

# Challenges and Opportunities Towards Small-scale Irrigation Based Onion Production: The Case of Fentale District, Oromiya Regional State, Ethiopia

**Tesfaye Tura**

Ethiopian Institute of Agricultural Research (EIAR), Werer Agricultural Research Centre, Werer, Ethiopia

**Email address:**

tesfishanni1599@gmail.com

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**Abstract:** Onion is one of the important vegetable crops grown by farmers mostly for market purpose. This study focus on explore the challenges and opportunities of small-scale irrigation onion production at fentale district. Samples of 180 onion producer smallholder households were selected through multi-stage random sampling from the three kebeles of Fentale district. Sources of data were both the primary and secondary sources. The primary quantitative data were collected through Interview schedule while the qualitative were collected by FGD and KIIs methods. The data analysis methods also encompassed both quantitative and qualitative. Descriptive statistics (percentage) were employed to analysis quantitative data while qualitative data were analysed by narrations and interpreting the meaning of words. The result of the descriptive statistic reveals that the high cost of inputs, fluctuation in irrigation access, disease and pest, the input supply shortage, high labour cost, flood problem and informal sources of seed were the challenges of onion production at the study area. Besides the high income gained from onion, access to irrigation, good weather condition and the high yield of onion from a small plot were the major opportunities to produce onion at the area. Finally, the researcher recommended that the Government organizations and other responsible bodies should ensure the equal distribution of irrigation water for both upper and lower streams, and strengthen inputs supply chains.

**Keywords:** Challenges, Fentale, Irrigation, Onion, Production

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## 1. Introduction

Onion was introduced to the agricultural community of Ethiopia in the early 1970s when foreigners brought it in [1]. Ethiopia is the third biggest onion producer in Africa continental next to the Egypt and South Africa. The estimated share of Ethiopia's production for the total world production is 2.7% between 2000–2011 [2, 3]. Onion is one of the important vegetable crops grown by farmers mostly for market purpose. Hence, from an economic point of view, it is an important crop for the country when compared to other vegetables. It is a high-value bulb crop that has produced by smallholder farmers and commercial growers both for local and export markets in the country. Producers involved in horticultural production in general and onion in particular usually earn much higher farm incomes as compared to cereal producers and per capital farm income has been

reported up to five times higher [4-6].

Onion can be cultivated twice per year both under irrigation and rain feed conditions in different parts of the country. The Awash valley and the Lake Tan regions are areas where the bulk of dry bulbs and onion seed are produced [7]. The national level onion production coverage and productivity reached 22,780 hectares and 230,700 tons respectively in the 2014/15 production season [8]. Indeed, the averaged over the period of 2010 to 2018, of onion area harvested, production, and yield at the national level were 28,942 hectares, 313,947 tons and 11.70 tons/ha, respectively [3].

Onion is an important vegetable and commercial crop produced on small scale in Ethiopia. It is used as spices and condiments for flavouring various dishes in day-to-day activities. According to Aklilu [9] onion grows between 500-2400 m.a.s.l in the country. Hence, its production is become increasing in different agro-ecologies of the country in small-

scale production systems that make it one of the important components of commercialization for rural and urban smallholder households as sources of both daily nutrition and income. However, despite an increase in the area of land cultivated with onion and year-round production scenarios, the productivity has not shown the same change. Although productivity can be more than 30 tons per hectare, the national average is far below (10.14 ton/ha) than the world average (19.7 ton/ha) [10]. The average yield per hectare under irrigation is of course higher than under the rain-fed cultivation. In irrigated areas, the average yield can reach up to 40 tons per hectare provided that recommended agricultural practices are followed.

In a country like Ethiopia, where the amount, timing and distribution of rain fall is irregular, use of irrigation would significantly improve and raise the level of production. Commercial horticultural crop production is carried out mainly in the central rift valley and eastern part of the country by irrigation means. Fentale district is one of the areas found in awash valley and has high potential with small-scale based onion production. However, the producers are face different challenges that hinder them to benefit from untapped irrigation based onion production potential of the area. Despite the ever-rising demands from time to time of onion vegetable due to the fact of its importance in Ethiopian daily diet and people's livelihood, there are challenges facing the onion productions in Ethiopia in general and at study area in particular. According to Getu and Ibrahim [11] the major production challenges of onion includes shortage of herbicides and pesticides chemicals, shortage of commercial fertilizers, shortage of irrigation water, shortage of quality seeds, or absence of improved cultivars, application of inappropriate agronomic practices and limited awareness of the benefits of intensive production. Postharvest loss occurs due to the perishability nature of onion vegetable is one of the challenges of onion production [12]. The producers sell their product on-farm at a low price due to the perishability characteristics of the onion and the absence of storage facilities. However the production challenges and opportunities may varies from one agro-ecological area to others and from time to time. Therefore, this study was undertaken to address the following objectives.

#### *Objectives of the Study*

1. To assess the challenges of small-scale irrigation based onion production at the study area.
2. To explore the opportunities of small scale irrigation based onion production at the study area.

$$\text{Respondent per kebele} = \frac{\text{Number of onion producers per kebele}}{\text{Total Onion producers of three kebeles}} * \text{Sample size}$$

**Table 1.** Sample size according to probability proportional to size.

Kebeles	Total HH	Onion producers HH	Sample Size
Garadima	1000	600	69
Gidara	870	522	60
Alge	730	438	51
Total	2600	1560	180

Source: Column 2 and 3 [13].

## 2. Methodology

### 2.1. Study Area

The study conducted in Fentale district East Shoa zone administrative division of Oromiya regional state, Ethiopia. Fentale district is located at a distance of about 193 km to the East of capital, Addis Ababa on the highway to Djibouti.

### 2.2. Sampling Technique and Sample Size

Multi-stage random sampling technique was employed in this study. At the first stage, Fentale district was selected purposively depend on its irrigation based onion production potential. At the second stage, out of eighteen kebeles of the district eight high potential onion producers' kebeles were selected and listed according to their onion production potential and irrigation access with consultation of the district Agriculture and Rural development expert. At the third stage, from eight onion producer kebeles listed according to their onion production potential and irrigation access, the first three highest potential kebeles were selected purposively by considering the time and others factors to ensure efficiency of the study. According to Fentale district pastoral and agro pastoral development office report, the total smallholder farm household of the three kebeles, Garadima, Gidara, and Alge were estimated to be 1000, 870 and 730 respectively [13]. From the total farm households of the three kebeles which means 2600, the onion producers were estimated to be 60% of their respective numbers. So, according to calculation from [14] formula the total sample size for the study was 180 onion producer smallholder households. Accordingly, 180 total numbers of respondents selected from three *kebeles* by applied probability proportional to size (PPS). The following formula was applied to determine sample size for each three study *kebeles*

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

Where n; represent the desired sample size, N; represent the total onion producer households and e; represent the maximum acceptable margin of error which was set at 7% for this study.

$$\frac{1560}{1 + 1560(0.0049)} = 180$$

### 2.3. Data Collection Methods

For this study, both quantitative and qualitative data were collected by employed semi-structure interview schedule (quantitative), Focus Group Discussion (FGD) and Key Informant Interview (KII) (qualitative). Interview schedule was employed to collect primary data by face to face contact

with sample households through researcher administrated semi-structured questionnaires. The questions were forwarded to 180 sample household heads those randomly selected from the three rural *kebeles*, *Garadima*, *Gidara* and *Alge* of the study district. The focus group discussion (FGD) was employed to collect qualitative data that help to strengthen quantitative data generated through interview schedule. The members of FGD composed both men and women those did not involve in the interview schedule. As the saturation of data existed the FGD limited to one at each sampled *kebeles*. The checklist prepared to guide the discussion on right track. The primary data (both quantitative and qualitative) collected through Interview schedule and FGD were also need to be further enriched by additional information that gathered through Key informant interview (KII). Thus, intensive interview were conducted with key informants that comprise two experts from two different departments, horticulture and agronomy, one development agent (DA) and one committee member of farmers' cooperative from each sampled *kebeles* are included as a key informant interviewees. The qualitative data generated from KIIs were help to enrich the quantitative data collected through Interview schedule.

### 3. Result and Discussion

The results of analysis have been conducted to address main and specific objectives of the research. This part is divided in to three major sections. The first section of this part presents socio-economic characteristics of respondents. The challenges of onion production in the study area are presented in the second section. In the third section the opportunities related to onion production were analysed and discussed. In generally, this part presents the results from the descriptive and qualitative analysis.

Sample population of onion producer those contacted during the survey was 180. Regarding to marital status, out of the total sample households 81% was married while 7.4%, 6.3% and 5.3% was widowed, single and divorced receptively. According to the result from descriptive statistics during the survey year (2019/2020) production seasons, 5332.95 kilograms at average onion were produced by sample smallholder households. Out of the total production at average, 5320.37 kilograms at average onion product were sold while 12.58 kilograms at average were consumed at home. Despite the variation in the level, the data show that at the study area the respondents produce the onion for market to gain income that enables them to buy food crops and agricultural inputs.

#### 3.1. Socioeconomic Characteristics of Households

##### 3.1.1. Age of Household Head

The results indicated in table 4 shows that the mean age of the respondent smallholder household heads was 36.05 years with 18 and 82 years of the minimum and the maximum age respectively.

##### 3.1.2. Sex of Household Head

The result from descriptive statistics of dummy variable indicated as 85% (153) of sample household heads is male while the left 15% (27) is female-headed households.

##### 3.1.3. Education Level of Household Head

The author treated the educational status of household heads as categorical variable in this study. The result from descriptive statics show 33.8% of sample household heads were unable to read and write while 15.9%, 22.8%, 12.2%, 12.7% and 2.6% of them have an education status of read and write, primary school (1- 6), junior secondary (7-8), secondary (9-12) and tertiary (university or college) education level respectively.

##### 3.1.4. Family Size

The average family size of the sample households was 5 persons, with minimum and maximum family size of 1 person and 18 persons, respectively.

##### 3.1.5. Farming Experience

For producers with high farming experience their confidence to overcome the expected risk will be high. The result from descriptive statistics indicated as the onion farming experience of sample households was 10.52 years at average with minimum of 1 year and maximum of 38 years respectively.

##### 3.1.6. Total Farm Holding Size

Another smallholder household characteristic which can depict the background of the smallholder household is the land holding size. The total farm size in this case includes all the farm land that smallholders owned both irrigable and non-irrigable farm. Most of the respondents land holding size is below a hectare (ha) even if there are also those own smaller size less than 0.125 hectare. The result from descriptive statistics show that the sample households land holding size was 0.63 hectare at average while the minimum and the maximum farm landholding was range from 0.063 and 3 hectares respectively.

Table 2. Results of descriptive statics for categorical variables.

Variable	Response	Frequency	%
Sex of HH	Female	27	15
	Male	153	85
Education Status of HH	Unable to read &write	61	33.8
	Read &write only	29	15.9
	Primary (1-6)	41	22.8
	Junior secondary (7-8)	22	12.2
	Secondary (9-12)	23	12.7
	Tertiary (university/college)	4	2.6
Irrigation	Access	167	92.8
	Not access	13	7.2
Credit	Access	54	30
	Not access	126	70
Extension service	Access	61	33.9
	Not access	119	66.1

Source: Own computed from survey, 2021

*Table 3. Results of descriptive statics for continuous variables.*

Variables	Obs	Mean	Std. Dev.	Min	Max
Age of HH	180	36.03	13.82	18	82
Total family size	180	5.03	2.32	1	18
Onion Farming Experience (years)	180	10.52	6.99	1	38
Total farm holding size (hect)	180	0.63	0.36	0.06	3
Onion farm size (hect)	180	0.35	0.39	0	3
Number of oxen owned (TLU)	180	0.84	1.06	0	5

Source: Own computed from survey, 2021

### 3.1.7. Farm Allocated to Onion

The result from descriptive statistics show that, the farm land allocated for onion production by sample households was 0.35 hectare at average with 0.39 hectare of standard deviation. Indeed, the results show the minimum of 0 hectare i.e. No farm land allocated for onion production during survey year and 3 hectare of maximum allocation. Here also the farm rented in and produced onion during the survey year included in this size of onion allocated farm.

### 3.1.8. Number of Oxen Owned

Oxen use a farming household and help to plough the farm. Specially, in Ethiopia in general and at study area in particular smallholders commonly use oxen as draught power. The average oxen number owned by sample households were 0.841 in tropical livestock unit (TLU) while the minimum and maximum number of oxen owned by sample smallholders were 0 and 5 in TLU respectively.

### 3.1.9. Access to Irrigation

Irrigation is the most important variable for production. Specially, at the study area the crops production mostly depends on the irrigation access as the area get low rainfall amount per year. As indicated by table 5 the result from descriptive statistics show 92.8% (167) of sample households was access to irrigation during the survey year while 7.2% (13) of sample households did not get irrigation service during the survey year. The sample households those not get irrigation during the survey year was produced other crops such as maize and teff with rain feed during main season.

### 3.1.10. Access to Agricultural Extension Service

The result of descriptive statistics show that during the production year of the survey undertaken in the study area, out of the total respondents 33.9% (61) of respondents were benefited from agricultural extension service while 66.1% (119) were not benefited from extension service. This implies as majority of the respondents were not benefited from agricultural extension services in the area during the survey year.

## 3.2. Challenges of Onion Production

The open-ended question regarding the onion production challenges were forwarded to sample smallholder onion producer households. Additionally, the information concerned the onion production were raised and discussed with the FGD and KIIs. According to the report from sample

households about 31% of the respondents were reported high input challenge for the onion production at the study area (Table 4). This finding is towards the finding of Wonduwossen and Bekabil [15] that state despite the enormous merits and potential, in Ethiopia the existing onion productivity has been low and variable under farmers' local condition. This is presumably due to lack of improved crop varieties, shortage of adapted varieties to different agro ecologies, lack of inputs, and lack of appropriate agronomic package, disease and poor extension activities. The low productivity could be attributed to the limited availability of quality seeds and associated production technologies used among the others [16]. The high cost of input followed by fluctuation in irrigation access, disease/pest, high labour cost, input supply shortage, flood and informal source of seed challenges and reported by 28%, 22%, 20%, 14%, 12% and 2% of the sample households respectively (Table 4). The result from the finding of Bezabih and Hadera [17] and Getu and Ibrahim [11] revealed that production seasonality, seasonal price fluctuations, poor pre-and post-harvest handling, prevalence of pest and diseases, lack of storage are some of the critical problems encountered vegetable production in Ethiopia...

The input supply and utilization includes fertilizer and seed expected to increase production and productivity. The data from Focused Group Discussion (FGD) show that the sources of onion seed at the study area are informal (sometimes unknown traders). While the producers simply buy from traders with too high cost and beyond cost even sometimes it may not germinate. Besides, the FGD participants explained that the herbicides and pesticides bought from informal traders, in which sometimes it is not work when applied to the perspective pest or insects.

*Table 4. Onion production challenges reported by respondents.*

Challenges	Percentage	Rank
Disease and pest	22	3 <sup>rd</sup>
Input supply shortage	14	5 <sup>th</sup>
High cost of input	31	1 <sup>st</sup>
High labor cost	20	4 <sup>th</sup>
Fluctuation of Irrigation access	28	2 <sup>nd</sup>
Flood problem	12	6 <sup>th</sup>
Informal source of onion seed	2	7 <sup>th</sup>

Source: Own computed from survey, 2021.

Another reported concerning the onion production constraint at the study area was fluctuation in irrigation

access. This was due to the reason most of the time the onion produced off season during drought when the irrigation water shortage was happen. As the result, limited access to irrigation water would occur. The other reported production challenge was unavailability of inputs at time required. The FGD participants in addition explain that the inputs that supplied by GO like fertilizer was not available at required time and the producers obligated to buy from other district with high cost.

### 3.3. Opportunities of Onion Production

Fentale district has the advantage of having good local agro-ecological condition and the Boset-Fentale irrigation project make the district more favourable to growth vast horticultural crops and onion in specific. Despite the small land holding size of the small household, at the area they get profit from the farm by producing two or three times per year. As KIIs discussed the development of Boset-Fentale irrigation development project open the door for smallholders to shift from solely depend on livestock herding to mixed farming practice.

Now days at the area, the smallholder households produce onion through irrigation water use and benefited from it despite the above mentioned challenges. According to result from descriptive analysis about 67% sample households were report the high capital sources gain from onion as the opportunity to produce onion at the area. This implies that since onion produced all year round at the area most of the households are use as their primary sources of income to buy food crops and agricultural inputs.

*Table 5. Onion production opportunities reported by respondents.*

Opportunities	Percentage	Rank
Good weather condition	8	3 <sup>rd</sup>
Irrigation access	13	2 <sup>nd</sup>
High yield from small plot	5	4 <sup>th</sup>
Short duration of maturity	3	5 <sup>th</sup>
High capital gain from onion	67	1 <sup>st</sup>
Easy to produce	2	6 <sup>th</sup>
Soil fertility	1	7 <sup>th</sup>

Source: Own computed from survey, 2021.

The commencement of on farm onion seed making was also another opportunity of onion production and marketing. Besides the irrigation access, good weather condition and the high yield from a small plot farm were reported by sample households as the opportunity to produce onion at the study area. Accordingly, the irrigation access, good weather condition of the area and high yield from a small plot were reported by 13%, 8% and 5% of sample households respectively. Additionally, the short duration of maturity, easy to produce, soil fertility and own labour sources were also reported 6% of sample households. The study conducted by [18] point out the relatively fertile arable land of the Awash River and abundant irrigation water potential as opportunities of marketing in vegetable in Afar region logia.

## 4. Conclusion and Recommendation

### 4.1. Conclusion

Ethiopia is the third biggest onion producer in Africa continental next to the Egypt and South Africa. Producers involved in horticultural production in general and onion in particular usually earn much higher farm incomes as compared to cereal producers and per capital farm income has been reported up to five times higher. In a country like Ethiopia, where the amount, timing and distribution of rain fall is irregular, use of irrigation would significantly improve and raise the level of production. Fentale district is one of the areas found in awash valley and has high potential with small-scale based onion production. However, the producers are face different challenges that hinder them to benefit from untapped irrigation based onion production potential of the area. Despite the ever-rising demands from time to time of onion vegetable due to the fact of its importance in Ethiopian daily diet and people's livelihood, there are challenges facing the onion productions in Ethiopia in general and at study area in particular. However, high input cost, fluctuation in irrigation access, disease/pest, high labour cost, input supply shortage, flood and informal source of seed were reported as the challenges for the onion production at the study area. Despite these challenges, the smallholder households produce onion through irrigation water use and benefited from it at the area. Indeed, the high capital sources gain from onion, the irrigation access, good weather condition of the area and high yield from a small plot were reported as the opportunities for onion production.

### 4.2. Recommendations

Depend on the result of finding, the researcher recommended the following recommendations. The shortage of herbicides and pesticides chemicals and the shortage of commercial fertilizers were the major production and marketing challenges of onion at the study area. Therefore, the Government Organizations and others development practitioners should subsidies the agricultural inputs for smallholders' farm households.

Indeed, the low product prices due to seasonal price fluctuation, intensive influence of speculators and brokers reduce the bargaining power of smallholders farming households. Hence strengthening the bargaining power of smallholders farm households are the areas needs policy interventions.

The fluctuations in irrigation water access were influence the smallholder households to benefit from onion commercialization as irrigation contributes two or more per year. Hence the access to irrigation water is the crucial issue and have unrepresentative role to produce crops both for home consumption and market at the study area. There is the need to establish more main canals or improve farmers' accessibility to reliable irrigation water to increase the production of market oriented crops like onion. Besides strengthen the roles of water users' association (WUA) is also

important to ensure the equal distribution of irrigation water for both upper and lower streams.

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