

# Challenge and Opportunity of Small Scale Irrigation in Assosa District, Benishangul Gumuz Region, Ethiopia

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## Abstract

This study was conducted to assess the challenge and opportunity of small scale irrigation in Amba four kebele, Assosa District, Benishangul Gumuz Region, western Ethiopia in the year 2019. In the kebele farmer's grow different cereals, vegetable and fruit and soil types was mostly dominated by clay red which have medium soil fertility. To undertake this research data was collected by questionnaires and interviews from 61 sample respondents and kebele agriculture experts. The data was analyzed by Statistical Package for Social Science and presented by like table, percentage and graph. There are so many challenges faced in the kebele based on the questionnaires survey 50% of the respondent are exposed to those serious factors i.e. lack of irrigation awareness, lack of water saving technologies, lack adequate base line about irrigation, lack of experience in design and supervision about irrigation project and poor economic back ground. Finally the research finding was concluded that there were different output/results based on the research objectives according to the challenges of small-scale irrigation 11.5% of the respondent were exposed to different conflict/disagreement due to shortage of sufficient irrigation system and low capacity of water on the area and on the contrary we have generalized that there have been good opportunities according to our finding 98.4% of the respondent are agree as result of irrigation they have an opportunity to produce crops and vegetables by gaining water from their irrigation system. As a result this irrigation technology used as source of income, maximizing of food production, reduction of poverty. The efficient and effective use of the water resource in irrigation region is central to the long term sustainability of irrigated region in the area. Finally we have been suggest different point of view based our finding we recommended to the concerned bodies such as Assosa District agriculture office, Amba four kebele agriculture office and farmers to work hormonally to each other sought solution for small-scale irrigation challenges and the government should give attention on those critical issues.

**Keywords:** small scale Irrigation, Challenge, Opportunities, Farmers, Respondents

**DOI:** 10.7176/JRDM/81-01

**Publication date:** December 31<sup>st</sup> 2021

## 1. Background and Problem Justification

Agriculture is the backbone of the Ethiopian economy which contributed 41.6% to (GTP, 2010). It also provides raw material to industrial sector, export items and is major source of employment for 84% Ethiopia population. Cognizant to this fact, the country focused its development policy, that is, Agricultural Development Led Industrialization (ADLI) on agriculture to transform the economy .ADLI aims for boosting agricultural productivity and improving the rural standard of living, which in turn increase the demand for goods and services and further lead to industrial development. One of the impetuses to achieve the agricultural policy objective is the promotion of irrigation agriculture and integrates water resource management (ADLI, 1994).

In Ethiopia; traditional irrigation had been practice since the ancient times. However, modern irrigation development is start during imperial regime in 1950s with large scale irrigation and hydroelectric power projects (Berhanu and Peden, 2002). So Irrigation is seen as the means of ensuring food security in Ethiopia. Thus the use of modern, advanced and resource efficient irrigation technologies is vital to increase farm output and take people out of poverty. The then large scale irrigation projects are intended to produce crops used for inputs of agro-industries. The Derge regime gave emphasis in development of large, small and medium irrigation schemes to mitigate drought and famine (ibid.). The Ethiopian People Democratic Front (EPRDF), the current regime, like its predecessors enthusiastic in developing irrigated agriculture. Thus, it has developed an irrigation policy that aims developing the huge irrigated agriculture potential for the production of food crops and raw materials needed for agro industries, in an efficient and sustainable basis and without degrading the fertility of the production fields and water resources base (MoWR, 2001). Though such attempts have been done for the last 45 years, the country still used 5 to 10% of 3.7 million hectares of irrigated potential area.

Irrigation agriculture produces less than 3% of the total food production of the Country. Hence, though successive regimes of Ethiopia have attempted to boost irrigated agricultural production through irrigation development, the country still could not exploit its irrigation potential efficiently and effectively. Instead, the country is highly dependent on rain fed agricultural production system. Small irrigation is the application of artificial water with small area of land up to less than 200ha which diversion weir made up of local material small irrigation the system of using the collect water from by different water collecting techniques such as roof water

harvesting, micro catchment, macro catchment and flood water harvesting to store water and used it for growing different agricultural output such as creel crop, fruit, vegetable and other agricultural output (Bekele et al., 2012). The beginning of irrigation in Ethiopia strongly associated with the ancient civilization of Axum north of parts of Ethiopia. In the highland of Ethiopia irrigation practices have been such longer ages since past period for production of subsistence food crop (Awulachew et al., 2007).

The supplementary irrigation has been practiced by small holder farmers of Ethiopia for many centuries to solve their livelihood challenge (Hagos et al., 2009). Modern irrigation is started in the early 1950s by bilateral agreement between the governments of Ethiopia during degree regime with Dutch jointly for sugar production. Challenges regarding to development of small irrigation system are include pre-dominantly nature of production system, shortage of enough agriculture in put such as fertilizer, modern, labor and enough capital, limited technologies, inadequate extension service due to above condition irrigations system contributes about 2.5% of overall GDP (MoA, 2011b).

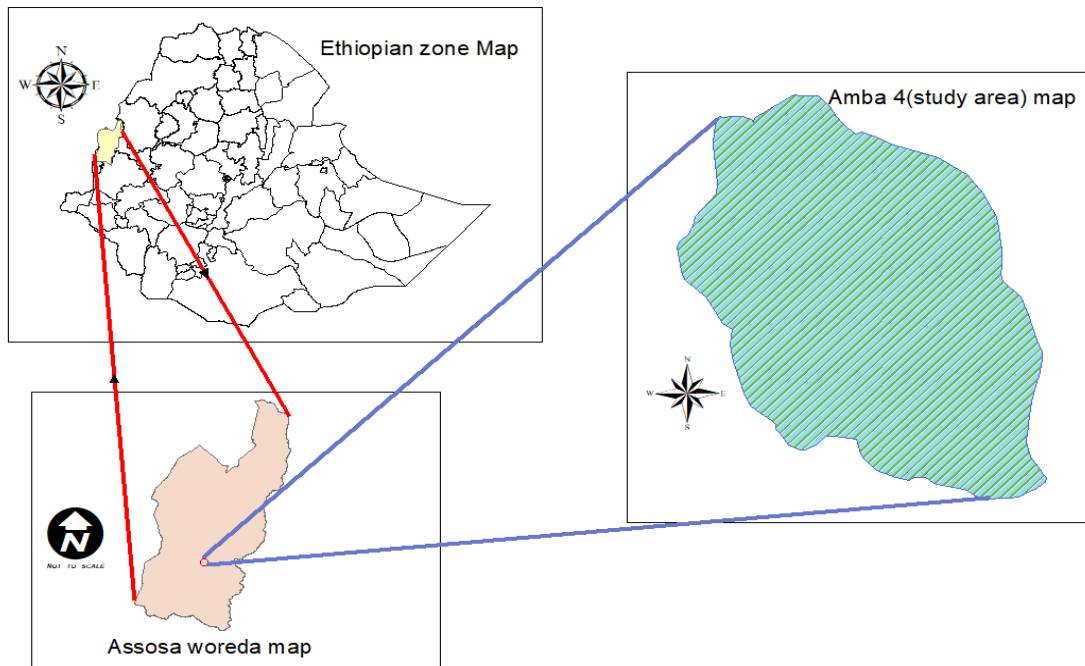
These challenges can be explained as technical constraints and knowledge gaps as (1) inadequate awareness of irrigation water management as in irrigation scheduling techniques, water saving irrigation technologies, water measurement techniques, operation and maintenance of irrigation facilities, (2) inadequate knowledge on improved and diversified irrigation agronomic practices, (3) shortage of basic technical knowledge on irrigation pumps, drip irrigation system, sprinkler irrigations, surface and spate irrigation methods (4) scheme based approach rather than area/catchments based approach for the development of SSI Schemes, (5) inadequate baseline data and information on the development of water resources, (6) lack of experience in design, construction and supervision of quality irrigation projects, (7) low productivity of existing irrigation schemes, (8) inadequate community involvement and consultation in scheme planning, construction and implementation of irrigation development, (9) poor economic background of users for irrigation infrastructure development, to access irrigation technologies and agricultural inputs, where the price increment is not affordable to farmers (FAO, 2012). There is a lot of opportunities to practice that enhance irrigation practice due to plenty resource of water and geographical location of the country (MoA, 2011a). Irrigation can included increase food production in rainfall lack area such as arid and Semi- arid area, enhance food production, promote economic growth, sustainable development, create employment, improving living condition of small-farmers and contribute to the poverty reduction (Abraham et al., 2011).

Ethiopia faces so many challenges to generate well promising benefit from irrigation. All most in all Ethiopians farmers are practiced very primitive way of irrigation system. The outcomes of the irrigation productivity are affected due to natural human and past and current condition of irrigation practice. Backward practice and lack of skilled man power and the technology are the main problem or our challenges that facing Ethiopia to generate well defines output from irrigation. Similarly, small scale irrigation practice in our study area is not that much suitable. That means farmers are not well intensively engaged to the activity. This shows that even if it is not well identified and documented they do have a sort of constraint's that limit their practices. Accordingly, this study was motivated to identify and document the challenges and opportunities of small scale irrigation practices in Assosa District, Benishangul Gumuz Region, Ethiopia.

## **2. Materials and Methods**

### **2.1. Description of the study Area**

This study was conducted in Assosa District, Benishangul Gumuz Region, Western Ethiopia. Assosa District is bordered in the North West direction by Kurmuk and Homosha District of Benishangul Gumuz Region; it is bordered in the Southern Direction by Mao Komo Special District of Benishangul Gumuz Region. The District is bordered in the West direction by Sudan and in the Eastern direction bordered by Bambasi District of Benishangul Gumuz Region. It is located at an altitudinal range of 1570m above sea level and the geographic location of the study area is range between 09.17<sup>0</sup>\_12.06<sup>0</sup> N latitudes and 34.10<sup>0</sup>\_37.04<sup>0</sup>E longitudes. (Assosa District BoARD, 2018).



**Figure 1:** Map of the Study Area

The agro ecological zone of Assosa district is fully Kola. The average temperature of the district is 27 °C. The rainfall pattern of the district is monomodal rainfall distribution. The rainy season starts in May and extends to October and the dry season starts in November and extends up to end of April. The dry season have a wider temperature differences mainly on the onset it is too cold in the morning and at the night and too hot in the midday. The dry season in the district has also a windy and cloudy nature. The annual rainfall of district ranges between 900mm to 1400mm by using the moisture available from rain water most of the crops are cultivated in the district( Assosa Agricultural Development Office,2014). Assosa District depends on agricultural products. The commonly produced field crops are Maize, Sorghum, soybean, finger millet, sesame etc. The commonly cultivated vegetable crops are Tomatoes, Onion and Pepper. Assosa District has high domestic animal resources the commonly raised ones are Cattle, Goat, Donkey, Mule and Poultry. The human population in Assosa District is totally 87,366. Out of these 44,176 are males and 43,190 are females. The total rural households in the District are 18, 125 out of these 14,678 are male headed household and 3,447 are female headed household. The average family size of per household in the district is 5 (Assosa District Agricultural Development Office, 2014).

## 2.2. Data Collection Method

The primary data were collected directly from kebele households by face to face interview, and physical observation. These data were collected from different published and unpublished documents, project reports and government officials.

## 2.3. Sampling technique and Sample size

For this study Amba four kebele is preferably selected considering the potential of irrigation and its accessibility for the study. The sample size of this study were determined by using Out of 160 household heads of the kebele, 61 household heads there is used as a sample respondent for this study as it is given below

$$n = \frac{N}{1+N(e)^2}$$

Where, n= Sample size

N=Number of household

e= significance level= 0.05

$$n = \frac{160}{1 + 160(0.1)^2} = 61$$

## 2.4. Methods of data collection

To obtain all required data effectively and efficiently both qualitative and quantitative data were used. Data collected from primary source like respondents. The secondary sources there collected from review the relevant material such as research documents, books reports and documentary source located in the study area and internet service. Interview are organized in a way that respondents were provide valuable information on the topic of the research and solution there provided on how to utilize the opportunities created much further. Semi -structured questionnaire are used for interviewing the respondents. Personal observation there used in order to have a chance to practically observe the challenges and opportunities of farmers in small-scale irrigation practice in our case study area.

## 2.5. Data Analysis and Presentation

Descriptive analysis is used to summarize the information or data collected from the sample respondents. Data processing is the transformation of raw data in to some processed data to facilitate the study. It includes, editing, coding and classification. The quantitative data collected by interview (semi-structured questionnaire) analyzed, organized and presented by using descriptive statistics such as percentage, frequency, table, charts and graph using Statistical Package for Social Science (SPSS) version 20 and the qualitative data are analyzed by conceptual, general, narration and interpreting for different qualitative questions.

## 3. Result And Discussions

### 3.1. Respondents' characteristics

Table 1: Age and Sex of respondents

<i>Respondents' characteristics</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
<i>Age</i>	<i>20-30</i>	<i>14</i>	<i>23</i>
	<i>30-40</i>	<i>12</i>	<i>19.75</i>
	<i>40-50</i>	<i>10</i>	<i>16.4</i>
	<i>50-60</i>	<i>17</i>	<i>27.9</i>
	<i>&gt;60</i>	<i>8</i>	<i>13.1</i>
	<i>Total</i>	<i>61</i>	<i>100</i>
<i>Sex</i>	<i>Male</i>	<i>47</i>	<i>77</i>
	<i>Female</i>	<i>14</i>	<i>23</i>
	<i>Total</i>	<i>61</i>	<i>100</i>

Based on table 1 above, the age of respondents in the studies area were 23%between 20-30, 19.7% b/n 30-40, 16.4% 40-50, 27.9%50-60 and 13.1%is above 60 years old. In general most of the respondents in the study area were the age b/n 50-60. Again Table1 above shows that males take high proportion accounting 77% of the total respondents and 23% are female. Thus the participation of females is relatively low. This is because they were not voluntary to respond the questionnaire, not only this but also cultural influence and they were probably invited the questionnaire to their participation nearby friends and to their husband. Therefore, their participation should be increased through avoiding the above stated problem and by creating awareness of them.

### 3.2. Crop production Pattern

Table 2: Crop production pattern of the study area

<i>Variable</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
<i>How many times you can produce crop, vegetable and fruit pre year?</i>	<i>Once</i>	<i>11</i>	<i>18%</i>
	<i>Twice</i>	<i>7</i>	<i>11.5%</i>
	<i>Three</i>	<i>43</i>	<i>70.5%</i>
	<b>Total</b>	<b>61</b>	<b>100%</b>

Table 2, shows that 11.5% of respondents reported that they produce twice per year and 70.5% of respondents reported that they able to produce three times per year. This shows that majority of farmer's produce three times per year. From the rain fed users all respondents reported that they able to produce only ones per years.

### 3.3. Access for Extension service

Table 3: Access to extension service

<i>Variable</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
<i>Where do you get Extension service?</i>	<i>Office</i>	<i>30</i>	<i>40.2%</i>
	<i>Farm</i>	<i>31</i>	<i>50.8%</i>
	<b>Total</b>	<b>61</b>	<b>100%</b>

Table 3, shows that 50.8 percent of respondents from irrigation users who were access to extension services reported that they obtain extension services at their farm and 40.2 percent of respondents reported that they obtain extension services at the office. The survey result show that majority of respondents (household) who were access to extension service obtain from their farm.

### 3.4. Access for irrigation technology

Table4: Accessibility of Irrigation technologies

Variable	Category	Frequency	Percent
Do you have any Irrigation technology?	Yes	35	57.4%
	No	26	42.6%
	<b>Total</b>	<b>61</b>	<b>100%</b>

From table 4 above, the accessibility of irrigation technologies were 57.4% and the remaining 42.6% shows that the limitation in irrigation technologies accessibility. It indicate that lack of capital, lack of knowledge ,lack of experience the major problem of irrigation user as the respondents has narrated via our open ended questions.

### 3.5. Opportunity of small scale irrigation in the study area

The basic opportunities of small- scale irrigation increased agricultural production to meet the growing food demands of rapid population growth, food security, promotes economic growth and sustainable development, create employment opportunities, and improve living conditions of small-scale farmer. As a result, irrigation contributes to poverty reduction and protects the environment from degradation and pollution. Furthermore, it increases subsurface water levels and recharges groundwater.

Table 5: Opportunities of small scale irrigation

Variable	Category	Frequency	Percent
Can you believe that small scale irrigation have created an Opportunists for food security to your?	Yes	60	98.4%
	No	1	1.6%
	<b>Total</b>	<b>61</b>	<b>100%</b>

Table 5 above, shows that 98.4% agree as result of irrigation they have an opportunity to produce crops and vegetables by gaining water from their irrigation system. As a result this irrigation technology used as source of income, maximizing of food production, reduction of poverty and also have a great opportunity in extension service, the efficient and effective use of the water resource in irrigation region is central to the long term sustainability of irrigated region in the area.

### 3.6. Market accessibility

Table 6: Market accessibility in the study area

Variable	Category	Frequency	Percent
Do you gain Market access?	Yes	55	90.1%
	No	6	9.8%
	<b>Total</b>	<b>61</b>	<b>100%</b>

From the above table 6, 90.1% of the respondent said that there were good market accessibility on the area. That means there were different suitable condition the area such as the market is near to the product, the cost of crops and vegetables were balanced and have low transportation cost.on the contrary 9.8% of the respondent were the reverse of the above.

### 3.7. Types of small-scale Irrigation

Table 7: Types of small-scale Irrigation on the study area

Variable	Category	Frequency	Percent
Which small scale Irrigation type do you use?	Modern micro dam	3	4.9%
	Traditional river diversion	58	95.1%
	<b>Total</b>	<b>61</b>	<b>100%</b>

From the above table 7: the respondent of modern micro dam 4.9% the percentage of Modern micro dam was very low it indicated that there were no capital or resources to construct such kinds of small-scale irrigation and 95.1% traditional river diversion these indicted that it was easy to use traditional river diversion rather than modern micro dam.



### 3.8. Availability of water for Irrigation

Table 8: The amount of water to irrigate on the area

variable	Category	Frequency	Percent
Is the Amount of water enough to irrigate your land?	Yes	41	67.2%
	No	20	32.8%
	<b>Total</b>	<b>61</b>	<b>100%</b>

Table 8: indicates that 67.2% of the respondents have got enough water for their irrigation purpose and 32.8% have not got enough water access for irrigation due to lack of rain fall, soil type and topography.

### 3.9. Water Application methods

Table 9: Application methods of water on the study area

Variable	Category	Frequency	Percent
What type of water Application method you use?	Flooding	2	3.3%
	Furrow irrigation	26	42.6%
	Sprinkle irrigation	1	1.6%
	Surface irrigation	32	52.5%
	<b>Total</b>	<b>61</b>	<b>100%</b>

From the above table 9: the respondents' use of irrigation method show flooding 3.3%, furrow irrigation 42.6%, sprinkler irrigation 1.6% and surface irrigation 52.5%. This indicates that most farmers use surface irrigation, to producing different types of farm products like fruit, vegetation, and sugar cane.

### 3.10. Challenges of small-scale irrigation

With regard to the prospects of effective Utilization of Irrigation Technologies, the result of the study has shown that availability of labor, agro-ecology, access to money, access to markets and support of government and NGOs were identified as major challenges or factors which can be prospect for utilization of irrigation technologies. The difficulty in maintaining new irrigation technologies, lack of access to spare parts and shortage of water, lack of training, uncertainty about new irrigation inputs and lack of know-how, were the most serious challenges hindering irrigation development. In addition to that, the income possible from non-crop producing activities is found to be a major inhibitor in the development and utilization of small-scale irrigation technologies. Weakness of Local facilities, Weakness of extension personnel in supporting farmers were also identified as a main hampering point of extension service.

Table 10: Challenges of small-scale irrigation on the study area

Variable	Category	Frequency	Percent
Challenges of small-scale irrigation	Yes	46	75.4%
	No	15	24.5%
	<b>Total</b>	<b>61</b>	<b>100%</b>
Do you feel you are Sharing equal water with every user in the scheme?	Yes	61	100%

Table 10 above shows that there were conflicts in the irrigation schemes with the use of their small scale irrigation systems 75.4% of respondents said that there was conflict during the use of irrigation water while 24.5% them says there is no conflict among the neighboring community in irrigation water use. The Challenges seem more severe in Amba 4 kebele as per the narration that most respondents give for our open ended questions. Most of the challenges are associated with poor scheme coordination, water theft, water shortages, Lack of transportation, theft of products like fruit, sugar cane, vegetables and threats such as insects. Again table 10 above, show that all farmers gain equal access of water distribution, since they irrigate on the same piece of land, divert water in water way, collect water during night.

### 3.11. Source of water for small scale irrigation

The survey result shows that the source of irrigations are river, spring, Well, Pond. The efficient and effective use of the water resource in irrigation region is central to the long term sustainability of irrigated region in the area. The river offers the potential to increase water availability by coupling proper water allocation with efficient use. Means 70% of the respondents are collected from the river. From figure 2: the result shows that the major source of Small Scale Irrigation got from The River.

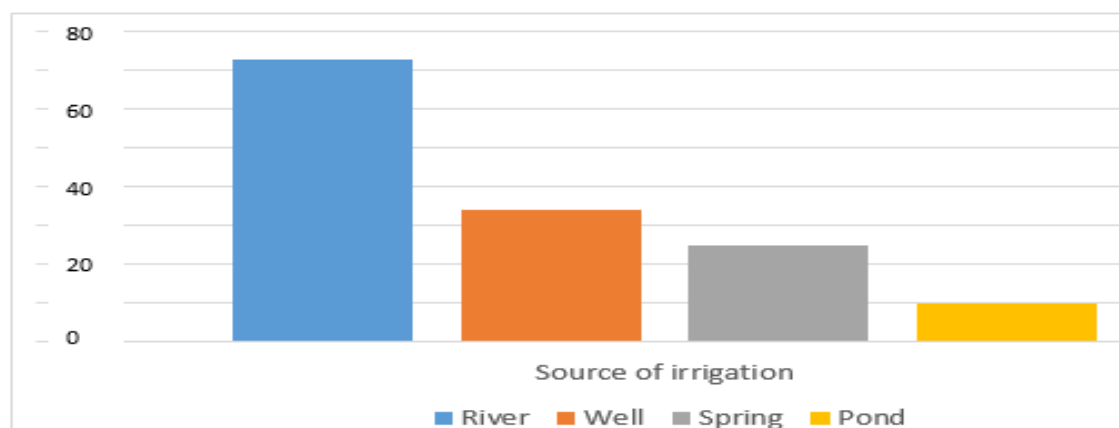


Figure 2: Source of water for small scale irrigation

#### 4. Conclusion and Recommendation

After making a detail investigation we have got a lot of challenge's which were identified in the Amba4kebele those serious challenges are shortage of enough water input for irrigation, lack of enough land size to practice of small scale irrigation, lack of labor, lack of enough capital to practice irrigation, inadequate extension service, lack of awareness about small-scale irrigation, lack of water saving irrigation technologies. All of the above challenges have been identified in the kebele. The practice of irrigation have a lot of opportunities to Amba4 kebele those opportunities of small-scale irrigation are increased agricultural production to meet the growing food demands of rapid population growth, to enhance food security, promotes economic growth and sustainable development, create employment opportunities and improve living conditions of small-scale farmer users. As a result, irrigation contributes to poverty reduction and protects the environment from degradation and pollution. Furthermore, it increases subsurface water levels and recharges groundwater. So according to this finding 98.4% of the respondent have agreed small-scale irrigation system is a best way to fulfill the above opportunities on their kebele. Small-scale irrigation leads to sustainable development creates job opportunity, improving living condition of small scale farmers and contributes to the poverty reduction. Generally we concluded that beside those challenge which existed in the kebele, but small scale irrigation user increasing from year to year which is against challenge which will solved in the future. We have recommended the following issues based on the main finding and which will indicates what to do in the future in order to solve those problems.

- ✓ Irrigation farming to be sustainable, there is need for intervention by interested stakeholders such as community based organizations and co- operatives.
- ✓ Responsible body should ensure that there are good roads and cheap transport which ferry the crops to different places for sustainable small-scale irrigation.
- ✓ The farmer to be co-operated in irrigation to minimize the challenges of small-scale irrigation practice.
- ✓ Farmers should have high interaction with development agent (DAs) at the farm place.
- ✓ Lastly, we recommend it is important to encourage farmers to apply new technology to be successful in small- scale irrigation practice in the study area.

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