities, attitudes, desires, personality traits behavior and patterns.

2.1.2. Participation

The term participation, however, has no one common definition. It is interpreted differently by different organizations and individuals. Cooke & Kothari (2001) defines participation as a process through which stakeholders' influence and share control over development initiatives, decisions and resources that affect their lives. Chambers, R. (1995) says that, participation is used to describe an empowering process which enables local people to do their own analysis, to take command, to gain in confidence, and to make their own decisions. De Beer & Swanepoel, H. (1998) define participation as a collective activity in that a group of people sharing mutual interests, a sentiment or concern, act together and in performance. They assert that this collective action will lead to minor successes that will boost the poor's confidence to tackle much bigger problems.

In the context of this study, participation refers to the ability of women to define and prioritize their challenges and actively engage in all activities in AWRM decision-making

processes that enrich their lives. Most development theorists however, agree that participation is a process by which people, especially the disadvantaged people, influence decisions that affects them though they disagree about how this influence should be applied and how strong it should be (Brett, E.A.2003).

2.1.3. Agricultural water resource management

Agricultural water resource management is using water in a way that provides crops and animals the amount of water they need, enhances productivity, and conserves natural resources for the benefit of downstream users and ecosystem services (USAID, 2015).

Accordingly, there is a range of regulatory arrangements in agricultural water resource management designed to minimize negative outcomes and resolve conflicts over competing demands for water resources (Sarah, A.A 2015).

2.2. Theoretical Framework of Participation and WED

Participatory decision making democracy is very necessary for AWRM. Thus, this study is therefore guided by the framework developed by Sherry Arnstein in 1969 which is commonly referred to a ladder of Citizen Participation. The rationale of this participatory approach is to encourage the involvement of all stakeholders in any development project implementation.

Arnstein represents this participatory process in the form of a ladder made up of eight rungs with each of them corresponding to the extent of power that the citizens have to influence social, political and economical outcomes. These steps are about manipulation, therapy, informing, consultation, placation, partnership, delegated power, and citizen control in projects management. Each rung corresponds to the extent of citizen's power in determining the end product (1969)

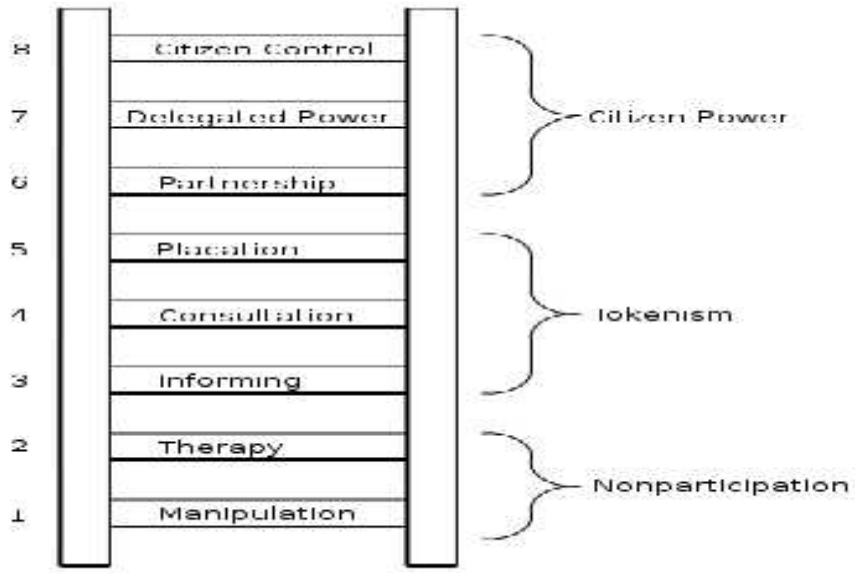

Figure 1: Diagram of Arnstein ladder of participation

Source: adopted from Arnstein, 1969.

The top of the ladder or model symbolizes genuine or optimal form of participation in which people have control over their resources and the power to substantially influence or initiate societal processes reflecting their own interests (Arnstein, et al 1969). Genuine participation only starts taking place at the level of partnership which is an outcome of a negotiation process between powerless and power holders that entails the re-distribution of power and an agreement among the partners to share planning and decision-making responsibilities. The next two rungs, delegated power and citizen control, describe the move from having genuine part in the decision-making process in a form of partnership to dominating that process, and eventually holding full-managerial power.

Tokenism describes a process of information sharing, in which the powerful inform the powerless and the latter are able to inform the powerful through consultation. However, the lack of power redistribution leaves the powerless without any ability to ensure that their views and aspirations have any influence on the process and its outcome. The bottom of the ladder represents the lowest rank of power. It can be interpreted as non-participation. At this stage, the model indicates that the "power holders" remain in total control and determine the outcomes of a given process, while at the same time maintaining an appearance of legitimacy and moral authority by referring to the participation of the people in the process. This is achieved through manipulation which

makes use of committees, advisory groups, and councils which have no legitimate function or power to pursue predetermined decisions.

2.3 . Theoretical framework of WED (women, environment and development)

In the early 1980s the WED (women, environment and development) was heavily propagated by nongovernmental organization (NGOs) and that portrayed women as having a strong affinity for the environment (Ray I. 2007 & Jackson C. 1993). These ecofeminist scholars posited that women are by virtue of their biology, more closely linked to nature, thinking that have rise to images of women as Earth mothers (M, Shiva V.1993 & Jackson C.1993). As much, women were seen not only as more likely to be harmed by the environment's degradation but also as more likely to be responsible for its care and conservation.

Questioning, regarding whether women's and men's relationship with nature differ have increasingly become a concern of feminist scholars. One outcome of this debate may be to question the extent to which women are more likely to be concerned about and capable than men in solving environmental problems. Three issues that lie at the heart of theoretical discussion on women and the environment are what are women's relationship with nature? what are the connections between the domination of women and the domination of nature? What role do women play in solving ecological problems? (Sachs, 1997).

Women's access to and control over resources is a crucial factor in discussions on women's connections to the environment. Access to property, land and water rights, particularly in agricultural systems, critically shapes people's relations with natural resources. State polices and local practices define women's and men's differential access to land and water. State-sponsored irrigation schemes are notorious for overlooking women's concerns. Further, they often increase women's involvement in agricultural decision-making (Sachs, 1997).

Although women are closer to nature trends to lean towards essentialist notions, it is also true that their first-hand practical knowledge on environmental issues and sustainability cannot be underscored enough. Too often, polices are formulated without consulting the women who continue to be integral factor in environmental resource management despite their invisibility in public policy.

Gender divisions in labor and access to resources results in men and women harboring distinctly different knowledge about the environment (Sachs, 1997). Women's knowledge about animals, plants and water often goes unnoticed by agricultural development agencies and other personnel, yet their strategies for survival may point to new directions for achieving environmentally sustainable agricultural and natural resources.

Relevance of the theories to the Study

(Arnstein's, 1969) model and WED are central as a conceptual framework for this study. Thus, participation has become a pillar in development discourse and practice, particularly in the management of water resources. Accordingly, stakeholders participation in decision making, planning, implementation and evaluation of water management practices is expected to increase efficiency and equity in water projects. Cleaver, E. and Elson, D. (1995) have pointed out that community AWRM schemes may not be equitable and lead to further marginalization of the poor, especially women. This is because AWRM projects generally view communities as homogeneous entities and overlook complex realities that influence access to and control over water resources. (Adams, D and Agarwal, B. 1997) propose that women's and men's involvement in community projects have to be assessed in terms of their decision making powers and the benefits accrued to them in various forms.

This framework of (Arnstein, 1969) and WED are used in this study to assess how the participation of women in the AWRM of Ada'a district conceptualized as stakeholder of the resource. Both frameworks are conceptualized in this study to place women as the key stakeholders among the list of actors. The frameworks help the activities around the water management in order to establish: how the women participate in, what capacity, to what effect and with what means. It equally finds out how the local women use the water resources and for what purposes. The frameworks are thus used to analyze how the contributions to the development and management of the water resources are divided between the local men and women.

Finally, the frameworks are used to assess women participation in different dimension, socio cultural and socio economic factors that affect women participation in AWRM, challenges and opportunities of women participation in terms of AWRM that is, are women participate in AWRM?, what are the factors that affect women participation in

AWRM? and challenges and opportunities of women in AWRM?. These questions help to enhance information as how and why the local men and women participate in the AWRM. The questions are all about dimension of participation, factors, challenges and opportunities. That is, how the women in Godino village Ada'a woreda Oromia Region have access to power to enable them to fully utilize the water resources for their own needs.

Thus, the objectives of this study are captured by framework which illustrating how water management issues relating to citizen control, delegated power, partnerships, placation, consultation, informing, therapy, manipulation by considering dimension of women participation, factors, challenges and opportunities in AWRM in the Godino village Ada'a woreda Oromiya region. The framework is also implicated in the methods that were used to collect and analyze information to relate to the objectives of this study.

2.4. Agricultural Water Resource Management (AWRM)

AWRM has a range of regulatory arrangements in designed manner to minimize negative outcomes and resolve conflicts over competing demands for water resources. Thus, key water governance issues for irrigators at the access/user level include the rights to use water and in what form use it and all its require and provision included in AWRM. Agricultural activity requires the greatest share of global water use. The share of water use in the agricultural sector rose steeply from the 1940s and by 2000 was estimated at 70 per cent of global total water use. This share varies by region, and estimates of agricultural water use range from 40 per cent in countries that import food and have a developed economy to over 95 per cent in countries where agriculture is the primary economic activity (UNW, 2006). Most of the world's production of agriculture is rain-fed. Irrigated land currently represents only 20 per cent of the world agricultural land but has expanded 117 per cent since 1961 (FAO, 2011).

Irrigated agriculture is the world's largest consumptive water withdrawal and use sector. Irrigation water withdrawal tends to exceed irrigation water requirement due to significant losses in distribution and application (FAO, 2012). Irrigation water use depends on the crop water requirements and the water available to crops. Crop production is by far the largest water-consuming sector within agriculture where rice, wheat, other cereals, roots and tubers, pulses and fruit and vegetables make up the

main irrigated crops for global food supply. Crops for livestock, pasture feed and other grain production require the highest levels of water application per dollar value of production relative to lower water use rates per dollar value of product for irrigated fruit and vegetable crops. It is estimated that 2.0–3.0 m^3 water is needed to produce enough food for a person's daily diet (FAO, 2012).

Irrigation has been growing strongly over the past 60 years. The adoption of irrigation practices was part of the 'Green Revolution' from the 1940s to the late 1960s. The largest irrigating countries (in terms of hectares of irrigated land) include India, China, USA and Pakistan. Irrigation in developing countries has been forecast to expand by 20 per cent between 1998 and 2030 with agricultural water demand growing by 14% in the same time period (FAO, 2002).

Although the world's cultivated area has only grown by 12 per cent in the past 50 years agricultural production has grown between 2.5 to 3 times. Productivity increases in recent decades have been influenced by input intensification, mechanization and irrigation; and more than 40 per cent of the increase in food production came from the increase in irrigated areas (FAO, 2011). Gravity-based irrigation which includes flood and gully irrigation is the main application used for surface water irrigation across the world 94 per cent. The remainder is irrigated by more expensive, energy-consuming methods such as sprinkler and drip irrigation. Other methods used throughout the world include pitcher (jug) irrigation.

The provision enhancement for agricultural water has traditionally dominated water resource planning in the modern era for many developed countries. Such enhancement is most dominant when the costs of irrigation infrastructure are low, freshwater supplies are seen to be unlimited and there is little consideration given to environmental, cultural or social demands (Griffin, R.2006). Hence, variability of water supplies over time and by location has typically been managed by building water transfer infrastructure and water storage. Thus, some supply enhancement strategies include: building/enlarging dams; drilling/improving wells; repairing infrastructure; and reprogramming reservoir operations (Griffin, R. 2006).

Water has high mass by volume making it bulky and expensive to transport compared to its value per unit of weight (young, H. 1985). The high fixed costs of building

bulk water storages have typically encouraged large shared storages and single entity storage providers. A consequence is that stored water can have a relatively low marginal cost. Expanding water storages, however, typically requires major investment causing divergence between short-run and long-run marginal cost. This short versus long-run cost divergence imposes pricing challenges on water managers seeking to provide a signal of water scarcity value, especially if water is priced at a rate that covers only the average supply cost and not the full costs (young, H. 2010).

2.5. Women participation in Agricultural Water Users Associations and decision making

It is real that a large number of women are involved in irrigated agriculture. However, the participation of women in WUA is very low. Thus, irrigation farming is perceived as occupation for men only and for that matter women are not seen as stakeholders (Zwarteveen, M. 1995). However, in Indonesia also revealed that water users associations are not able to function properly because of the lack of women in the association (Zwarteveen, M. & Neupane, N. 1996).As a result, the interest of women cannot be represented and it can lead to poor performance in management of agricultural water.

Broadly as the facts revealed, women are increasingly being seen as active agents of change and the dynamic promoters of social transformations that can alter the life of all members in society (Sen, Sen, Amartya. K. 1999). However, the manner in which decisions and choices on water resources are handled can have great implications on women who use the technologies to get water and are the end users of water resources in the households (Rydhagen, B. 2002).

Gender sensitivity which involves women participation in agricultural water management is important. According to the (UNDP, 2006), the cause of the water crisis globally, is believed to be far from a scarcity problem. Instead, it was as a result of poverty, inequality, unequal power relations and defective water management policies evident in most third world countries. Policy constraints and gender inequalities in water management has resulted in low sustainability of the conventional communal water supplies, leaving more people in the rural areas with no access to safe water for domestic and non-domestic use (Sutton, S.2008).

In most societies, women have the primary responsibility for the management of household water supply, sanitation and health. Water necessity is not only for drinking, but also for food production and preparation, care of domestic animals, personal hygiene, cleaning, washing and for productive use. Because of their dependence on water resources, women have accumulated considerable knowledge about water resources, including location, quality and storage methods.

There has been a growing body of evidence that just demonstrates the value and importance of an integrated approach to water management. The role that women play in the entire process of water management cannot be over emphasized. The gender roles of women make them key custodians of domestic water supply and they should be seen as important agents in its management. Women give life and take care of families and water is a necessity to human health, economic and social development of communities and nations around the world, (GWA, 2006).

It is almost certain that the value they place on water is a vital resource in searching for the most cost-effective solutions. This value may also lead to efficient solutions, as evidence has shown that when women and men share the burdens and benefits of any given developmental project are remerged, it deepens on community involvement and optimum use of time, money and resources. It may further contribute to finding equitable solutions in WRM because gender-sensitive water projects offer opportunities to address inequalities between women and men in access to resources, services and influence, and to promote the empowerment of women (Van Wijk-Sibjema C. 1998). Participatory or integrated approaches in resource management and agriculture can be more responsive to the needs of people, as they fundamentally change the respective gender roles of extension agents and clients. An agent is no longer seen as the expert who has all the useful information and technical knowledge. Individual and collective client knowledge is recognized as a major resource, and solutions to local problems are developed in partnership with all stake holders.

According to (Isha, R. 2008), water researcher, as well as practitioners at the community, national and international levels has become much more gender sensitive than previous. She argues that many researchers have converged on the desirability of local-level or community participation in AWM, especially women participation. The argument of the

researcher, favors women's participation in decision making over the use and management of water resources shift from sustainable development to women's empowerment. when people are denied access to clean water at home or when they lack access to water as a productive resource, their choices and freedom are constrained by ill health, poverty, and vulnerability and while scarcity is a widespread problem. Due to this women and young girls face double burden disadvantage, as they are the ones who scarifies their time and education to collect water (UNDP, et al 2006). And yet, the issue downfall a building global commitment, as well as politics around water management, since the crisis hits most directly the poor and women who lack the voice.

According to (Opare, S. 2005) the inability of women to rise up to leadership position is as a result of cultural belief that reduces women to subordinates and men as the dominant group. Hence leadership roles are ascribed to men who are even younger over older women because they are men. Furthermore, (Barrie, 1982) asserts women's subordination is associated with specific household ideology which excludes women from gaining access to resources such as income and political autonomy. This makes women economically dependent on their husbands. The various beliefs the place of a women is associated with the domestic sphere where they take care of children and that reproductive work is a women's sole worlds is used reinforce women's subordination.

In rural communities, women have limited or no voices at all in decision making even if they have, they are position as that are not directly influential for example organizers and ordinary executive members (Opare, S. 2005). In addition, they are not involved in any decision making or development planning processes because they are not able to express themselves in the presence of the heavily dominated males, they are considered as non-literate by the men and they lack the confidence to resist challenges of such actions (Zwarteveen, M. and Neupane, N. 1996). Furthermore, women's needs are neglected even though they are specific and different from those of men or are complementary to the needs of men. It is often presumed that women are the subordinate group in society and hence have nothing to contribute when it comes to farming or irrigation agriculture, which women are ignorant about. The lack of empirical studies on such gender issues related to AW has created a vacuum in policy making. Women issues, views and interest

in AWRM have generally been ignored and ill-represented in literature (Zwarteveen, M. 1994).

The World Bank report states that such Water Users Association (WUA) have been effective, in increasing farmers' productivity, improving accountability and performance and improving the financial sustainability of AWM systems in developing countries (World Bank, 2004). In spite of this, the new system of water management is not without challenges. This includes poor representation of women in the management of such associations and the schemes (Agarwal, B. 1981). While the new system of irrigation management encourages participatory irrigation management based on gender lines among others, and the approach perceived as opportunity for a more equitable access to use and management of water, they have often excluded women in management positions (World Bank, 2004).

2.6. Evaluating dimension of women's participation in AWRM

Participation can be viewed from either a planner centered or a people centered window. In the planning phase, participation by people increases their investment in the success of a project. From this level, participation is seen as a device to achieve efficiency. In contrast, when discussed from a people centered perspective, participation helps satisfaction of local needs and also serves as a tool for empowerment, especially for women. However, it is very important measuring women participation based on participation indexes. These dimensions are planning, implementation and monitoring; and three of them are described below.

Planning

Gender-transformative planning techniques acknowledge and make visible women’s experiences, and activities, needs and responsibilities associated with domestic and other productive work. They also respond to the consequences of having a female sexualized body in public space, and the temporal dimension of everyday life, that looks beyond the productive life and responds to the different times when domestic and other productive work are developed (Moser, A. and Levy, C. 1986). These issues are enormously important in rural, playing out via policies about basic services and how these are prioritized, how daily mobility systems are structured that was, how, when, for what

reason, and with whom people move throughout space, or how safety was perceived in the public space.

Participation as a tool of empowerment, which can be used in processes by which organized groups in the rural and individuals within their identity and articulate their interests, negotiate change with others, and transform rural community life and their role within it (Beall, J. 1996). It is essential to include a gender perspective in participatory processes to be able to respond to the diversity of people and practices, and break hierarchies. Participatory planning processes need to be gender-transformative (Kabeer, C.Y. 2005), responding to women's needs according to their realities, but without limiting women to the care role, and without reproducing gender stereotypes; transformative in the sense of promoting women's ability to challenge these roles and stereotypes.

View of planning from a gender perspective considers that women are experts about the places where they live and about the resources where they use like water. Planning must take, as its starting point, the experience of people at the community and neighborhood level, who live in, use the spaces and resources; it focuses on and wants to develop (Fenster, A. 2005). In general, a gender-inclusive planning prioritizes a model of packed together rural women in AWRM planning stage to present their interest including others in order to balance decision making between men and women.

Implementation

Implementation is also seen as a learning process thereby, promoting a continuous, even endless participation process. In such a scenario, the implementers through continuous searching processes always find improved goals and functions and more reliable management techniques and technologies (Liebenstein, U. and Maital, Z. 1994).The effective participation of women's groups in the implementation process could facilitate development as an outcome. Conversely, the non-participation of the community especially women in implementation process may undermine the collaborative effort of managing the scarce resource like AWRM.

Implementation as an evolutionary process is when deciding on goals and finding the means to enhance the outcomes takes place in a dynamic environment with ever changing circumstances rather than in a static environment. (Majone G. & Wildavsky, B. 1978) put

these changing circumstances into a better perspective, namely, at each point we must cope with new circumstances that allow us to actualize different potentials in whatever policy ideas we are implementing. The different potentials in my view seem to suggest the promotion of a broader participatory union even far beyond the women. In this particular resource management implementation the WUC could be potential partners regarding women participation in AWM. The indeterminate environment in this case could be the complex social structures and value systems, which define the position of women in rural Godino community. To implement a policy in such an environment may require some degree of tact, flexibility, and adaptation in design and planning as a mechanism to make women as a participant during the course of implementation. In this connection, where, when, and how adaptation should take place are of crucial importance for the inclusion of women in AWRM as an outcome.

Monitoring

Monitoring refers to the process of keeping track of progress and reviewing whether the AWM implementation was progressing according to plan. In order to conduct any kind of monitoring it would start with a monitoring plan. Accordingly, monitoring must be participatory; as the community members must be the direct beneficiaries of the resources, can play an active role in monitoring (Meera K., 2006). For these reason including women in monitoring is very important as the planned, implemented together. Thus, maintaining the record at the direct beneficiaries level, analyze progress and use the information to make decisions about plan implementation must be inclusive. Therefore all monitoring activities are geared towards producing reports for the community. While timely reporting to the community was important, monitoring plays a key role within a beneficiaries and it was most effective when used by participants who are stakeholders of the resource and implementers to review progress and make day-to-day decisions.

It may not always be possible, or desirable, for everyone at the community level to maintain records. In this case, community members must select a person or a small group of people including to take on this responsibility for the community (Meera, K. 2006). However, all beneficiaries the marginalized poor and especially women must participate in and have access to monitoring information, and this information must be shared

periodically with the community, members are fully informed when decisions regarding implementation are taken. This can be done during regular meetings with all the community members inclusively. Progress for the past period, such as the previous month, was discussed and decisions are made for the subsequent time period. While these regular meetings can be run by community volunteers associated with the community inclusively, the community member must be present (Coupal F., 2001). Such a process ensures active involvement of all concerned beneficiaries in the review and planning processes by then. Accordingly, for the monitoring process first planning is very important to carry out monitoring that focus on AWRM aspect in order to see the issues related with it. In addition, record is necessary for previous action in order to check the accomplishment and modify the procedure in new way.

2.7. Factors affecting women's participation in AWRM

There are different types of factors that affect women participation in AWRM. These different factors categorize into two, socio-cultural and socio-economic factors. The socio-cultural environment was described as an environment which consisting of everything that is not contained within the economy system (Felicia, 2013). It was a socio-cultural system which is made up of collection of activities and relationships through which people engage in their personal and private lives which include population features, demographic, ethnicity, religion and associates. These environmentally relevant patterns of behavior lead to the creation of different cultural values in different societies, some of which influence the decision to create new environment. Therefore, culture, as distinct from political, social, technological or economic contexts, has relevance for participation behavior (Shane S. 1993).

Therefore, there are socio cultural factors that affect women participation in AWRM in the study area. These socio cultural factors like community attitude toward women participation, women participation acceptance by the community, looking women as incapable in decision making and culturally women are not favored to involve in management are common in the community of Godino village.

Attractions refer to cultural conceptions about what are desirable goals or ends and what are appropriate standards for judging actions. They constitute standards by which people evaluate goals and actions (Rokeach M,1974). Also, values or attraction refer to

convictions about what is right and wrong (Robbins S. & Coulter M. 2007). There is a widespread agreement in the literature regarding five features of the conceptual definition of values: A value is a (1) belief (2) pertaining to desirable and states or modes of conduct, that (3) transcends specific situations, (4) guides selection or evaluation of behavior, people, and events, and (5) is ordered by importance relative to other values to form a system of value priorities (Schwartz S. & Bilsky W. 1990).

Attitudes (acceptances) are evaluative statements either favorable or unfavorable concerning objects, people or events. They reflect how an individual feels about something (Robbins and Coulter M., 2007). However, there are major agents of social factors are family, the peers, the school and the media, reference groups, roles and statuses (Phil A., 2010). Reference groups are groups that serve as direct or indirect points of comparison or reference in the forming of person's behavior. For example, some people admire business people, musicians, politicians models, and so on. In most cases reference groups contain our heroes and women for instance will tend to be participant when they see their referents. Also family constitutes the most influential primary reference group that shape an individual's behavior. Families shape many of an individual's basic values and attitudes including views and religion, politics, education and one's attitudes towards material possession. Also, families can inspire certain values and beliefs into their children, and until they become adults, these continue to influence their decision processes. Moreover, as the culture is learned behavior, formal and informal education plays an important role transforming cultural values from one generation to another. Thus, education system assists to foster support and encourage those interested in knowing what it is like to be participant (Alwis W. & Senathiraja R., 2003). Therefore, cultural factors influence the participation of women in AWRM broadly in the different community context; and the choice of participation to be undertaken.

As the points elaborated above, in Ethiopia, the conviction of the community what is right and what is wrong for positive cognition toward women participation is very low. Thus, like practices in the community not adjusted with actual updated policy that promoting women participation in AWRM. Beside the practice of socio-cultural factors

like attitude toward women participation, the role they play and the contribution that they offer not valued properly.

In addition, culturally women are not favored to assign as a leader in management was another factor that discourage women motivation and limit participation of women. Further, community perceived that women are incapable to make such management decision. This is one of the potential socio-culture hot issues through Ethiopia nation nationalities. Thus, still the documented policy not properly implemented, especially at rural area and the study area too. As a result, the past practice that the community internalized as a culture still not changed at rural area. These all the above factors affect the participation of women in AWRM.

In spite of their contributions to the wellbeing of their family and community affairs. Women are facing multiple forms of deprivation. Gender based discrimination, lack of protection of basic human rights, violence lack of access to productive resources, education and training, basic health services, and employment are wide spread (NCTPE, 2003).

Socio-economic factors

There are different factors that affect women participation in different issue in rural area; those are socio cultural and socio economic. The socio cultural factors discussed in detail the previous section. The socio economic factors like sex of household head, marital status of household head educational status of household head, family size of household head, average annual income of household head and credit access of household head.

Women's independence in participation is positively associated with the above mentioned factors at rural level. Illiterate rural women have less autonomy in participation in society. Education increase women’s confidence to participate in any management process as well as in AWRM. Women’s participation is related to their mobility. But it is a common scenario of today that women movement has locked in patriarchal society because of having low educational status. Bbaale, E. & Mpuga, P. (2011) stated that the importance of education for woman has been accepted worldwide, as it improves their earning ability and participation. Education also pays in economic terms for women, by allowing them going out of their houses and work in different sectors of the country.

Female education has also been claimed to alter household power relations making women more confidence and giving them greater control of various dimensions of their lives (Omariba, D. 2003). Education is recognized as a major instrument in empowering women. Education may help a woman to gain a better understanding of her rights and responsibilities, and make her more confident about her possibilities, including the possibility of participation. (Acharya, Y. 2008 & Maitra, P. 2004) argued that female education is likely to increase the bargaining power of the wife and reduce the power imbalance within the family. Also, the higher the education level of woman, the stronger is the effect of education on participation.

In addition, credit access can be an important factor in protecting female households from shocks to their income because of agricultural risks which include drought and diseases. The role of credit access may also include increasing agricultural production and smoothing consumption patterns of rural households. Credit access can also provide rural female households with a choice to spend more on agricultural inputs (Adams, D. & Vogel, R. 1990). In general, credit access is a critical contributor to poverty reduction in rural female households (Bandyopadhyay, A.1984). Having credit access one of the major way to empower rural women by providing finance that help them to buy agricultural inputs. Thus, as the women actively engage in agriculture, they tend to use agricultural water. The one who use agricultural water need proper management of agricultural water and motivate to participate in AWRM. Due to easy way access of credit one of potential determinant for participation. Thus, women participation affected by the factor of credit access.

However, due to lack of credit access, female household heads are more dependent on friends and relatives for credit. So, for household heads (whether male or female) credit from friends and relatives is the major source of credit access. This is common in most developing countries (Zeller, M.1997).

2.8. Challenges and opportunities of women's participation in AWRM

2.8.1. Challenges of women participation in AWRM

The characteristics of social challenge are social in their result and they affect all sections of society, and the responsibility for social challenges is social means it requires a collective approach for their solution. Social challenges in its nature occur in all societies

(Ahuja, P. 2002). Types of social challenges for example social conditions are a symptoms of social challenges; and the blamed system in which they live in as well (Eitzen, B. 2009). The focus is on how the society operates and who benefits and who doesn't benefit under existing social arrangements. Some of the system bias like the way how are society's resources distributed, some categories of people suffer due to the way of management and some are suffer because of the way health care is delivered.

Another social challenges is like the local institutional deviance for example water use association at rural level is a term use to describe a situation when the institutions of society serves a selected few people who are generally powerful (Eitzen, B. 2009). In the other word the local institution leaders favor some sort of selected people in the community may raise other deviance of individually, in group as well as institutionally. However, deviance exists when society and its formal organizations are not meeting the needs of individuals. Hence, this became one of the social challenges in the community. Thus, it is very difficult for women to manage this type of problem which occurred due to social challenge. This may affect women participation in AWRM. Therefore, the causes of social challenge might be individual, cultural and structural.

In general, the fact is that the environment surrounding our society is rapidly changing, not to mention the climate change, aging population, energy problems, or food crisis, and due to the evolution of our lifestyle, social condition and institutions are evolving. Thus we face to social challenges ever more urgent and complex. The limited resources and increasing pressure on cost control, it is crucial that new knowledge and talent be deployed and developed as efficiently as possible. We need to contemplate how to overcome social challenges by using knowledge and skills wisely. However, our most significant social challenges are resisting conventional approaches to solve them. We need to search for innovative measures of tackling these challenges which affect women participation in AWRM in the study area.

The potential benefits of allowing access to information held by the Government were noted at the outset. It was underlined that for the public to participate effectively in the management of natural resources they need to have correct information. Thus, it is imperative for the public to be provided with requisite information that will enable them to take part in policy formulation. Without information the citizens may not have an

insight into the functioning of Government or participate in its decision-making processes (Edwin, A. 2011**).** Accordingly to the above truth the lack of access to information limit the participation horizon of stakeholders as well as women participation in AWRM. Knowledge as a person's range of information presents knowledge acquisition as an active process. Information is data that has been interpreted in a way that is understandable to the perceiver. (Sajama, S. & Kamppinen, M. 1987). Accordingly lack of knowledge toward an issue was a lack of the active process to engage in action.

2.8.2. Opportunities of women to participate in AWRM

Technical support includes different types of support which capacity building through skill training, awareness creation session for local community, empowering the community with small scale income generation activities (IGA), consulting based on their engagement activity type, providing agricultural inputs (like fertilizer and special seed) in low cost especially for women and conducting the regular follow up in order to monitor their progress. These all would provide according to the gaps of the community in order to empower their knowledge toward their activity as they engaged to improve their way of lifestyle and economic status include the women improvement in knowledge, information and economy, the improvement from the family to the nation (Walker, G. 2001). Thus, the majority of Ethiopia community from the rural and the majority of next generation and most of the time the rural dweller women's opportunity narrow due to remoteness of the area. Another way of technical support is rural community mobilization. Thus, the triple responsibility of the rural women became a burden for them and they suffer to attend the skill training and awareness session. Thus, they were the one to accomplish the household chores in order to satisfy the husband and children interest. The household chores or triple responsibility would affect all women regardless of marital status.

Land tenure includes the concept of tenure security, which refers to enforceable claims on land, with the level of enforcement ranging from national laws to local village rules, in turn supported by national regulatory frameworks. This refers to people's recognized ability to control and manage land using it and disposing of its products, as well as engaging in such transactions as the transferring or leasing of land. Secure land rights can improve income status as well as access to credit, and, in times of crisis, serve as a source

of security (Brasselle, A. 2002). Thus, land tenure was one of an opportunity for women participation in AWRM.

In addition, policy is another opportunities that support women participation in AWRM by providing means to land tenure in order to engage in agriculture development in order to maintain their economic development. Decision making power is another opportunity that the extent to which women and men can act on their preferences and priorities depends on the extent of their decision-making power.

Further, adult education was another opportunity that reduce lack knowledge within communities; it can instill a sense of empowerment through learning and help people get back to positively change direction (David, M. 2016). Accordingly, adult education was one tool to aware the community particularly the women at rural area; and as the women aware they motivated to participate in AWRM. In general the absence of the all the above issues would determine participation in specific position as well as in AWRM..

2.9. Conceptual framework of the Study

The conceptual framework of this study shows the interlink of factors that affect the participation of women in different dimensions. It constitutes concepts with one another, articulate their respective phenomena, and establish a framework specific idea. According to Miles and Huberman (1994), a conceptual framework lays out the key factors or variables, and presumes relationships among them.

Accordingly, based on the concepts of determinants on women participation (planning, implementation and monitoring) and the evidence from literatures the framework below conceptualize how different factors affect women participation in AWRM. These determinants are socio cultural factors which incorporate women are incapable to make decision and culturally women are not favored to involve in management are explicit determinants of women participation in AWRM. The socio economic factors which are household headship, marital status of household, family size, educational status of household, average annual income of household and access of household to credit determining women participation. Besides, social challenges like the deviant group in the community is challenging the participation of women in AWRM.

Further, the technical support opportunity like training, consultancy and awareness which have association with women participation in AWRM. The single arrow shows

how those factors directly affect the participation of women in AWRM and there is no backward association between determining factors as well as women participation.

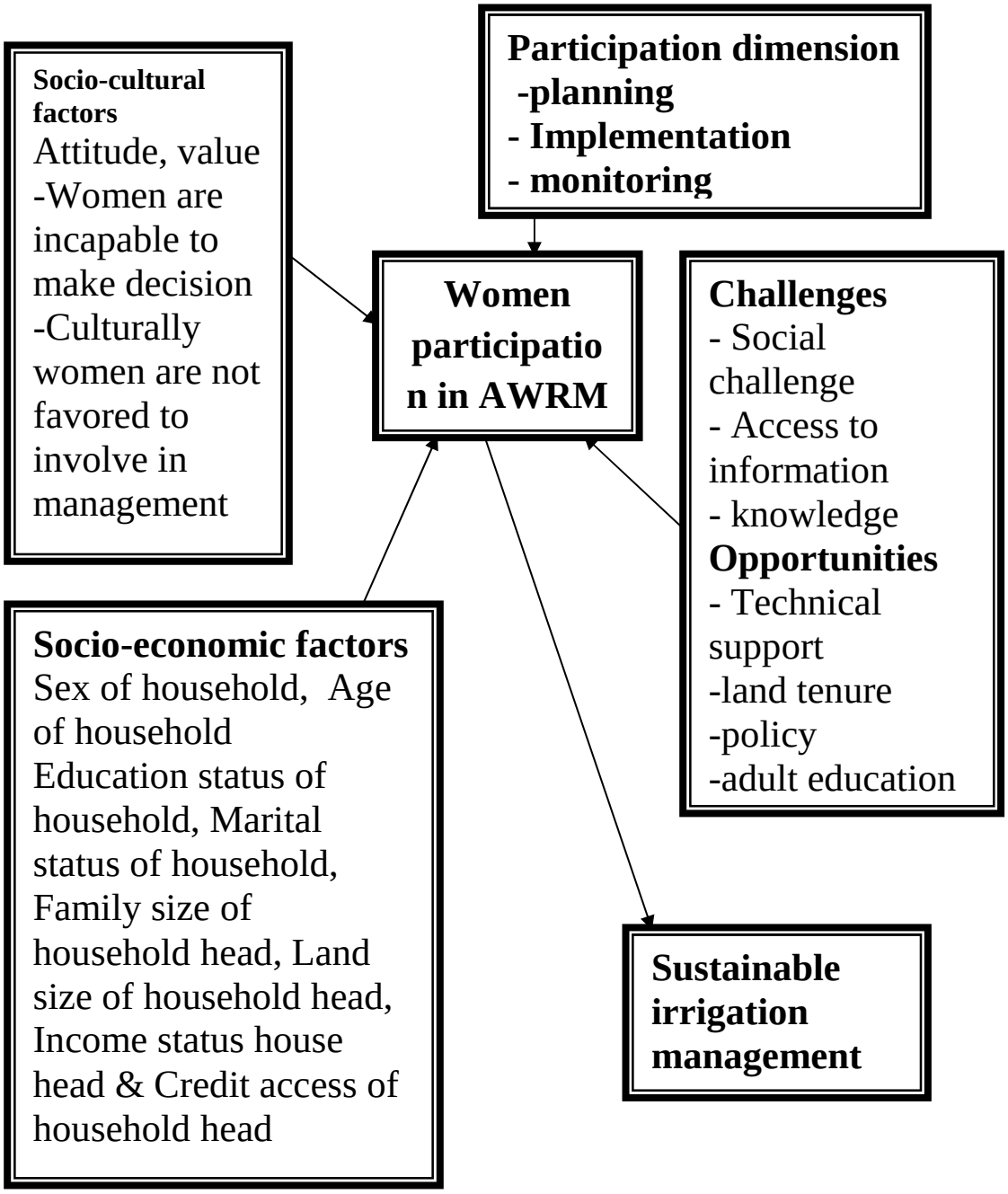

Figure: 2. Conceptual framework of the study

Source: own constructed from literature review (2018)

CHAPTER THREE: METHODOLOGY AND MATERIALS

3.1. Description of the study area

This study would conducted in Godino village Ada'a woreda of East Shewa zone of Oromia Region. It is part of the former Ada'a Chukala woreda and located in the Great Rift Valley. Ada'a is bordered on the south by Duguda Bora, on the west by the east shewa zone on the northwest by Akaki, on the northeast by Gimbichu, and on the east by Lome. Ada'a woreda is one of the woredas in East Shoa Oromia Region which is located about 47 km distance of the administrative town from Addis Ababa.

The altitude of this woreda range from 1500 to over 2000 meters above sea level (APLSDPDA, 2011).The woreda is geographically located 8030' N latitude and 39017' E longitude. The woreda covers an area of 92,751.33 ha stretching east of the Bole International Air Port to the Northwest of Koka dam. Although the highest point in Ada'a, and in east Shewa, is Mount Yerer which lies on the border with Akaki. Rivers (surface water) resources in the Mojo, Belbela, Wedecha and Dukem, Other bodies of water include the five crater lakes around Debrezite: Lake Bishoftu, Lake Hora, Lake Bishoftu Guda, Lake Koriftu and the seasonal Lake Cheleklaka.

Ada'a district has 27 kebele there were 42 Farmers Associations with 26,525 members (Government of Oromia Region, Socio-economic profile). Based on figures published in 2007, Ada'a had an estimated total population of 355,343, of whom 175,788 were men and 179,555 were women respectively (CSA, 2007).

Agro-ecologically, the woreda is best suited for diverse agricultural production. There are a number of rivers and lakes that are being used for irrigated agriculture. There are two cropping seasons in the area. Belg (short rainy season) is from March to April and Meher (main rainy season) from June to September. Belg rains are mainly used for initial breaking of the soil. Meher rain which accounts for about 74% of the annual precipitation is the most economically important rain for crop production. The annual precipitation is 860 mm (www.wekipedia). March, April and May are the hottest months and November and December are the coldest months. Black clay (locally called Koticha) and red light soils are the dominant type. Lithosol (red light soils) in Ada'a is highly degraded infertile soils, while Vertsol is generally fertile with good moisture holding capacity. They are hard and crack during dry and sticky when it is wet.

Livestock production is an integral part of the production system. Production of cattle, sheep, goat and poultry is a common practice and there is an existing market oriented production system (fattening and dairy production). However, these production systems are not the common practice for Godino kebele. The farmers dwell in the study area are commonly engaged in crop production.

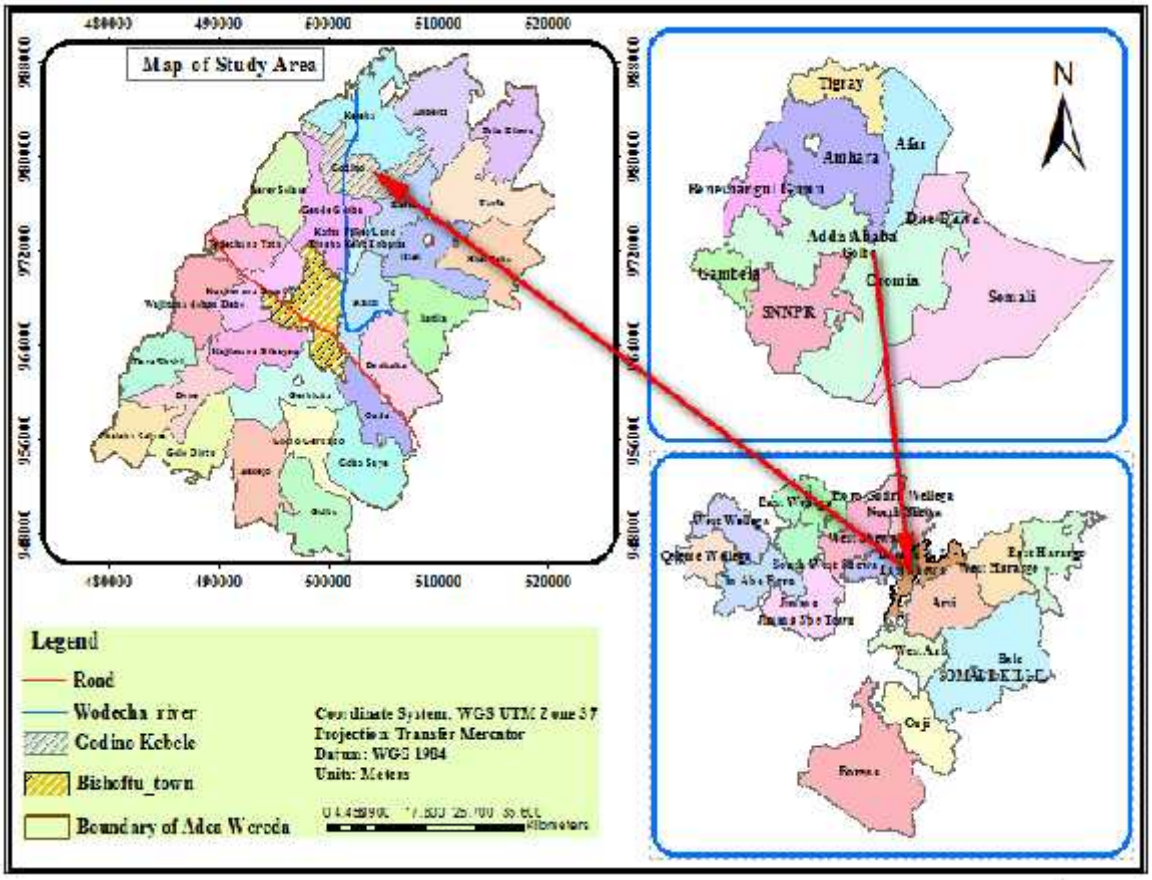

Figure 3: Location map of study area Source: Ethio GIS, 2017

3.2. Rationale for selection of the study area

The rationale for the selection of the study area was agro-ecological unit of the area woyna dega; and in addition the community use irrigation for agriculture production in dry season for their consumption and market product. Accordingly, as the community depends on the irrigation agriculture the management of agricultural water resource use and management required to make the farmers familiar with water storage and the way how they mange that the scarce resource of the water.

3.3. Research Design

Research design employed to assess participation of women towards agriculture water resource management vary from one study to the other depending on purpose of the study, objective of the study, resource availability, capacity and skills. This research design employed cross sectional survey design which incorporates both qualitative and quantitative approaches as to come up with complete and sounding research results. The rationale behind the choice of this approach was the short duration of the study which obliges the collection of data to take place at one point in a time.

3.4. Sample size and sampling technique

The study population was irrigation using farmers who live in Godino village of Ada'a district. Godino village is one of the Ada'a district was selected as a target population of this study. The selection of the village was made purposively due to the familiarity of the researcher with the area. The sample size for this study was calculated based on the following assumption. The total populations of the Godino kebele were about 873 and all of them use irrigation. Then the calculation based on the number of households who use irrigation (873/873*100) equal to 100% is (P=1). The P estimated proportion of population made the estimated characteristics of the target population proportion q become zero (0). Therefore, the researcher used according to C.R. Kothari (2004) the determination of sample size through the approach based on precision rate and confidence level and estimating a percentage or proportion for sample size. To find the sample size for estimating a proportion, first of all, the researcher specified the precision and the confidence level.

Since p is actually what we are trying to estimate, then what value we should assign to it. There are methods to estimate P. One method may be to take the value of p = 0.5 in which case '*n*' will be the maximum and the sample will yield at least the desired precision. This is the most conservative sample size. The other method is take an initial estimate of p which may either be based on personal judgment or may be the result of a pilot study. Though, the researcher choice personal judgment for p value based on the total population size in the village who use irrigation. Therefore, the value of p=16% (0.16) and then the work out of the sample size undertake.

Thus, the sample size formula:

$$n = \frac{z2(pq)N}{e2(N-1) + z2(pq)}$$

where

p = sample proportion (16%=0.16), q = 1 – p; (1-0.16=0.84)

z = the value of the standard at a given confidence level and to be worked out from table showing area under Normal Curve which is 1.96 ;

n = size of sample

e= Level of statistically significance set (5%) margin of error

N= total population size in the village which is 873 (i.e all of them who use irrigation).

$$n = \frac{z2(pq)N}{e2(N-1) + z2(pq)}$$

$$n = \frac{(1.96)2(0.16)(0.84)873}{(0.05)^2(873-1) + (1.96)2(0.16)(0.84)}$$

$$n = \frac{(3.8416)(0.1344)873}{0.0025 * 872 + (3.8416 * 0.1344)}$$

$$n = \frac{450.74}{2.7}$$

= 166

The total sample of the respondents becomes 166.

Among the calculated 166 household, the sex of household was purposively disaggregated in equal number 83 men and 83 women. To fairly assess both group the sample size disaggregate equally. These purposely done to avoid one side group idea domination in order to fairly assess both side participation in AWRM. The second reason the number of female household headed farmers is very small to calculate proportionate size based on total size of in the village who uses irrigation. Due to these the researcher decided to disaggregate groups equally in order to identify the participation extent of women in AWRM.

Sampling techniques

To make generality about the whole population different sampling designs and procedures are used to get the truly representative sample (Israel, 1992). For the purpose of this study, a multi stage sampling procedure was employed to draw the sample households. First, using information obtained from three, Ada'a District irrigation

authority offices Godino village administration and development agent about the irrigation user households have listed and stratified accordingly. This is due to the reason women participation in AWRM not well understood by the community of the study area, and stratifying households considering the participation of women in AWRM to help represent all communities in the village. Then, from each stratum, both male and female were selected using simple random sampling method which resulted in a total of 873 households. Finally, using the calculated sample size, all randomly selected household heads are included in the study. Each individual irrigation user and non-user has been selected using simple random sampling method.

3.5. Types of Data and Data collection Instruments

Both Primary and secondary sources of data were used to gather reliable and valid data. Primary data sources include survey questionnaires, key informant interview and focus group discussion. In addition, secondary data was also collected from documents, books, journals, annual report, internet, websites and other sources from irrigation authority with concerned officials in the woreda particularly data about women participation in AWRM.

Data Collection Instruments

The research applied both quantitative and qualitative methods of data collection to investigate the issues under question.

Household survey questionnaires: the semi-structured household survey questionnaires were used to quantitative data in order to investigate the association between the dependent and independent variables of 166 household respondents of the study.

The themes of the questioners were prepared based on researcher's personal experiences, results of preliminary survey, and reviewed literatures. The total numbers of questionnaire items were main features of environment, demographic, general information; basic objective questions and all items were filled by respondents. The survey questionnaires have different major parts. The part were about the demographic and socio-economic aspects, the major characteristics of the agricultural water use and management, types of crop produced by sex, dimension of women participation, factors that affecting women participation in AWRM, challenges and opportunities of women in AWRM. The questionnaires were first prepared by English and were translated in to Afan Oromo. However, all communities are fluently speak Amharic. So the survey and

discussion are conducted in Amharic. Eventhough, the enumerators who speak fluent Afan Oromo and Amharic language were hired and trained on how to administer the survey interview. The survey was administered by the enumerators along with the researcher. Before that the pilot test conducted by the researcher about female irrigation user farmers, water user committee, dimensions of participation and factors that affect women participation in AWRM

Key informant interview (KII): Open-ended interview check list question was developed by the researcher to collect the necessary data from KII who have an experience about women participation in AWRM from irrigation authority and kebele agricultural office development agent were interviewed face to face in their respective office using interview checklists. Qualitative information of the study was obtained through interview and was carried out with the district irrigation authority offices and development agent (DA) in their respective office using interview guidelines. The aim of key informant. interview was to identify institutional hurdles in promoting women participation in AWRM.

Focus group discussion: to compliment quantitative data obtained through questionnaire, three focus group discussions with six to ten members were held in each both division (discussion with women only and with WUC, communities) among household heads who were not included in the sample by using a checklist. Discussion was conducted with irrigation water user household heads. The discussion result in three FGDs was found similar; and the researcher understood that further discussion not add further value.

Field Observation: field observation data gathering instrument helps the researcher to analyses the reality of the problems through observation. Engagement of women in agriculture and their cultivation situation was also supported by this method.

3.6. Data analysis and processing

3.6.1. Descriptive Analysis

Descriptive analysis mainly focused on analyzing the descriptive statistics of percentage, mean and standard deviation. Besides, the socioeconomic factors of women participants including family size, education status, access to credit, land ownership, land size, household size, age household head, income and education would analyzed by logistic

regression. Moreover, the data also contains beneficiary of men and women farmers' decision with regard to the use of productive water resources. This data was collected using secondary data from WUC and district irrigation authority document review, in addition to focus group discussion with participants at scheme levels

The thematic analysis was used for the data that were collected through focused group discussion; KII, personnel observation and secondary document analysis were based on the content of the data. Simple quantitative measures like percentage, mean with minimum and maximum were used from the data gathered from sample households. The analyzed data were presented using tables.

3.6.2. Quantitative analysis

Specification of the Models

Socio economic factors that affect women participation

Logistic regression model will use to determine the factors that affect women participation in AWRM. The model is necessary to explain the prediction of the presence or absence of an outcome variable which was based on values of a set of predictors and for this case, the dependent variable (women participation) is dichotomous with two values, 1 if the women participate and 0 for otherwise (Schiippert**,** 2009). Based on Gujarati et al.,(2004), the model can be presented in the following equation:

$$p_i = E(Y = \frac{1}{x_i}) = \frac{1}{1+e^{-(\beta_1+\beta_2 x_i)}} \quad (1)$$

In the logistic distribution equation, Pi is the probability of women participation, *X*i is the data, iis the possibility for women participation extent (option of having 1 and 0 values). When $\beta_1+\beta_2 x_i$in Equation 1 is replaced byZ_i, equation 2 is obtained.

$$p_i = \frac{1}{1+e^{-zi}} = \frac{e^z}{1+e^z} \quad (2)$$

Zi is between - ∞ and + ∞, and $P_i$is between 1 and 0. When Pi shows participation of women, *X*i is the data, iis the possibility of women participation extent (option of, the possibility of this event for no participation of women is 1- $P_i$then, the possibility of no participation of women can be explained as in equation 3 as follows:

$$1 - P_i = \frac{1}{1+e^{zi}} \quad (3)$$

Equation 4 is obtained by dividing participation by no participation of women:

$$\frac{P_i}{1-P_i} = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi} \quad (4)$$

When the natural logarithm of both sides of the equation is written, equation 5 is obtained:

$$Li = ln(\frac{pi}{1-pi}) = Z_i = \beta_1 + \beta_2 x_i \quad (5)$$

Thus, non-linear logistic regression model is liberalized based on both its parameters and variables. "*L*" is called "logit" and this model is called logit model. When there are more than one independent variable, (x_1,x_2...x_k), the equation becomes:

$$P_i = \epsilon(Y = \frac{1}{Xi} = \frac{1}{1+e^{-(\beta 1+\beta 2x1+\beta 3x2+\cdots+\beta kxk)}}) \quad (6)$$

If the disturbance term $U_i$is considered the general logit model becomes:

$$Z_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_n x_n + U_i \quad (7)$$

Under certain conditions, the maximum likelihood method provides consistent and efficient estimates of the parameters β after logistic regression (Grenne, 2003). Hence, maximum likelihood methods assumed to calculate maximum probability of women participation in WRM.

Therefore, in these case;

Women participation = β_0 +β_1Sex of household head + β_2 Educational status of household head + β_3 Marital status of household head+ β_4 family size of household head + β_5 Average annual income of household head+ β_6 Credit access of household head+ ε

Whereby; Water resource management (WRM)

1 if women are participate

0 if women are not participate

α = is an intercept

β_i = coefficients for the independent variables

ε = error term changing variable

X=independent variables affecting participation of women that is explained in the Table 2. (Sex of household head, Educational status of household head, Marital status of household head, family size of household head, Average annual income of household head and Credit access of household head) Thus, explanatory variables were obtained from (Welle and Williams, 2014 and Water aid, 2011).

3.7. Diagnostic Test

Before the start of any model analysis it is essential to attend to the problem of multicollinearity and contingency coefficients among the selected explanatory variable (Gujarati, 2004). The correlation of above 0.80 and below -0.80 are used and as a critical point to indicate serious multi-collinearity problem (Wooldrige, 2009, Stock and Watson, 2007). The coefficients of all variables in this study were found to be below 0.3465 and above -0.5812 (see appendix 4). Therefore, there was no severe multi-collinearity problem among independent variables. Besides, the model goodness fit was tested using prob>chi^2 which found to be 1 which is greater than 0.05 (see appendix 6) which indicates the model was good. And also, the value of Pseudo R^2 was found 0.7081(see appendix 5), which indicated the model was fitted well.

Linktest was run to test the model specification error. The null hypothesis is that there is no specification error. If the p-value of hatsq is not significant then we fail to reject the null hypothesis and conclude that our model is correctly specified. So, the value of hatsq in the model was found to be insignificant with p-value of 0.908 (see appendix 6).Thus, it is concluded that there is no specification error in our model.

Table 1: Summary of Model Diagnosis Test

Test	Name of test	Women participation	
Gof	Chi^2	1	
Linktest	Hatsq	0.908	
Multicollinearity	Pwcorr	Min= -0.581	Max=0.3465

Source: Computed from own survey data (2018)

3.8. Hypothesis and Definition of Variables

Outcome Variable

Promoting sustainable irrigation management through women participation was used as outcome variable.

Predictor Variables

Based on available literature the following selected independent variables as a predictor variables that influence women participation was explained and hypothesized as follows.

Table 2: Explanatory Variables, nature of variable and Expected Sign, of Ada'a District

Explanatory Variables	Nature of variable	Excepted sign	Literature
Sex of household head	Dummy	-	Amleset, (2011)
Educational status of HH	Categorical	+	AcharyaY. (2008).
Marital status of HH	Categorical	+	Ximena P., (2013)
Family size HH	Categorical	-	Sebele, (2016)
Average annual income of	Continuous	-	Simago (2015)
Credit access of HH	Dummy	+	Kalkidan, (2014)
Social challenges (like deviant groups in community)	Dummy	-	Eizten et al (2009)
Technical support	Dummy	+	Walker G. (2001)
Land tenure	Dummy	+	Brasselle A.(2002)
Policy	Dummy	+	
Adult education	Gummy	+	David, (2016)

Source: Computed form own survey data (2018)

Note:

+ sign: indicate as the predictor variable increase the probability of women participation

- Sign: the inverse relationship between the predictors and the probability of women participation.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

The issues dealt in this chapter contain the main findings of the study. It consists of eleven sections. The first section deals about the demographic characteristics of household, second section contains socioeconomic characteristics of household , third environmental characteristics and farming system of the study area, fourth is the dominant farming activities of the study area, fifth type of crop production by sex, sixth water users committee: history, operation and women assignment as a leader, seventh section contains the main features of agricultural water resource management; and sections eight contains dimension of women participation in AWRM, section nine deals with the socio-cultural factors, section ten observes the socio-economic factors that affect women participation in AWRM. Finally, challenges and opportunities of women participation in AWRM is discussed in the eleventh section.

4.1. Demographic Characteristics of households

The demographic characteristics of households include sex, age and marital status. This information is used to grasp the general background of the households. Some of the descriptive statistics of the demographic characteristics of households are summarized in table 3 below.

Table 3: Households demographic characteristics in Godino village of Ada'a District

Explanatory variable					
Household headship	Frequency			Percent	
Male	83			50	
Female	83			50	
Total	166			100	
Age of household	Obs	Mean	SD	Min	Max
	162	48	11	32	77
Marital status of household	Frequency			Percent	
Single	23			13.85	
Married	79			47.59	
Divorcee	20			12.05	

Widowed	44	26.51
Total	166	100

Source: Own survey data (2018) Obs: Observation

The responses obtained from 166 household heads illustrates that other the households 50% were female headed and 50% were male headed household. The sex aggregation of housed holds is made purposively to identify the participation of the two sex The youngest age of the household was 32 and the oldest age was 77 respectively. Beside the marital status of the households, 23 (13.85%) were single, 79 (47.59%) were married, 44 (26.51%) were widowed, and 20 (12.05%) were divorced.

4.2. Socioeconomic Characteristics of households

The investigation shows that the socioeconomic characteristics of the study area is based on different categories that directly linked with the socioeconomic facts of the respondents. Therefore, the issues were stated clearly in table 4 below.

Table 4: Household socioeconomic characteristics in Godino village of Ada'a District

Explanatory variables		
Educational status of household head	Frequency	Percent
Illiterate	89	53.61
Read and write	38	22.89
Primary (Grade 1-8)	32	19.28
Secondary (Grade 9-12)	7	4.22
Total	166	100
Land ownership	Frequency	Percent
Yes	Yes	Yes
No	No	No
Total	Total	Total
Livestock possession	Frequency	Percent
Yes	164	98.79
No	2	1.21

Total			166		100	
Major source of livelihood			Frequency		Percent	
On-farm			159		95.78	
Off-farm			7		4.22	
Total			166		100	
Family size	Obs	Mean	SD	Min	Max	Median
Total	166	5	2	2	9	4
Land size	Obs	Mean	SD	Min	Max	Median
Total	166	1.1	0.59	0.25	3.5	1
Number of livestock	Obs	Mean	SD	Min	Max	Median
Total	166	12	12	0	105	10
Average annual income	Obs	Mean	SD	Min	Max	Median
Total	166	36610	63748	900	80000	29950

Source: Own survey data (2018) Obs: observation

The study status of the household head is carried out in a categorical form; and it made to capture the education level of the household heads. Thus, the survey indicates that the 85 (53.61%) of the household heads were illiterate, 38 (22.89%) read and write were able to attended education, 32 (19.28%) primary and 7 (4.22%) attended secondary education. Education is base for both rural and urban dwellers. The survey finding indicates that all the respondents were 166 (100%) households own farm land. Land ownership provides the most secure tenure and enables the owner for land benefits. Therefore, as women being owner of land increase the extent of participation in AWRM as agriculture production require water and land.

In addition, the survey indicates that 164 (98.79%) of household heads possess livestock and 2 (1.21%) have no livestock at all. This indicates that majority of household heads possessed livestock in the study area. In the response of the respondents, the major source of livelihood of the household head was on-farm (agriculture) farming. Thus, the majority

of the household heads involved in farming, 159 (95.78%) and 7 (4.22) were engaged in off-farming additionally.

The median of household size was 4, but there were households with 2 members and with 9 members. The finding indicates that the median of land size is 1 with a minimum of 0.25 and a maximum 3.5 in hectare. The size of the land was smaller to produce a different types of crops. As the rural community livelihood depended on farming, large land size is one of the wealth that urge them to produce different type of crops for consumption and market..

As mentioned above in table 4, the median number of livestock possession in household is 10 with a minimum of zero (0) and a maximum of 105 in number. Large number of livestock require large grazing area and large labors in order to take care for each type of livestock. Thus, framers with more cattle can't invest more time to participate in AWRM and women farmer too. Finally, the study indicates that the major income source of the household was farming, as indicated in table 4 above the medium of annual income of the household heads was 29950.00 ETB with the minimum of 900.00 ETB and with the maximum of 80000.00 ETB. Income is one of the potential factor that determine women participation in several angles.

4.3. Environmental characteristics and farming system of the study area

The study area agro ecology condition, the level of the farm land fertility situation, the past 10 years rainfall and the temperature amount variability situation in comparison with the current condition investigation; and the adaptation activity that conducted by the agriculture office for the climate variability shown in table 5 below.

Table: 5. Agro ecology, farm land fertility, rainfall and temperature variability

Explanatory variable		
Agro ecology	Frequency	Percent
Dega	1	.6
Weyna dega	163	98.2
Kolla	2	1.2
Total	166	100
Level of farm land fertility	Frequency	Percent

Fertile	8	4.82
Moderate	138	83.13
Less fertile	20	12.05
Total	166	100
10 years ago rainfall amount	Frequency	Percent
Decreasing	112	67.47
Increasing	8	4.82
No change	5	3.01
I don't know	41	24.7
Total	166	100
10 years ago temperature	Frequency	Percent
Decreasing	3	1.81
Increasing	118	71.08
No change	4	2.41
I don't know	41	24.7
Total	166	100
Adaptation activity conducted by agriculture office for climate variability	Frequency	Percent
Yes	127	76.51
No	39	23.49
Total	166	100
Contact with agricultural extension agents	Frequency	Percent
Yes	57	34.34
No	109	65.66
Total	166	100

Source: Own data survey (2018)

As stated above in table 5 the agro ecology situation of the study area shows that 163 (98.19%) temperate (ወይናደጋ).The fertility level of the farm land was moderate as the majority 138 (83.13%) indicated above in table 5. In addition the majority of the

respondents response indicates that the current rainfall amount of the study area in comparison with the current was decreased 112 (67.47%) and the degree of temperature was increased as the response were shown 118 (71.08%) respectively. Yet, these critical climate issues were not considered by the Ada'a District agriculture office and irrigation authority. As the result of survey indicates the majority of respondents were 127 (76.51%) replied "No" that there is no regular adaptation activity action conducted by experts in order to control the variability of rainfall and temperature. One of the respondent during the survey time mentioned that the overall water availability for agriculture depends on the rainfall amount. However, to control the regular increasing change of temperature affects the rainfall negatively. Yet it was not considered by anyone else properly. In general this idea explicitly reveals there was less consideration toward adaptation mechanism in order to balance both rainfall and temperature in the study area. In addition, there is no regular contact practice with the agriculture extension agents as the response of survey indicates were 109 (65.66%) respectively.

4.4. Dominant farming activities of the study area

Based on the findings of the study, the dominant farming activity of the farmers is crop production. Production is mainly for consumption and market. Further, the road access of the study area and the nearest market for their purchase and sell of different agriculture inputs and production was investigated from the respondents and stated in table 6 below.

Table: 6. Dominant farming, distant to market and access to road.

Explanatory Variables		
Dominant farming	Number	Percent
No farm to the household	2	1.21
Crop production	92	55.42
Mixed production (crop & livestock rearing)	72	43.37
Total	166	100
Distant to market	Number	Percent
1kilo meter	74	44.58
2 kilometer	27	16.26
3 kilometer	65	39.16

Total	166	100
Road access	Number	Percent
No	63	37.95
Yes	103	62.05
Total	166	100

Source: Own survey data (2018)

The general overview shows that the dominant farming activities of the study area are crop production 92 (55.42%) and were crop and livestock rearing 72 (43.42%) respectively. There was road access to bicycle were 99 (61.1%) and the nearest market from study area takes 1 kilometer as 71 (43.2%) and 3 kilometers 65 (43.3%) respondents replied the survey.

4.5. Type of crop production by sex

As the findings indicate the study area's major livelihood of the communities is different type of crop. Accordingly, the amount of teff, wheat, potato and onion crop productions. So, the four type of crop production amount in comparison between male and female household production was stated in table 7 below.

Table: 7. Different type of crop production in Kilogram by sex

Sex	**Teff production in Kg by sex**		Total
	1070 and greater than 1070	**Less 1070 Kg**	
Male	27	56	83
	32.53%	67.47%	100%
Female	10	73	83
	12.05%	87.95%	100%
Total	37	129	166
Sex	**Wheat production in Kg by sex**		Total
	779 and greater than 779	**779 and greater than 779**	
Male	50	33	83
	60.24%	39.76%	100%
Female	37	46	83
	44.58%	55.42%	100%
Total	87	79	166

Sex	**Potato production in Kg by sex**		Total
	2441. and greater than2441	**2441. and greater than2441**	
Male	11	72	83
	13.25%	86.75%	100%
Female	2	81	83
	2.41%	97.59%	100%
Total	13	153	166
Sex	**Onion production in Kg by sex**		Total
	1887 and greater than1887	**1887 and greater than1887**	
Male	30	53	83
	36.14%	63.85%	100%
Female	16	67	83
	19.28%	80.75%	100%
Total	46	120	166

Source: Own survey data (2018)

The majority of the respondents are engaged in the dominant activity of crop production of teff, wheat, potato and onion are the most common products in the case of study area. The medium of annual production of teff 1070 with maximum of 9200 kilogram, wheat mean 992 with maximum 4000 kilogram, potato 2441 with maximum of 3000 kilogram and finally onion the medium of 1887 with the maximum 10000 kilogram respectively. As the result indicates that the high crop type which produced by each household are potato and onion.

However, as the data indicates that more farmers harvested potato and onion than teff. In table 7 indicated above in four type of crop production in comparison male and female household production of teff is very low. 10 (12.05%) female were harvested 1070 and greater than 1070 kilogram; and 73 (87.95 %) female were produced less than 1070 kilogram. However, 27 (32.51%) male household framers were harvested 1070 and greater than 1070; and 56 (66.47%) were harvested less than 1070 kilogram teff in a year. As shown in the table 7 above the crop production of wheat by female 37(44,58%) produced 779 and greater than 779 and 46 (55.42%) less than 779 kilogram. Whereas, wheat produced by male 50 (60.24%) 779 and greater than 779 kilogram and 33

(39.78%) produced less than 779 kilogram. Again, the crop production of female 2 (2.41%) produced 2441 and greater than 2441 and 81 (97.59%) kilogram. However, male farmers produced 11 (13.25%) 2441 and greater than 2441 kilogram and 72 (86.75%) were produced less than 2441 kilogram potato. As obtained result, the onion production female farmers 16 (19.28 %) were produced 1887 and greater than 1887 kilogram and 67 (80.75%) were produced less than 1887 kilogram. Though, the male farmers produced 30 (36.14%) 1887 and greater than 1887 kilogram and 53 (65.85%) were produced less than 1887 kilogram. As the result shows in comparison male and female household production, female household production is very low. As the response of survey and group discussion realized, because of water distribution problem female household production declined. Thus, water distributed day and night for the whole 24 hours. Though, it is very difficult for the females households to use water at night due to risk that occur at night. As the turn once missed, the only chance looking for the next another chance. Until the turn the watering time was passed and the crop production became decline.

4.6. Overview of water users committee members and selection procedure

All farmers who are using water for agricultural production are member in water users association and the association managed by WC. Though, water committee selected by the association to manage agriculture water. The number of women in committee, committee selection procedure and women assignment in leadership are indicated in table 8 below.

Table: 8. Number of women in committee, selection procedure and women assignment in leadership

No	**Explanatory variables**		
1	Number of women in committee	Frequency	Percent
	No women in the committee	160	96.38
	1 or 2	4	2.41
	3	2	1.21
	Total	166	100
2	water user committee selection procedure	Frequency	Percent
	Nominated by the kebele leaders	2	1.2

	Elected by the water users in the irrigation scheme	164	98.8
	Total	166	100
3	Women assignment in leadership	Frequency	Percent
	Yes	5	3.01
	No	161	96.99
	Total	166	100

Source: Own survey data (2018)

The survey 160 (96.38%) revealed that there are no women in the committee and the selection procedure was not inclusive. In addition to the survey, the focus group discussion approved that the working in water committee is hard to women. Since water distribution is done day and night; and sometimes water users like youth want to use water without their turn and due to handling the task is hard for women. The survey indicted 164 (98.8%) the selection of water user committee undertake by the members of water users association. Thus, as the focus group discussion with communities, water user committee and with only women group, revealed that almost the same point about the selection procedure of water user committee that carry out by the water users in the irrigation scheme. In addition, different groups said there is no practice of selection of women as a water user committee in our village. Thus, culturally, management responsibility has not been given to women than men in the study area. Because no one consider women to select and give approval for them to be select as water committee. Thus, the large number of the respondents 161 (96.99%) were replied "No" for the assigning of women as a leader as shown in table eight above. The woreda irrigation authority expert revealed that communities not willing to select women, thus traditional consideration of the community about women to serve only there family and to accomplish the house chores as a main responsibility. In general, the above findings from survey, discussion and interview notice that the absence of women in committee, the community neglecting to not select them to be a leader and committee member in the study area.

4.7. Main features of agricultural water resource management

As the respondents indicated and the researcher observed, the current major key of water sources in the study area are spring, river and Wedecha dam. All these water sources are

used for domestic chores, cattle and irrigation purpose and the water availability was permanent. Key water source, its description, accessing purpose, allocation, payment and rainfall time duration in the study area shown in table 9 below.

Table: 9. AW sources, description, accessing purpose, allocation, payment and the rainfall time duration

Explanatory variable		
Sources of water	Frequency	Percent
Spring	128	45.71
River	147	52.5
Bono	5	1.79
Total	280**	100
Description of water	Frequency	Percent
Permanent	162	97.59
Seasonal	2	1.21
Shallow well	2	1.2
Total	166	100
Purpose	Frequency	Percent
Irrigators	3	1.81
Domestic users	8	4.82
Both	151	90.96
All	4	2.41
Total	166	100
Main users	Frequency	Percent
Irrigators	51	30.72
Domestic users	5	3.01
All	110	66.27
Total	166	100.
Water allocation	Frequency	Percent
Yes	135	81.33

No	31	18.67
Total	166	100
Payment	Frequency	Percent
Yes	164	98.8
No	2	1.2
Total	166	100
Rainfall time duration	Frequency	Percent
Three months	116	69.88
One and half months	1	0.6
Seasonal	49	29.52
Total	166	100

Source: Own survey data (2018) ** Multiple responses

The majority of the respondents replied the key point of the water source of the study were both spring 128 (45.71%) and river 147 (52.5%) respectively. The data for key water point source based on multiple response (276**) as shown in the table 9 above. Both water sources are permanent as huge number of respondents 162 (97.59%) indicated in the table 9. And also, each sources of water accessed to the purpose of both irrigation and domestic uses 151 (90.96%) as indicated and the main users of spring and river water were both irrigators 51 (30.72%) and domestic 110 (66.27%) respectively. However, the potential water source for agriculture is the Wedecha dam which was constructed for farm purpose in 1978 during the reign of Derg in collaboration with the Cuban government. Currently the dam supplies Keteba Gimbi, Harawa, and Godino village. The dam itself was located in the border of Sendafa and Gimbichu woredas. The storage area of the dam was 15.160*106 m^3 and the stored water mainly from flood water that depends on the amount of yearly rainfall. This stored water is utilized in the right and left cannels and feeding the various schemes along its way until it ends up in Belbela dam which is not used by Godino village farmers. The current usage of water for irrigation before the entry to Belbela dam is 577.625 hectare. Thus, as the dam water storage depends on water flood and amount of yearly rainfall which was for three months as 116 (69.88%) of respondents indicated in the survey. So, as its dependency on flood water, if

the yearly rainfall amount became less the storage became less. Due to these reasons, the volume of water stored in the dam was limiting the utilization of water for irrigation.

The allocation of irrigation water undertake by the committee for the agricultural water as majority replied in the survey were 135 (81.33) and the payment made based on the land size of irrigable farm per year were 164 (98.8) indicated in the table 9 above.

4.8. Evaluating dimension of women participation in AWRM

Women participation in agricultural water resource management is assessed based on different dimensions of participation. The dimensions of participation have emphasized the extent of women participation in agricultural water resource management which helps to manage resource properly in the corporate manner with different stakeholders including women. The participation dimension like planning, implementation and monitoring are the measurement ways used to women study are participation in agricultural water resource management at the local level. Unlike excluding some part of stakeholders lead to miss the potential human capital especially women whom are familiar with different sources of water. The participation dimensions explicitly indicate the extent of women participation in agricultural water resource management whether it was gender centered or not. Thus, participation was worth for bringing of different stakeholders into teamwork through participatory approach. Therefore, the respondents' response indicated about participation dimensions shown in table 10 below.

Table 10: Women Participation extent in each participation dimensions

No	**Participation dimensions**		
1	Planning	Frequency	Percent
	Yes	42	25.3
	No	124	74.7
	Total	166	100
2	Implementation	Frequency	Percent
	Yes	10	6.02
	No	156	93.98
	Total	166	100
3	Monitoring	Frequency	Percent

Yes	0	0
No	166	100
Total	166	100

Source: Own survey data (2018)

From the study, it was able to explore that the inclusion extent of women in AWRM have been assessed based on participation dimension for upgrading the awareness of the community toward the contribution of women participation for better protection and care of such scarce resource of water.

Planning dimension

As the household survey result indicates 124 (74.7%) there was no more participation of women and 42 (25.3%) of few respondents indicates the participation extent of women in agricultural water resource management. As the discussion pointed out that less participation of women in agricultural water resource management in planning dimension. Women only invited to hear the final decision planning. This indicates that no further participation of women in planning, and as women group discussion indicates, women are not invited even to listen the final decision of the planning, everything decided by men and get information from our neighbors. According to Fenster (2005) planning must take, as its starting point, the experience of people at the community and neighborhood level, who live in, use the spaces and resources, it focuses on and wants to develop. Unfortunately, in the study area the worthy of women participation is not considered as the fact realized and the community perception toward women participation is low..

However, gender-transformative planning techniques acknowledge and make visible women's experiences, and activities, needs and responsibilities associated with domestic and other productive work (Campos, 1996). Thus, Participation as a tool of empowerment, which can be used in processes by which organized groups in the rural and individuals within their identity and articulate their interests, negotiate change with others, and transform rural community life and their role within it (Beall, 1996).

Implementation dimension

Large number of respondents indicate were 156 (93.98%) responded that there is no sufficient participation of women in implementation dimension of AWRM. Few

respondents 10 (6.02%) said that there are few women who participate at the implementation stage as the survey result shows in table 10.

The group discussions shows that women are only invited to participate in yearly canal cleaning implementation only. Again as the women only group discussion pointed out canal cleaning is one of the major plans for WUC and they became individuals' house to announce the canal cleaning day. Whereas, the implementation like canal maintenance and other which related with the expense and others no one invite us for this type of implementation. However, the effective participation of women's groups in the implementation process could facilitate proper resource management as an outcome.

However, according to, Charles B. Kessey (2004) the fact note that water management initiatives that exclude women as stakeholders ignore half the population, decreasing the efficiency and effectiveness of the actions promoted. In addition, they stress that women make up over 50% of the world's population and are primary producers directly working on land and using water resources. It is essential therefore that they are involved in all aspects of water management implementation not just as laborers but also as informed individuals who can make and implement wise decisions. Unluckily, study area women participation in agricultural water resource management was very poor as the result indicates above.

Monitoring dimension

The respondents 166 (100%) replied in table 10 that there was no women participation at the monitoring stage of AWRM in the study area. Besides the survey, discussion findings implies that there is no women participation in monitoring stage in agricultural water resource management in the study area. There is less consideration towards women participation with regard to agricultural water resource management monitoring. Women were invited highly only for labor and finance contribution in the study area. Though, in order to conduct any kind of monitoring it would start with a monitoring plan. Accordingly as Meera K. (2006) states that monitoring must be participatory; as the community members must be the direct beneficiaries of the resources, can play an active role in monitoring. But the reality of participatory monitoring process denied in the study area.

Beside the response of respondents, the deep discussion session revealed that, the main

reasons for the absence of women participation in water user committee for agricultural water management are:

- Culturally management responsibilities are not given to women than men;
- women are unable to work at night;
- Incapability of women to make decision;
- A lot of domestic work at home;

Other perceptions, such as men know more how and what to say in meetings and in public gatherings and males also have more ability to convince others in negotiation and type of conflict resolution cases.

Discussion with female headed farmers and communities revealed that the participation of women in the agricultural water resource management was totally zero. No one select woman during the election time of water user committee. Thus, because of different reasons like inability of women to not able to work night, knowledge limitation toward water management, and lack of experience. This knowledge limitation toward water management is stagnate women participation in AWRM. Lack of experience of women only related with AWRM issue. AWRM issue requires the high exposure negotiation skill to convince the deviants who intentionally rise conflict. So, it is difficult for women to give more time with external issues to get experience about it. Thus, women are busy with a lot of domestic work at home and out of home. Due to they lack experience about AWRM in order to manage it in proper way. However, it was possible to assign women as a cashier, store keeper and assigning them in day time water distribution work in order to join together them in water user committee as one of stakeholder of the resource. As the discussion result, women participation was unnoticed in the study area. As stated by the irrigation authority experts of Ada'a district and development agent in village level, women participation was not seen through the mirror of participation dimensions. To see the optimal level of women participation in AWRM the responsible bodies from village and district supervise the planning, implementation and monitoring records and procedures to cross check the inclusion of women in each dimension. Again, the responsible bodies regularly follow up the committee meeting agenda and the irrigated production of women in comparison with men irrigated production. And finally, critically analyze the extent of women participation in AWRM in the study area. These are the ways

how to see the participation of women in AWRM. This finding explains about the understanding problems of communities toward women participation for the inclusion of women in the specific dimension of participation.

However, it is mandatory for all members of water user association should participate in the maintenance and clearance canals of agricultural (irrigation) water schemes. At least two times a year in the months of September and February, all farmers clean the canals. Without participation in canals cleaning and maintain, it is not allowed to use water for irrigation. Women headed farmers also have an obligation to participate; themselves, their sons, relative or they can hire a daily laborer.

Annual average value of farmers' contribution in water user association also constitutes contribution in cash form. The result of discussion with water users committee in many of the agriculture water (irrigation) schemes showed that female farmers pay their contribution for the committee as much as possible on time as compared to male farmer members of the association. One of the committee member from the study revealed that the female headed farmers accomplishment of contribution payment on time indicates that the willingness, submissiveness and women's obedient personality for the suitability of proper water management. But these all potentials of women contribution most of the time denied and the community miss the benefit. Only women participate in the crucial issues of agricultural water resource management like cleaning canals, maintenance and to attend in the contribution fee announcement meeting. However, attending meetings and discussing matters are thought of as male activities.

From the above findings, as respondents, discussions and interview revealed that women are participated in labor and payment contribution only. However, in planning, implementation and monitoring there is no optimal participation of women in agricultural water resource management at all. In addition, group discussions and respondents replied that women are not included in the vital areas of participation dimensions as a member and as a leader in the study area.

4.9. Socio-cultural factors that affect women participation in AWRM

The socio-cultural environment is described as an environment which consisting of everything that is not contained within the economy or political system (Weatherly, 2011 & Felicia, 2013). A combination of socio-cultural factors were limits women from active

participation in agricultural water resource management. Some of these factors are the prevailing poor attitudes of the community, community value toward women participation, women are incapable to make such decision and culturally women are no favored to involve in management are the major ones that prevent women participation in agricultural water resource management. Due to this those women, who choose to participate actively in agricultural water resource management, run the risk of being accused of inappropriate behavior. The responses of respondents for the prevailing socio cultural factors indicated below in table 11.

Table 11: Socio-cultural factors that affect women participation

No	Socio-cultural factors		
1	Attitudes of community toward participation	Frequency	Percent
	Yes	107	64.46
	No	59	35.4
	Total	166	100
2	Community value toward women participation	Frequency	Percent
	Yes	48	29.6
	No	118	71.08
	Total	166	100
3	Women are incapable to make decision	Frequency	Percent
	Yes	165	99.4
	No	1	0.6
	Total	166	100
4	Culturally women are not favored to involve in management	Frequency	Percent
	Yes	105	63.25
	No	61	36.75
	Total	166	100

Source: Own survey data (2018)

Attitudes of community toward women participation

In most cultures, women must have acquired the skills necessary to do household works; like cook food, wash cloth, take care of family and the likes.

The survey result indicates in table 11 above were 107 (64.46%) of the respondents in the study area replied that attitudes of the community factor that influences participation of women in agricultural water resource management which was no habit to lead and to manage natural resource like water by women. Besides, the discussion with only women

noted that, communities habit leading by women and this is highly discouraged women to participate women in AWRM. Thus, attitudes are evaluative statements either favorable or unfavorable concerning objects, people or events. They reflect how an individual feels about something (Robbins and Coulter, 2007). In addition, attitude refers to person's enduring favorable or unfavorable cognitive evaluation, emotional feelings, and action tendencies towards some objective or idea.

The interview revealed that there were no agents of social factors like model women leader whom being an exemplar for other women, group and association in the study area that a bit can change the attitude of the community. As Gamba, 2003 and Phil, 2010 pointed out family, peers, schools reference groups, roles and statuses are agents of social factors. According to this idea, the reference groups are groups that serve as direct or indirect points of comparison or reference in the forming of person's attitudes or behavior. Thus, as some people admire sport, musicians and so on. Therefore, in the most cases reference groups contain our heroes and women for instance would tend to be participant when they see their referents. Unfortunately, there are no referents at root level in order to update the attitude of the community and due to this women quit themselves to not participate in agricultural water resource management in the study area.

Community value toward women participation

In addition to the above factors 118 (71.08%) of the respondents in the study area respectively stated that, community value toward women participation affect women participation in agricultural water resource management. As it is understood from different interview, women's most important participation in water management in the traditional context was seen within the domestic arena like that of domestic water managers. Due to these women participation in agricultural water resource management was extremely low. As Rokeach (1974) states that values refer to cultural conceptions about what are desirable goals or ends and what are appropriate standards for judging actions. They constitute standards by which people evaluate goals and actions. Accordingly, discussion revealed that the value of community toward women participation, women deserved to contribute their participation only within the family but not in external issues like agricultural water resource management. The set of the study area cultural conception or value about women participation were not positive.

Women are incapable to make decision

The findings indicated that, 165 (99.4%) respondents replied that women are incapable to make decision. The community socially determined women as incapable person to decide and manage a natural resource like water. The community perceived women to be in home, give birth and care for children. Since it is flet decided women are incapable to make decision and they don't want to select them.

Beside, the group discussion pointed out that throughout the history the culture women are considered incapable of decision over natural resource like water and others, decision making power had lied within the domain of men at all level. Due to this in rural communities, women have limited or no voices at all in decision making even if they have position, they are not directly influential. As Opare (2005) states, the inability of women to rise up to leadership position is as a result of cultural belief that force women to subordinate and men as the dominant group. Hence leadership roles are ascribed to men who are even younger over older women because they are men. Furthermore, Barrie, (1982) asserts women's subordination is associated with specific household ideology which excludes women from gaining access to resources such as income and political autonomy. Due to, regardless of other rights, the decision making power right of women laid under men.

Culturally women are not favored to involve in management

Survey result indicates that 105 (63.25%) were said that culturally women are not favored to involve in management position either in agricultural water resource management or other in general in the study area. This type of belief of the socio-cultural factor affect women participation to participate in agricultural water resource management.

In addition, the respondent and discussion noted that, the cultural sayings of the society discourage the participation of women in agricultural water resource management. For example;

Trust in woman is just as hold a cloud.

"ሴት ያመነ ጉም የጨበጠ"

Woman be inside not to out.

"ሴት ወደ ማጀት እንጂ እንዴት ወደ ዉጪ"

No matter the wiseness of a woman, the decision is to the man.

"ሴት ብታወቅ በወንድ ያልቅ"

A house constructed by women is collapsed when a hyena shouts.

“በሴት የተገነባ ቤት ጅብ ስጮህ ይፈርሳል”

The presence of women to work together was result in damage.

ከሴት ጋር የተጀመረ ሥራ ዉጤቱ ጥፋት ነዉ

The presence of women to work together result in damage and the like shows that how women’s work invalidates by their society and demoralized them. Thus, even if women are excluded from water user committee because of the myth that women’s involvement will reduce success. All these have far reaching implications on women’s social space and the question of social justice and empowerment.

The respondents pointed out that, it is clear that in most circumstances, the work of water committee is hard to women and they cannot capable to manage it. Due to this, women are excluded and are obliged to manage those household resources under their control to ensure the survival and well-being of other household members. Because of this habit in the study area, those who are women headed households are victims of such exclusion to participate in water user committee. Therefore, it is important to go beyond cultural saying, belief and norm of the community to improve the participation of women in agricultural water resource management.

The interview result showed that, the primary concern of women is for activities which make them acceptable by society as a good woman is the way what they culturally socialized.

Generally, the rationale for women, who attend the meetings but not participating actively in the discussions, can be found further in the prevailing gender ideology among the population in the study area. As articulated frequently by men and women respondents, women are considered to be less capable in their understanding of how the water user committee functions. Thus, the main reason for women not participating in committee is lack of awareness towards gender equality that exists among both men and women.

4.10. Determinants of women participation in AWRM

In the earlier sections, factors that influence women participation in agricultural water resource management have been discussed referring the association that exist between the

dependent variable (i.e women participation) and the explanatory variables by using descriptive analysis. In this section, the binary logistic regression model was employed to estimate the effect of each hypothesized variables on the participation of sampled household heads. Table 12 shows the odds ratio, the p-value and marginal effects of explanatory variables on the dependent variable i.e women participation.

Table 12: Logistic Estimation Model for socio economic Factors affecting women participation

No	Household head participation	Odds Ratio	Robust Sta.Err.	Z	P>z	Marginal Effect (dy/dx)
1	Sex of household					.
	Female	22.40507	22.96267	3.03	0.002***	.2319482
	Male [RC]					
2	Educational status of household					.
	Illiterate	22.73512	17.49173	4.06	0.000***	.4055896
	Literate [RC]					
3	Marital status of household					
	Unmarried	11.69915	11.88707	2.42	0.015**	.2657632
	Married [RC]					
4	Total family size of household	.1977403	.1599488	-2.00	0.045**	-.1529291
5	Average annual income of household	53.4832	45.7574	4.65	0.000***	.5368982
6	Credit access of household	8.149493	6.228463	2.75	0.006**	.2479509
	Cons	.00033302	.0008166	3.24	0.001	

Source: Computed from own survey data (2018)

** = significant at 5% and ***= significant at 1% level of significance

rc=reference category

From the logistic model estimation the decision of women to participate in agricultural water resource management is influenced by sex of household head, educational status of

household head, marital status of household head, total family size of household head, average annual income of household head, and credit access of household head.

Sex of household head: women participation was positively and significantly related with the sex of the household head with P-value 0.002 and with odds ratio 22.40 respectively. The odds ratio result indicates that the probability of participation in agricultural water resource management for male household head is 22.40 times higher than female household head. The marginal effect of this variable 0.232 was implying the probability of women participation in agricultural water resource management for male household head increases by 23.2 percent as compared to female household head. Thus, being female household limit women participation extent in agricultural water resource management due to influence of different barriers within family and in community than male. This result is similar with other studies conducted by Amlset (2011) that found a positive relationship between sex of the household head and women participation in water resource management.

Educational status of household head: as education has for multipurpose, the household head educational level was found as positively and significantly related with agricultural water resource management with p-value (0.000) at 1 percent significant level and with odds ratio 22.735 respectively. The odds ratio 22.735 result indicates that the probability of women participation increases by 22.735 times for one grade increment in education status of the household head. The marginal effect of 0.405 for educational status shows that keeping other factors constant, that the probability of women participation increases by 40.5 percent for one grade increment in educational status of the household head. The result of this study is similar with the findings of AcharyaY (2008) found that upgraded educational status of household head significant and positive factor in rising women participation.

Marital status of household head: women's participation is positively and significantly related with the marital status of the household head with P-value 0.015 and with odds ratio 11.699 respectively. The odds ratio result indicates that the probability of women participation for married household head is 11.699 times higher than unmarried household head. The marginal effect of this variable is 0.266 implying the probability of women participation in agricultural water resource

management for married household increases by 26.6% percent as compared to unmarried household head. As the result indicates above being married maximized women participation extent in agricultural water resource management because naturally women who live with husband respected in the community. Similarly, Ximena P. (2013) found that being married increase participation of women household to manage resource as well as to get position. As he argued, in most society married respected to give position.

Family size of household head: total family size of the household affects women participation in agricultural water resource management in a negative way with p-value of 0.045, with odds ratio of 0.198 and marginal effect of -0.153 respectively. The odds ratio result indicates that the probability of women participation in agricultural water resource management for household who have greater or equal to five family size by 0.198 times decrease than household who have less than five family member. The marginal effect of this variable is -0.153 implying that the probability of women participation in agricultural water resource management for household those who have five and above family member decreases by 15.3 percent as compared to household those who have less than five household family member. This finding indicates that the negative effect of large family size in the household head on women participation in the household head. Similar finding was found by Yonas (2015) that family size negatively association with participation of women in management too. The women who has a large family size more loaded by child care, home chores and other related responsibilities in order to manage their family as much as possible. So, family size associated negatively with the external participation of women like in AWRM as the work of it became hard.

Average annual income of household head: the average annual income of household influences women participation positively with a significant p-value of 0.000 and with odds ratio value 53.483 respectively. The positive significant regression of average annual income variable with women participation emphasizes the participation extent increment of women AWRM. The odds ratio value 53.483 indicates that the probability of women participation in agricultural water resource management for household who earn average annual income birr 63748.00 and greater than 63748.00 birr by 53.483 times increases the household who earn average annual income less than 63748.00 birr. The

marginal effect of average annual income on women participation has a value of 0.537. This implies that, keeping other factor constant, as income level of a household increases 53.7 percent. Other finding was pointed out by Patience M. (2015) which indicated that as the average annual income of the household increases, the probability women participation increased.

Credit access of household head: women participation is positively and significantly related with the credit access of household with p-value of 0.006 and odds ratio 8.149 respectively. The odds ratio result indicates that the probability of women participation for those household get credit accesses is 8.148 times higher than those household not get credit access. The marginal effect of this variable is 0.248 implying that the probability of women participation for those household head who get credit access increase by 24.8 percent as compared to those household head who not get credit access. The finding of this study is reliable with the result of Kalkidan (2016) on women participation.

4.11. Challenges and opportunities of women participation in AWRM

4.11.1. Challenges of women participation in AWRM

Based on the findings challenges that limit women participation in AWRM like social challenges, lack of resource in cash and in kind, access to information and knowledge is discussed as follows in table 13 below.

Social challenge

Social challenge is one of the potential challenges that limit women participation within a given society; and affects women participation horizon negatively.

Table 13: Social challenges of women participation

Explanatory variable			
Social challenges	Frequency	Percent	Chi-square
Yes	111	66.87	0.011**
No	55	33.13	
Total	166	100	

Source: Own survey data (2018) **= significant at 5% significant level

Respondents indicated 111 (66.87%) of social challenges like social participation responsibilities in mourning, weeding that consume time of women and deviant groups in the community are limit women participation in AWRM. In addition, deviance is one of the potential social challenges in a given society that rise due to different reasons and affect women participation negatively. As hypothesized the chi-square test in cross tabulation shows that the association of social challenges and women participation found to be statistically significant with a value of 0.011. This implied that as women loaded with social challenges the probability of women participation in AWRM would be less. The discussion pointed out that social challenge like deviant group who violate formal and informal cultural norms such as customs that limited women participation in AWRM. Therefore, women participation and social challenge have association and this indicates the highly influence of it that limit women participation in agricultural water resource management in the study area.

4.11.2 Opportunities of women participation in AWRM

Based on the findings opportunities that motivate women participation in AWRM like technical support chances were deeply discussed below.

Technical support

Technical support is one of the scientific practical and procedural way that includes package of knowledge, skill and innovative idea to run business and other similar daily and lifelong activities. Women will beneficial given the opportunity to participate. Thus, the intervention of government and other stakeholders organizations either private or charity is required in the area in order to create empowered and active participant women who are responsible for the proper management of the scarce resource of agricultural water. However, lack of technical support cause miss of knowledge, skill and other crucial benefits. The association of it with women participation stated in table14 below.

Table 14: Opportunity of technical support for women participation

Explanatory variable			
Technical support	Frequency	Percent	Chi-square
Yes	50	30.12	
No	116	69.88	0.004***
Total	166	100	

Source: Own survey data (208) ***= significant at 1% significant level

The survey result notified that 116 (69.88%) respondents replied "No" to technical support in the study area for women that update them to participate in agricultural water resource management. Moreover, the chi-square test in cross tabulation indicates that the association between women participation and technical support found to be statistically significant with a value of 0.004. This implies that as women provided with technical support like training and counseling, the probability of women participation in agricultural water resource management would increases in the study area. It has positive contribution that adds value to rises women motivation and have active participants in different direction and lightens the opportunity for women as they updated through different technical provision that update their understanding toward AWRM.

The discussion revealed that technical support is built capacity of individuals and aware about situations and issues which interconnected their lifelong progressing activities. Most of the time we local community (rural dwellers) are miss different type of technical support. Thus, due to different uncomfortable infrastructure like road, light and quality water, no one adds to rural area either private or non-government organizations. We get little support government once through a year and struggling with it until government provides other. As the traditional saying of Ethiopia "the wise child hold what already given and cry for other" ብልጥ ልጅ የሰጡትን ይዞ ያልቅሳል እንደሚባል. This saying indicates that the big gap of knowledge about agricultural water resource management in the study area.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The participation of women in agricultural water resource management is very important as one of the stakeholder. In the case of our country the participation of women in WRM is beautifully stated in policy documents. However, when we observe the reality at the hand, since they are not participating in AWRM.

Participatory management of agricultural water resource play vital role in the sustainable livelihoods of rural people. Irrigation is one of the options which increases agricultural productivity diversification, reduces vulnerability and creates employment opportunities. Community natural resource management (for instance agricultural water management) is increasingly recognized as a viable alternative to ownership of the resource. As a result, local level resource management institution (water user association) to enforce them are receiving greater attention. Accordingly, the participation of women in agricultural water resource management is very important as one of the stakeholder. In the case of our country the participation of women in WRM is beautifully stated in policy documents. However, when we observe the reality at the hand, since they are not participating in AWRM.

Women's participation to be appreciated and enhanced has been made at various points throughout the thesis. Thus, political structure and specific gender relations, all put forth some force in shaping and defining the emergent patterns in agricultural water resource management and development. In this regard, the participation and women, environment and development approach construct and universalize is certainly appropriate. Hence, based on the reviewed theoretical perspectives, the purpose of this conclusion is to highlight the various constraints on women's participation in agricultural water resource management.

Constraints to women's participation in agricultural water resource management in the study area, socio-cultural factors have hindered rural women's participation in agricultural water resource management. Socio-cultural practices are enforced by cultural sayings, which serve to further constrain women in their productive roles. Because cultural sayings sometimes forms the basis of local institutionalized practices like water

user association in local community level, it becomes difficult to undertake any meaningful practice reforms with regards to gender issues. The strong presence of cultural systems acts as an obstacle to women's full participation in water resource management. Lack of support from local institutions, means that the needs of women are often very poorly represented or overlooked. Further, women are poorly represented in local water user association. They are minimally involved in leadership. Men continue to dominate in decision-making and leadership circles of water resource management. The invisibility of women's roles and activities in water resource management efforts is a factor that continues to hinder their increased productivity in development activities. Women's work in the environment as well as in development is not given full recognition.

Lack of educational facilities for women has acted to bind them further into time-consuming and overburdening, and hinder women participation in AWRM. In addition, socio-economic factors like credit facilities, annual average income of household, marital status of household, family size of household and others all put forth some influence in greatly diminishing women's participation in agricultural water resource management. Social challenges like deviant groups within the community is one of critical hindrance for women participation in agricultural water resource management.

5.2.Recommendations

Based on the above conclusion the following recommendations are generated to take account by district of Ada'a.

The district should provide awareness and advocacy as a regular effort for women in the study area. Thus, the difficulty of women must be steered to the forefront of national and regional development planning agendas.

Education and training sessions need to target women more aggressively. While it has been noted that time constraints appear to be a universal factor for most women, it is important that they undergo training sessions as this would greatly enhance their time management to participate in agricultural water resource management. Education and training can be conducted in small informal groups with women being encouraged to assume leadership roles. This would have the effect of supporting their self-esteem and confidence and encourage them to participate more actively in wider water resource

management. Education also has the effect of making women aware of their legal rights. Government, development agencies and other stakeholders have need to specifically incorporate and implement a woman training aspect in their activities. Ultimately, this would encourage them to participate in decision-making and leadership roles, a factor that would positively influence their quest for increased rights to resources management.

Constraints that hinder women from fully accessing economic facilities should be addressed. Local cooperatives and agricultural financing institutions need to be encouraged to assign women into their clients base.

The fact that women are often rendered invisible in water resource management and development circles tends to overlook not only their actual role but the potential they have. Women's indigenous skills, knowledge and insights should be welcomed in planning implementation and monitoring water resource management efforts. This is a crucial factor in empowering women because their resourcefulness would be recognized and ultimately, their productivity would be heightened.

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Appendixes

Addis Ababa University

College of Development Studies

Center for Environment and Development Studies

Appendix 1: Household survey Questionnaires

Dear Respondents;

This study is conducted in partial fulfillment of the requirement for the degree of Master of Science in

an *Assessment of women's Participation in Agriculture water resource management in the case of Godino village Ada'a district Oromia Region*. The purpose of the structured open-ended questionnaire is to get information about participation of women in agriculture water resource management. It contains two parts: part one questionnaires for general information and part two for basic objective based questions. I would like you to note that the information to be obtained from you is very essential to the successful completion of this study. Since your responses will be kept confidential, please give your honest response.

Thank you in advance!

1. Background information and

1.1. Name of interviewer_____

Date of Interview_____

Kebele/Village_____Got/Sub-Village _____

1.2. Respondent

Name(optional) _____ Sex_____ Age_____

1.3. Education; 1. Illiterate 2. Read and write 3.Primary education (Grade 1-8)

4. Secondary (Grade 9-12) education 5. College diploma 6. Degree and above

7.specify if any other_____

1.4. Marital status: 1. Single 2. Married 3. Divorced 4. Widowed 5. if any other specify _____

1.5. Religion: 1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. if any other specify_____

1. 6.Relationship of the respondents to the head of the household: 1. Head 2. Spouse

3. Child 4. relative 5. if any other specify_____

1.7. Family size

Age	M	F	Total
< 15			
15 - 64			
> 64			

1.8.Agroecology: 1. Dega 2. Weyina Dega 3. Kolla

1.9. What is your major livelihood sources; (multiple response possible)

1. On-farm (1.Agriculture 2. Livestock rearing, 3. fattening)

2. Off-farming (1. charcoal production 2. Petty business 4.Housewife

3.Non-farm (employed) 4. please specify if any_____

1.10. For how long did it rains in the village? 1. Three months, 2. Two months

3.One and half months 4. if seasonal, please mention the seasons_____

Is the condition of rainfall affect any of your socio-economic activities?

1. Yes 2. No

If yes in Q. 1.10. the above which activities were affected?_____

1. fishery activity notify 2. harvesting activity 3. weeding activity

4. Hoeing activity 5. Husbandry activity 6.poultry activity

II. General understanding about AWRM

1.11. What is key point for water source for you in your village? (multiple response)

1. Borehole water 2. Spring 3. Rivers

4. Water point (bono) 5. Others (specify) _____

1.12. Description of the sources of water;

1. Are the rivers permanent 2. Seasonal

3. Shallow wells: do they dry up in the dry season

4. specify other_____

1.13. For what purpose each source accessed?

1. Only Irrigators 2. Only Domestic user 3.Both

4. Others (specify) _____

1.14. Is there water allocation limitation in the village? 1. Yes 2. No

If yes what are the measurements:

1. Number of days in week 2. Number of hours in day

1.15. Who are the main users of water?

1. Irrigators 2. Livestock holders 3. Domestic users

4. Others (specify)_____

1.16. Do you pay for using of agriculture water? 1.yes 2.No

If your answer is Yes, what is the time of the payment:

1. Per moth 2. Per 3 months 3. Per 6 months 4. Yearly

5. Specify if any other_____

What is the criteria for the payment? 1. Based on land size owned

2. Based on time duration of water use 3. Based on type of cultivation

For which type of cultivation ?

1. For cereal 2. For husbandry 3. For vegetable 4. For poultry

5. Specify if any other_____

1.17. How many women are in the committee? _____

1.18. Are they ever assigned as a leader in the committee? 1. Yes 2. No

If your answer No why? _____

1.19. How are the WU committees selected in your village?

1. Nominated by the keeled leaders
2. Elected by the water users in the scheme

1.20. Who makes a decision on the sequence of agriculture water use?

1. Executive committee of WUC 2. Water committee
3. based on the agreements between the water users

4.others (specify_____

1.21. Do you receive water when needed? 1. Yes 2.No

1.22. Is water distribution fair? 1.Yes 2.No

If No, which socio-economic groups consume/use more water?

1. Committee members 2.Model farmers
3. Association member having good relations with committee members
4. All WUA have equal access to agriculture water

1.23. What are the major agriculture water management problems related to water

distribution in the irrigation system?

1. poor coordination by water committee
2. Lack of punishment against illegal water users
3. Rotations are not strictly implemented
4. We have no problem

III. Objective based Questionnaires

Objective 1: Dimension of women's participation in AWRM

1. Is AWRM functional in your village? 1. Yes 2. No

2. Are you participate in AWRM ? 1. Yes 2. No

3. Do women's participate in management and planning of AWRM?

1. Yes 2. No

If your answer No, please explain your reason_____

4. Is there specific structures that manage fairness between men and women participation in planning stage of AWRM? 1. Yes 2. No

If your answer yes, please explain your reason _____

5. What are the functions of the water management teams?

1. managing 2. leading 3. planning 4. all

6. Are you involved in the management team? 1. Yes 2. No

If No, why_____

7. Are there challenges you have faced with the management of the AW system?

1. Yes 2. No

If yes please specify_____

8. Do you participate in the implementation of AWRM?

1. Yes 2. No

If yes which ways they participate your village?

1. managing 2. in planning 3. specify if any other

If No please explain reason_____

9. In your understanding to what extent women's participate in the monitoring of AWRM?

1. Daily 2. Weekly 3.monthly 4. seasonal

5. specify if any other_____

10. In your opinion what is the contribution rate of women participation in AWRM during monitoring in your village?

1. High, 2. Low, 3.medium 4. I do know

Objective 2: Factors affecting women's participation in AWRM

Socio-cultural factors

11. Are there norms in your village that affect women participation in AWRM?

1. Yes 2. No

If Yes please mention them_____

12. Are these norms are imbalance the decision making power between men and women in your village? 1) Yes 2) No

13. If yes, who makes most of the decisions?

1. Mainly the men 2. Mainly the women 3. Joint decision

Men decisions 1. in allocation 2. in distribution system 3. in fee amount decision 4. specify if any other_____

Women decisions 1. in fee collection 2. in task division 3. specify if any other

Joint decision 1.in water using time schedule 2. in cultivation categorization 3. in method irrigation 4. specify if any other _____

14. If mainly men are decision maker, what are the main reasons?

No	Reasons	Tick
1	Because the women are not equally capable to make such decision	
2	Women are usually occupied with domestic activities	
3	Cultural practices usually favor the involvement to feminine such matters	
4	Most of the resources and capitals are controlled by men	
5	Others specify	

15. Is the participation of women in AWRM valued in the village?

1. Yes 2. No

If your answer No, please explain your reason _____

Socio-economic factors

16. In your opinion do women's can participate in village level meeting to solve socio-economic problems of the village through AWRM? 1. Yes 2. No

17. In your view do the village leaders ever solve any of women socio economic

problems?

1. yes 2. No

18. In your understanding what motivate women's to increase their participation in agricultural WRM? 1. money 2. awareness 3. education 4.all

5. specify if any other_____

19. What hinders women's from participating in the WUA?

1. illiteracy 2.ignorance 3. social status 4. income status 5. all

20. Do you get sufficient credit services from district cooperative office?

1.Yes 2.No

21. In your opinion, how much do these factors affect women's participation in AWRM? please tick the following factors in the table below.

Socio-economic factors	**Tick**
Sex of household	
Land size	
Livestock possession	
Age of household head	
Family size	
Income	
Education	
Credit access	

Objective 3: Challenges and opportunities of women's participation in AWRM

22. Is there social challenges in your community that hinder women participation in agriculture development? 1. Yes 2. No

If your response is Yes, please mention type of challenges and justify_____

23. Are local water sector ever conduct awareness session that inspire women to engaged in agriculture WRM? 1. Yes 2. No

If your answer Yes, please explain your reason _____

24.Do you have adequate knowledge on AWRM?

1. Yes 2.No

25. Do you get technical support services from Woreda Agricultural offices?

1. Yes 2.No

If your answer is Yes in Q.N. 25 please circle from the alternatives

1. Training support 2. Monitoring & Evaluation support

3. Consult support 4. if any other____ _____

26. Do you need training on AWRM? 1.Yes 2. No

27. Is there any restriction for women to inherit land from their family in your community? 1. Yes 2. No

28. How did you acquire the land?

1. By inheritance 2. through marriage 3. through land distribution

4. By leasing from other holders 5. Other means

29. Under whose name is the land registered/certified?

1. in my own name 2. inhumane of the husband

3. in the name of both 4. in the leaser's name 5. in the name of others

29a. what kind of challenges that you had faced during land registration/certification?

1. my husband was not willing 2. cultural influence

3. there was no challenges 4.Ifanyother

30. Is there any adult education opportunities for women in your village?

1. Yes 2. No

If Yes please specify_____

31. In your opinion do women regularly get training chance in your village?

1. Yes 2. No

32. Is there any technology system that motivate women for further participation in AWRM? 1. Yes 2. No

Farmers overall situation

33. The possession of the livestock of the household:

No	Type	Number
1	Cattle	
2	Heifers	
3	Horse	
4	Mule	
5	Donkey	

6	Sheep	
7	Goat	
8.	Poultry	

34. Do you have access to credit services? 1. Yes 2. No

35. Are you member in any association in your village ? 1. Yes 2. No

if Yes circle from the alternatives

1. Youth association 2. Women association 3. Cooperative association

4. farmer association 5. other_____

36. Do you have regular access to whether information? 1. Yes 2. No

37. Do you have bicycle road access? 1. Yes 2. No

38. How far is the nearest market from your residence? _____(hour)

39. Do you have contact with agricultural extension agents? 1. Yes 2. No

40. If Yes for the above question, how many times do you usually meet with extension agents per cropping year?

1. weekly 2. Monthly 3. In 3 months 4. In 6 months 5. Yearly

41. Do you usually participate in farmers' field days 1. Yes 2. No

42. Total farm land size of the household in hectares _____

43. The level of fertility of the farm land 1. fertile 2. moderately fertile 3. less fertile

44. Does the household possess an irrigated agriculture? 1. Yes 2. No

45. If your answer is Yes for the above question, what is the size of the irrigated land in timad?_____

46. Crops produced by the household

No	Crop type	Land size in timad	Production in 2010	Fertilizer applied in Kg	Seed applied in Kg
1	Teff				
2	Barely				
3	Wheat				
4	Maize				
5	Chickpea				
6	Lentil				

7	Pea				
8	Faba bean				
9	Potato				
10	Onion				
11	Garlic				
12	Other				

47. Which form of farming activity do you carryout for living?

No	Farming type	Yes	No
1	Crop production		
2	Livestock rearing		
3	Mixed farming (crop production & livestock rearing)		
4.	Based on the above farming form, which one is the dominant for you? 1. Crop production 2. Livestock rearing 3. Mixed farming		

48. Average annual income from the following sources:

No	Sources	Annual income
1	Farm income (Crop, livestock & Beehive)	
2	Non-farm income	
3	Remittance	
4	From other source	

49. How was 10 years age rainfall amount in comparison with the recent rainfall?

1. Decreasing 2. Increasing 3. No change 4 I don't know

50. How was the 10 years temperature in comparison with the recent temperature?

1. Decreasing 2. Increasing 3. No change 4 I don't know

51. Is there adaptation action under agriculture office to control temperature variability?

1. Yes 2. No

Thank you very much for your time and cooperation!

Appendix 2: Check list for KII

Key Informants Interview (KII) Interview checklist with concerned officials of irrigation authority of Ada'a District

Date of interview: _____Name of

person:_____

Position:_____

1. Is the importance of women involvement in AWRM recognized well?
2. According to irrigation policy, is the committee cycle considering women representation?
3. What is the contribution of women committee members in AWRM?
4. Is there structural factors that affect women representation in decision-making position in AW committee?
5. What are the different benefits created due to participatory AWRM in the area?
6. Is the opinions of the community flexible for the changing principle and policy?
7. What is the extent of woman involvement in planning, organizing and implementing in AWRM?
8. According to your opinion what motivates the women's to involve in agriculture WM?
9. Women play vital role in agriculture WRM more than men but most of the time they neglected in the community. How far do you agree with this statement?
10. What is the extent of involvement of women in the AWRM scheme in your area?
11. Is there equity consideration by the organization in access to and allocation of water?
12. What are the bases/criteria's for irrigable land?
13. Do you think the existing land tenure system is fair and help full for the sustainability of the AWM schemes? How?
14. What are the major social and technical problems in the irrigation system?
15. Do women have right to land tenure in your kebele?
16. Is there any prerequisites for women to hold land tenure in your community?

Thank you very much for your time and cooperation

Appendix 3:Check list for FGD

With communities and committee about women participation in AWRM

1.When was the committee/association established?

2. Why do you have committee/association in your village?

3. What are the responsibilities of these committees/associations?

4. How were you selected to be members of the committee/association?

5. Was there any aspect of gender perspective in the selection of the members?

6. How many women in the committee?

7. Are women in the committee/association allowed to make any decisions?

8. Do all the committee/association members understand water policy issues?

9. Are there any changes after the formation of the committee/association?

11. What are the bases/criteria's for irrigable land?

12. What are the rules for water allocation to individual water users?

13 Do you have rules and regulations for water allocation?

Thank you very much for your time and cooperation

Questionnaire 4: with women only about their Participation (FHH)

1. What are the sources of water in the village?
2. Who owns these sources of water?
3. Which priorities are given in the access of water for women?
4. Are there rules on how to access water in the village?
5. What are the roles and responsibilities of men and women in the management of AW?
6. Do you ever selected as a member in WU committee?
7. Are you allowed to use water for any purposes at anytime?
8. Are the women ever make decision equally with men in the AWM?
9. Are women ever assign as a leader in water user committee?
10. How was the attitude of the committee members toward women being as a leader?
11. Is the distribution of AW equitable for male house headed (MHH0 and female household (FHH) users?
12. How you evaluate the current land tenure system in the area as to the economic sustainability of the women?
13. What are the bases/criteria's for irrigable land?
14. What are the rules for water allocation to individual water users?

Thank you very much for your time and cooperation

Appendix 4:Multicollinearity

```
. pwcorr Sex Age Education_status Marital_status total_family_size land_size average_annual_size credit_access
```

	Sex	Age	Educat~s	Marita~s	total_~e	land_s~e	averag~e
Sex	1.0000						
Age	0.2320	1.0000					
Education_~s	-0.0846	-0.2472	1.0000				
Marital_st~s	-0.5812	-0.3523	0.3706	1.0000			
total_fami~e	-0.2011	0.0285	-0.2351	-0.1030	1.0000		
land_size	-0.0789	0.0184	0.0745	0.0725	0.1516	1.0000	
average_an~e	0.0857	-0.1854	0.3465	0.2570	-0.3217	0.1876	1.0000
credit_acc~s	-0.0037	-0.1735	0.1521	0.0681	-0.0073	-0.0032	0.0646

	credit~s
credit_acc~s	1.0000

```
. xi: logistic i.Women_participation i.Sex Age i.Education_status i.Marital_status i.total_family_size i.land_size
>  i.average_annual_size i.credit_access, r
i.Women_parti~n   _IWomen_par_0-1     (naturally coded; _IWomen_par_0 omitted)
i.Sex             _ISex_0-1           (naturally coded; _ISex_0 omitted)
i.Education_s~s   _IEducation_0-1     (naturally coded; _IEducation_0 omitted)
i.Marital_sta~s   _IMarital_s_0-1     (naturally coded; _IMarital_s_0 omitted)
i.total_famil~e   _Itotal_fam_0-1     (naturally coded; _Itotal_fam_0 omitted)
i.land_size       _Iland_size_0-1     (naturally coded; _Iland_size_0 omitted)
i.average_ann~e   _Iaverage_a_0-1     (naturally coded; _Iaverage_a_0 omitted)
i.credit_access   _Icredit_ac_0-1     (naturally coded; _Icredit_ac_0 omitted)

Logistic regression                             Number of obs   =        162
                                                Wald chi2(8)    =      52.41
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -29.676059               Pseudo R2       =     0.7081
```

_Iwomen_par_1	Odds Ratio	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ISex_1	22.40507	19.37167	3.60	0.000	4.115169	121.9845
Age	.9973913	.0310296	-0.08	0.933	.9383915	1.060101
_IEducation_1	22.73512	18.69013	3.80	0.000	4.538784	113.8819
_IMarital_s_1	11.69915	11.91199	2.42	0.016	1.590257	86.06793
_Itotal_fam_1	.1977403	.1771789	-1.81	0.070	.034151	1.144952
_Iland_size_1	.6554628	.5674529	-0.49	0.626	.1201264	3.576495
_Iaverage_a_1	53.4832	41.23624	5.16	0.000	11.8013	242.3845
_Icredit_ac_1	8.149493	6.169561	2.77	0.006	1.848118	35.93614
_cons	.0003302	.0007156	-3.70	0.000	4.72e-06	.0230944

Appendix 5: Logistic Regression Estimation Result and Marginal Effect

```
. xi: logistic i.Women_participation i.Sex Age i.Education_status i.Marital_status i.total_family_size i.land_size
>  i.average_annual_size i.credit_access
i.Women_parti~n   _IWomen_par_0-1     (naturally coded; _IWomen_par_0 omitted)
i.Sex             _ISex_0-1          (naturally coded; _ISex_0 omitted)
i.Education_s~s   _IEducation_0-1     (naturally coded; _IEducation_0 omitted)
i.Marital_sta~s   _IMarital_s_0-1     (naturally coded; _IMarital_s_0 omitted)
i.total_famil~e   _Itotal_fam_0-1     (naturally coded; _Itotal_fam_0 omitted)
i.land_size       _Iland_size_0-1     (naturally coded; _Iland_size_0 omitted)
i.average_ann~e   _Iaverage_a_0-1     (naturally coded; _Iaverage_a_0 omitted)
i.credit_access   _Icredit_ac_0-1     (naturally coded; _Icredit_ac_0 omitted)

Logistic regression                               Number of obs   =        162
                                                  LR chi2(8)      =     143.99
                                                  Prob > chi2     =     0.0000
Log likelihood = -29.676059                       Pseudo R2       =     0.7081
```

_IWomen_par_1	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ISex_1	22.40507	22.96267	3.03	0.002	3.005804	167.0059
Age	.9973913	.0344212	-0.08	0.940	.932158	1.06719
_IEducation_1	22.73512	17.49173	4.06	0.000	5.032776	102.7039
_IMarital_s_1	11.69915	11.88707	2.42	0.015	1.596909	85.70939
_Itotal_fam_1	.1977403	.1599488	-2.00	0.045	.040511	.9652009
_Iland_size_1	.6554628	.5126681	-0.54	0.589	.1415088	3.036076
_Iaverage_a_1	53.4832	45.73574	4.65	0.000	10.00735	285.8353
_Icredit_ac_1	8.149493	6.228463	2.75	0.006	1.822122	36.44884
_cons	.0003302	.0008166	-3.24	0.001	2.59e-06	.042073

```
. mfx

Marginal effects after logistic
      y  = Pr(_IWomen_par_1) (predict)
         =  .10751807
```

variable	dy/dx	Std. Err.	z	P>|z|	[	95% C.I.	]	X
_ISex_1*	.2319482	.10276	2.26	0.024	.030546	.433351		.679012
Age	-.0002507	.0033	-0.08	0.940	-.006724	.006222		46.4012
_IEduc~1*	.4055896	.12584	3.22	0.001	.158944	.652236		.401235
_IMari~1*	.2657632	.1394	1.91	0.057	-.007465	.538991		.481481
_Itota~1*	-.1529291	.07602	-2.01	0.044	-.301922	-.003937		.450617
_Iland~1*	-.0422565	.08366	-0.51	0.614	-.206236	.121723		.617284
_Iaver~1*	.5368982	.11731	4.58	0.000	.306984	.766812		.407407
_Icred~1*	.2479509	.10615	2.34	0.019	.039899	.456002		.401235

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 6: Logistic Model (Goodness-of-Fit Test) and linktest

```
. estat gof

Logistic model for _IWomen_par_1, goodness-of-fit test

       number of observations =       162
 number of covariate patterns =       149
           Pearson chi2(140) =        81.20
                 Prob > chi2 =         1.0000

. linktest

Iteration 0:   log likelihood = -101.67309
Iteration 1:   log likelihood = -32.388249
Iteration 2:   log likelihood = -29.959784
Iteration 3:   log likelihood = -29.677151
Iteration 4:   log likelihood = -29.669326
Iteration 5:   log likelihood = -29.669323

Logistic regression                             Number of obs   =        162
                                                LR chi2(2)      =     144.01
                                                Prob > chi2     =     0.0000
Log likelihood = -29.669323                     Pseudo R2       =     0.7082

------------------------------------------------------------------------------
_IWomen_par_1 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
         _hat |   .9939593   .1772549     5.61   0.000     .6465461    1.341373
       _hatsq |  -.0069696   .0600232    -0.12   0.908    -.1246129    .1106737
        _cons |   .0263698   .4083031     0.06   0.949    -.7738896    .8266292
------------------------------------------------------------------------------
```

Appendix 7: Field photos

Picture: 1. HHS by data collector

Picture:2. HHS by researcher

Picture: 3. Key informant interview (2018)

Picture: 4. FGD with communities & committee

Picture: 5. FGD with women only

Picture: 6 Spring water source

Picture: 7 Wedecha River

Picture: 8 Onion crop