



Assessment of the Role of Small-Scale Irrigation Practice on House Hold Food Security in Haramaya District, Eastern Haraghe Zone, Eastern Ethiopia

Tasisa Temesge Tolossa^{1,a,*}

¹School of Natural Resource Management and Environmental Sciences, Haramaya University, P.O. Box, 138, Dire Dawa, Ethiopia

*Corresponding author

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However, irrigation practice is poor in Ethiopia, increases agricultural production and productivity. The study was conducted in Haramaya district, Eastern Ethiopia. The object of this study is to see contribution of small scale irrigation towards increasing agricultural production, and identify the factors that affecting the use of small scale irrigation. From the district, three peasant associations were purposively selected each from different agro ecological classifications. Sampling size of 116 households was interviewed and Secondary data were also collected from the office. Three different types of irrigation were identified; Surface irrigation type using furrow method of irrigation is the most common irrigation type in the study area, which accounts about 66.5%. The study indicated that, water scarcity, lack improved seed, and disease outbreak and drought were among the major constraints of irrigation practices in the study area. Therefore practicing water harvesting and supplying improved technologies provide extended service regularly for farmers should be practiced in the future.

^a asisatemesgen@gmail.com

<https://orcid.org/0000-0001-8937-6364X>



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Introduction

In Africa, agriculture forms the backbone of most of the continents economies, providing about 60% of employment (Brenda et al, 2011). Small Scale irrigation is said to be the dominant contributor to the total irrigated area in many African countries (Mwakalilaand, 2004). Small scale irrigation development has shown throughout the developing world that it could be used as a key drought mitigation measure and as a vehicle for the long-term agricultural and socio-economic development of a country. Ethiopia has irrigation potential of about 3.7 million hectares. However, so far the country has utilized only 5% of its irrigation potential (IWMI, 2007).

The central role of irrigation agriculture within the context of poverty reduction efforts of the country is well understood as it increases the production of agricultural raw materials. Exploit land and water resources with enhanced sustainability reduce depends on rain-fed agriculture and its vulnerability to erratic rainfall prevailing in the country and avoid the shattering consequences of periodic droughts (MOWR, 2002). As a

result, irrigated agriculture currently is a priority in the agricultural transformation and food security strategy of the Ethiopia government.

Regional state and non-governmental organizations (NGOs) are promoting small scale irrigation scheme development to increase and stabilize food production in the country. It is presumed that irrigation water utilization has a huge contribution for household food security. There are positive relations between irrigation service and poverty alleviation. The availability of irrigation water to communities helps boost food production. It increases potential for producing more food consistently in drought prone and food insecurity area (FAO, 2003).

One challenge facing to attain food security and reducing poverty is highly dependency on rain-fed agriculture. The major problem associated with rainfall dependent agriculture is high degree of variability and on reliability rainfall pattern. To overcome the problem, utilize all potential water resources must be used to feed the growing population (Hail, 2008).

Agricultural irrigation has been regarded as a powerful factor for providing food security, protection against adverse drought conditions, increased prospects for employment and stable income, and greater opportunity for multiple cropping and crop diversification. Furthermore, (Hussain et al., undated) posit that access to reliable irrigation can enable farmers to adopt new technologies and intensify cultivation, leading to increased productivity, overall higher production, and greater returns from farming.

Statement of the Problem

Irrigation has contributed significantly to poverty reduction, food security, and improving the quality of life for rural populations. However, the sustainability of irrigated agriculture was being questioned, both economically and environmental. Rainfall is not distributed evenly especially in eastern part of Ethiopia. The small scale irrigation is widely used for house hold food security. Irrigation development provision of adequate and sustainable water for agricultural purposes is an option to reduce food insecurity. The general objective of this study was to assess the role of small scale irrigation on household food security in Haramaya District.

Specific Objective

- To identify the factors that affecting the use of small scale irrigation in the study area.
- To identify strategies for alleviating irrigation related problems.

Research Question

Both primary and secondary data was collected during field work aims to be in the study area answering the following question.

- What are the kinds of crops do you produce after and before involvement of small scale irrigation practice?
- Which kinds of crops do you produce more?
- What are the main problems you face in irrigation practices?
- What type strategies do you have taken to reduce this problem?

Material and Methods

Description of the Study Area

The assessment was conducted at Haramaya District, Eastern Ethiopia (figure 1). Haramaya district is one of 18 districts located on East Hararghe zone, eastern part of Ethiopia, the zone is bounded by Dire Dawa administrative council to the north; Somali regional state to the north, east and southeast; Bale zone to the south and southwest; and West Hararghe zone to the west. The Harari regional state is surrounded by East Hararghe zone. The zone capital is Harar, located 510 km to the east of Oromia Regional State and Ethiopian Capital city.

Climate

The economy of the zone is based on agriculture, mainly mixed agriculture in the highland/Dega and Weyna-Dega traditional climatic districts. In the low land traditional climatic zone there is extensive form of livestock production adapted. The mean annual

precipitation range of the district varies between 530 and 3100 mm. Precipitation varies from year to year and over decades, and changes in amount, intensity, frequency, and type. Even with same amounts, the rainfall can be very different if the frequency and intensity of precipitation differ (Figure 3). These variations have significant effects on the soil moisture and stream flow. The temperature varies in a range 18 to 29.7°C within the watershed.

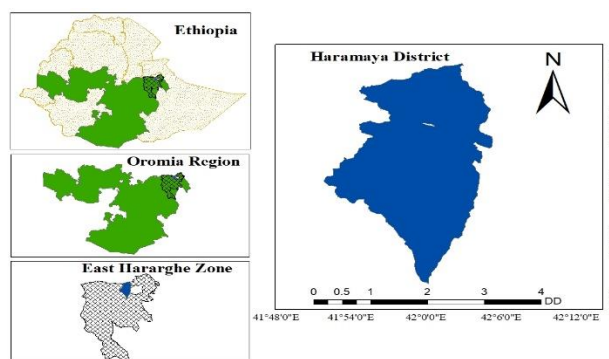


Figure 1. Map of the study area

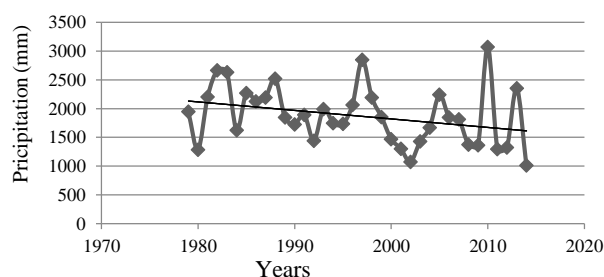


Figure 2. Variation of precipitation from year to year (1979-2014)

Method of Data collection

To achieve the objectives of research mentioned above data were collected through primary and secondary sources. Primary data was collected from the rural households using a structured questionnaire, GPS reading and field observations. In addition, secondary data was collected from published and unpublished materials. The information was also collected from zonal and district level offices of irrigation authority.

Sampling Technique and Size

The study was carried out for selected sites from different agro-ecological zones of the Eastern Hararghe intended to represent the irrigation potential areas to assess the irrigation practice and utilization with respective constraints, problems and opportunities. Purposive Sampling technique was used for identifying three districts that have better irrigation practices and utilization in Eastern Hararghe. This district was taken from different agro ecologies classifications (Lowland, mid land and high land) depend on availability of irrigation practices and information collected from Zonal Irrigation Authority (ZIA) as secondary information. From this district, three peasant associations (PAs) were purposively selected from each three-agro ecological classifications highland, midland lowland.

Data Collection

Data on irrigation methods, water sources, utilization, gaps, and constraints exist in irrigation, major crop that farmer’s plants, the seasonal climate pattern of the area, Area covered by irrigation practices were collected.

Data Analysis and Presentation

The both quantitative and qualitative data collected by the structured questionnaires were analyzed using MS Excel and Package for Social Science (SPSS) software, version 20. 3.

Result and Discussion

Socio-economic and Demographic Characteristics of the Respondents

As can be seen in Table 1, males predominate in irrigation activities (68.7%). This corroborates with similar findings of other studies, such as (Tafesse, 2003, Kebede, 2011 and Yasin, 2002), where subsistence rural food production is found to be an activity usually practiced by males. From the interviewed household heads, the minimum and maximum ages of the respondents are 19 and 79 with the average and standard deviation of 44.45 and ~13.87 years, respectively. Education plays a key role in the household’s decision to adopt technology. It creates

awareness and encourages innovation and invention. The study revealed that 33.2% of the users and 22.5% of the non-users of small scale Irrigation are illiterate (Table 1).

About 56.4% of the respondents had not attended school and are illiterate, whereas only 24.6% can read and write. Those who had completed an elementary level of education made up only 16.8%.

An interesting point can be observed from Table 1 is that there is a remarkable difference in level of education within irrigating and non-irrigating households. About 33.2% of the irrigators are illiterate compared with only 23.2% of the non-irrigators. Hence, it can be concluded that a low level of education is correlated with the non-irrigator category. It is believed that educated farmers are more aware of irrigation’s technological inputs, utilizations, and risks. Our findings confirmed that education has an impact on the involvement of farmers on irrigation practices. However, it is also important to note that SSI is practiced by people with different educational levels.

More than 68% of the respondents are married. The proportion of divorced household heads takes the second position (15.9%) followed by widowed (10.2%) and single households (6%), respectively. It is also crucial to note that 43.1% of the users and 24.9% of the non-users of small scale irrigation are married.

Table 1. Respondents’ sex, education, house types, household size and marital status.

Characteristics of HHs	Irrigating HHs		Irrigating HHs		Total	Sample HHs
	No	%	No	%	No	%
Sex						
Male	139	41.6	98	29.3	237	71
Female	64	19.16	33	9.9	97	29
Total	203	60.76	131	39.2	334	100
Education						
Illiterate	114	33.2	79	23.2	193	56.4
Read and write	52	16.6	20	8	72	24.6
High school and above	27	9.9	22	9.1	49	19
Total	193	59.6	121	40.4	314	100
Marital status						
Married	144	43.1	83	24.9	227	68
Unmarried	5	1.5	15	4.5	20	6
Divorced	26	7.8	27	8.1	53	15.9
Widowed	18	5.4	16	4.8	34	10.2
Total	193	57.8	141	42.3	334	100
House Hold size						
1-2	13	3.9	15	4.5	28	8.4
3-4	37	11.1	39	11.7	76	22.8
5-6	73	21.9	57	17.1	130	38.9
7-8	40	12	31	9.3	71	21.2
>9	17	5.1	12	3.6	29	8.7
Total	180	54	154	43.14	334	100
Irrigation status						
House hold	Response Frequency	Irrigators		Non Irrigators		Total
		Male	Female	Male	Female	
Roof harvest	%	31	11	57	27	126
		9.3	3.3	17.1	8.1	37.7
Surface harvest	%	108	43	41	16	208
		32.3	12.9	12.3	4.8	62.3
Total	%	149	74	108	43	374
		39.8	19.8	28.9	11.5	100

Trends of Small-Scale Irrigation Schemes on the Study Area

East Hararghe zone is one of the targeted zones of Irrigation Value Chains for Ethiopian Smallholder. The major livestock and irrigated crops and commodities selected for intervention are dairy, small ruminants, poultry, fruits, vegetables and fodder. Haramaya District is one of the consistently agricultural surpluses producing areas in East Hararghe Zone. It is believed that the Woreda has a high potential to produce irrigated crops. At present, both traditional and modern small-scale irrigation systems are being practiced side by side in the study area. Traditional ground water use is one of the irrigation systems and it is simple for farmers to practice by inheriting the knowledge from grandparent but the amount of increase of ground water depth and seasonality of rivers are major problems (Figure 3). Currently modern irrigation scheme like river diversions are introduced and many farmers have adopted various irrigation technologies like motor pump, treadle pump, and rope and washer pump. The total irrigable land potential in the district is estimated to be 6450 hectares.

Small Scale Irrigation Practice and System

Method of irrigation system

According Tuner (1994), small scale irrigation usually on small plots, in which private farmers have the major controlling interest. Level of technology that farmers can effectively operate and maintain themselves is an important objective in the promotion of small scale irrigation and also increases farmer's involvements in the design, implementation, operation and maintenance of irrigation system. In our study area, most of the local people practiced traditional irrigation system in order to fulfill their food security at the local of house hold. Majority of Haramaya district farmers used surface irrigation to irrigate their crop lands (Table 2, Figure 4).

Contribution of small scale irrigation on house hold food security

The aim of irrigation is to enable the farmers' to make at most use of the natural resources, water and soil using his or her labor and skill to produce crops (subsistence and commercial) for livelihood. Livelihood includes on farm non-farmer and off farm activities that aims at food security in the first place poverty alleviation, biodiversity, crop diversification and last but not least socio-economic importance of the entire rural community, climate and topography (shape and slope) is to be taken to account

The small scale irrigation plays greater role in increasing the level of house hold income by reducing house hold food insecurity, increasing agricultural production and balance market price crisis. Crops that are mainly feasted by increasing the level of income i.e. Onion, Carrot, Cabbage, Tomato, and Chat have high market price (Table 3). Most of the households produce the crops that are used for food to reduce food insecurity like Potato, Maize, Aja and Barely (Table 3). This result is similar to Hussein and Hanja (2004) that is increased production makes food available and affordable for the poor farmers. Some households do not practice irrigation systems, because of topography, land in accessibility and lack of water.

The above table indicates that 55 (47.7%) of household respondents obtains high level of income by producing 24.4% of onion, 24.4% of cabbage, 19.5% of tomato,

17.07% of carrot and 14.6% of chat. As seen in Table 3, House hold respondents produced crops that used to reduce food insecurity 40 (32.6%) 28.57% produce Aja, 42.8% produce potato, and 7.14% produce barley 24 (19.7%) produce Aja, Potato and Barely respectively. House hold respondents does not used irrigation, are generally produce 82.35% of Teff, 17.64% of wheat by utilizing or using rain fall, because of lack of adequate water, land inaccessibility and topography are made un favorable for irrigation practice.



Figure 3. Schematic picture of irrigation practice of farmer (Photo was taken from irrigation farm lands in Haramaya District, Gabisa Village, 2019)



Figure 4. Schematic picture of irrigation practice of farmer (Photo was taken from irrigation farm lands in Haramaya District, Tuji Gabisa Village, 2019)



Figure 5. Schematic picture of water harvesting which have been using for small scale irrigation (Photo was taken from irrigation farm lands in Haramaya District, Damota Village, 2019)

Table 2. Methods of irrigation

Methods of irrigation	No of respondent	% of respondents
Furrow	106	91.3
Flooding	10	8.7
Total	116	100%

Source: Eastern Hararghe Zone, Haramaya District Office of Agriculture and Natural Recourses. (2019)

Table 3. Contribution of small scale irrigation on household's food security.

Use of category	No of respondent	% of respondents	Types of crop produced	No of respondent	% of respondents
High level of income	145	43.4	Onion	36	10.8
			Cabbage	25	7.5
			Tomato	26	7.8
			Carrot	19	5.7
			Chat	39	11.7
Food production	112	33.5	Maize	36	10.8
			Aja	11	3.3
			Potato	25	7.5
			Barley	11	3.3
			Sorghum	29	8.7
			Teff	16	4.8
No irrigation	77	23.1	Wheat	22	6.6
			Others	39	11.7
			Total	334	100%

Source: Eastern Hararghe Zone, Haramaya District Office of Agriculture and Natural Recourses. (2019)

Rainwater Harvesting

In Haramaya District there are two seasons namely: rains season “*yeroo robba*” and dry season “*yeroo gogginsa*”, during rainy season farmers collect water from roof and flood which is called water harvesting “*bishaan walitti qabu*”. Including irrigation, water harvested is used during dry season for different purpose. This system involves the collection of runoff from large areas which are at an appreciable distance from where it is being used. This method is applied with intermediate storage of water outside the cropped basin for later use as supplementary irrigation. In this type of water harvesting (slope of mountain or hill) is collected and taken to farm land located at considerable distance from the collection catchment.

Conclusions

Irrigation is one of a means by which agricultural production can be increased to meet the growing food demands. Irrigation contributes to house hold improvement through increased income, food security, employment and poverty reduction. The economy which has been highly depends on agriculture is very much weak and affected by unreliability of rain fall pattern. To overcome this problem introducing of farmers about effects of small scale irrigation is very important. Small scale irrigation in the poverty redaction household enhancement discourse especially in recent time when the rainfall pattern is increasingly becoming erratic, while small scale irrigation is very important to enhancing food security. To understand the role of irrigation in economic growth and poverty alleviation it is useful to review the fundamental source of economic growth.

Small scale irrigations are important for increasing income of the house hold as well as the country economy by producing agricultural products like onion, cabbage,

tomato, maize, potato and etc. The small scale irrigation practices are important for the local community that create job opportunity and balance income distribution through the year and it can helped to self –reliance and independent in food security of house hold, good management activities are important for the use sustainable irrigation land and water, and also increasing the production of agricultural products.

Small scale irrigation contributes more in food security in the recent years. But should be well practiced in study area based on the following points is recommended.

- In order to improve house hold food security small scale irrigation the farmer should be experienced of irrigation system.
- Most of house hold in the study area practiced in small scale irrigation only for independent in food security; therefore they are better to produce more agricultural products for international markets to the growth of the country GDP.
- Some house hold contracts their lands to other people and they are added different chemical to the lands as a fertilizer. But these chemical fertilizers reduce the productivity of the land for many years. So, it is better to use organic fertilizer for sustainable use of land and house hold uses their own land. Based on the study, household with the educated heads are better in food security status than households with non-educated heads in the study.

The finding reveals that irrigation and food security are positively and significantly related in the study area. Participation in irrigation helps the households to generate additional income and diversification of household food consumption. Therefore, development strategies and programs related with food security through agricultural production should think about the importance of irrigation. Hence, the governmental and non-governmental

organization should expand access of small scale irrigation to households in poverty reduction and to improve their food security. Therefore, it is recommended that the regional and federal governments should provide access to education for farmers. Strong regulatory mechanism should be designed to overcome problems related to irrigation use to provide incentives to committed and disciplined farmers.

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