Value chain analysis of malt barley in North western part of Ethiopia

Metadel Kassaw1*, Akalu Teshome2,3, Essa Chanie2 and Yonnas Addis1

Abstract: This research attempted to analyze value chain of Malt barley in North Western part of Ethiopia in Estie District. The primary data were collected from 121 malt barley producer farmers selected through two stage sampling technique and from other respective actors. To analyze the data, both descriptive and econometric analytical tools were applied. From Malt barley value chain actors, the chain is governed mainly by malt factory with the assistance of primary cooperatives and cooperative union. From three market channels, channel three product passes from produces to malt factory through primary cooperatives and union is the major marketing channel for malt barley product. The highest gross marketing margin (62.9%) was shared by malt factory, but the profit margin was highest for producers (53.4%). Multiple linear regression model results show that six variables such as education level of the household, farming experiences in malt barley production, choice of contract agreement, availability of active labor force, credit access and land allocated to malt barley production significantly and positively affect the quantity supply of malt barley product. The results of the study, therefore, suggested that policy implications drawn from the study findings include the need to improve the input supply such as improved seed, improving farmers’ knowledge and experience on malt barley production, encouraging adult education, expanding accessibility of credit and improve market infrastructure.

Subjects: Agriculture and Food; Environment & Economics; Manufacturing Industries

ABOUT THE AUTHOR

Corresponding author Mr. Metadel Kassaw is currently lecturer and researcher, Wolkite University, Ethiopia at the Department of Agribusiness and value chain management. He has research interest on value chain and supply chain of different agricultural commodity, commercialization of agriculture, food security, entrepreneur development and related issue.

PUBLIC INTEREST STATEMENT

Smallholder farmers in Ethiopia have an opportunity to meet the growing demand of malt barley for malt barley industry and improve the livelihoods of the smallholder farmers, which plays an important role for economic development with import substitution in hard currency. In the study area, low market supply level and producers are not benefited from value addition; hence, they sold raw malt product with improper post-harvest handling, cleaning and storage. Thus, this research helps to fill the existing gap by employing a strategic value chain approach in the malt barley sector based on identification and assessments of the whole range of actors involved in different activities from input supply to final utilization as well as provide information for value chain development intervention activities for responsible body.
Keywords:- Value chain analysis; malt barley; margin; value share; marketing channel; multiple linear regression model

1. Introduction
Smallholder agriculture, one of the principal economic occupations in the world, is the main source of income and employment for the 70% of the world’s poor in rural areas (Poole, 2017). Agriculture does not only signify the adequate acquisition of food crops to attain food security but also have positive impact on the economy (CSA (Central Statistics Authority of Ethiopia), 2019, ATA (Agricultural Transformation Agency) (2017), and IBC (Institute of Biodiversity Centre) (2009)). In Ethiopia, agriculture is the most promising resource and foundation of the country’s economy, accounting for 42% of GDP (ATA (Agricultural Transformation Agency), 2017), 83% of labor force involved in this sector (Kefyalew, 2012) and contributes about 83.9% for exports (Garomsa, 2016).

Barley (Hordium vulgär L.) is one of the most important cereal crops in the world, ranking fifth after wheat, maize, sorghum and rice in terms of production (FAO (Food and Agriculture Organization), 2012; Lapitan et al., 2009). Ethiopia is ranked 21st in the world in terms of barley production (USAD, 2014), second largest barley producer in Africa, next to Morocco (Rashid et al., 2015) as well as the largest producer of barley in Sub-Saharan Africa cultivated in the country (Mulatu & Lakew, 2011).

Malt barley is grown as a cash crop in a number of developing countries including Ethiopia. Farmers in Ethiopia have an opportunity to meet the growing demand for malt barley, but production is low, and the quality does not match with that of imports which directly connected with national economy, as beer plants import it from abroad with high hard currency (FAO (Food and Agriculture Organization), 2009). Therefore, the integration of agriculture with industry has a crucial role in the economic development of the nation (Mulatu & Grando, 2011). In an effort to strengthen linkages between malting factories and producers, the barley improvement program is promoting modern business models, contract farming and private sector investment in post-harvest processing. Modern business approach is expected to raise production; reduce imports and therefore save foreign currency; boost exports; and deliver improved rural livelihoods (ICARDA (International Center for Agriculture Research in the Dry Areas), 2017).

Malt barley product in the study area is second most important produced crop next to teff in terms of production (EWAO (Estie woreda agricultural office), 2019). In Estie district, there is enough potential in production of malt barley and contract marketing practice in malt barley product is available due to the presence of primary cooperative farmers, but low supply level and producers are not benefits from value addition; hence, they sold raw malt product with improper post-harvest handling, cleaning and storage.

Therefore, for filling the huge gap in the malt, barley sector needs employing a strategic value chain approach in the malt barley sector based on identification and assessment of the whole range of actors involved in different activities from input supply to final utilization. This entails a need for more comprehensive study, which thoroughly analyzes recent functions of malt barley value chain segments with the specific objectives by addressing factors affecting malt barley producers’ quantity supply level in malt barley market; identifying the major malt barley value chain actors, roles, functions and their value shared which helps to determines who benefits from participating in the chain and who would need support to improve performance and gains along malt barley value chain in the study area.
2. Methodology

2.1. Description of the study area

The study was conducted in Estie district south Gondar Zone of Amhara Region, Ethiopia, which is located 653 km north of Addis Ababa (Federal capital city) and about 114 km East of Bahir Dar (Regional capital city) as well as 56 km south of Debre-Tabor (Zone administrative city). In the district, agriculture is the mainstay of the economy characterized by crop-livestock mixed farming system where crop production is dominant. The major cereal crops grown in the area are malt and food barley, tef, maize, bean, soya bean, sorghum and wheat, … etc (EWAO (Estie woreda agricultural office), 2019). Estie District, especially dega areas, is the barley producing area in general and malt barley in particular, which ranked first in South Gondar zone in its production potential and supply level of malt barley into Gondar malt factory. The representative map of the study area is shown in Figure 1.

2.2. Source of data and method of data collection

Qualitative and quantitative pertinent information and data were collected from both secondary and primary data. Secondary data were collected from relevant district offices of agriculture, trade and industrial office, CSA documents so as to back up the primary data. Additionally to understand and conceptualize the malt barley value chain, desk review was conducted from different journals, thesis and other relevant published and unpublished documents to substantiate the information collected through primary data collection tools.

Based on the study objectives, cross-sectional primary data were collected from sampled respondent of the farmers using semi structured questionnaires (mix of unstructured and structured questionnaires) by using enumerators since most of farm households cannot be able to read and write.

Key informant interviews were conducted at all level of value chain actors and experts as well as people who have firsthand information about the malt barley sub-sector in the districts. The key informants interviewed include experts from kebeles and woreda agricultural office, expert of...
primary cooperative at the woreda and kebele level, expert of malt factory assigned at woreda level and private seed enterprise.

In this study, four focus group discussions (8 peoples in each group) were also held with farmers to address the issue such as; the integration of producers with primary cooperatives and other actors, support services provided to farmers, trends in the production and marketing of malt barley product.

2.3. **Sampling technique and sample size determination**

**Sample producers**

To select sample malt barley producer households, two stage random sampling techniques were employed to draw an appropriate sample household. In the first stage out of 18 potential malt barley producers four rural kebeles in the district, four kebeles namely Agana, Dat, Agamach and Achikan were selected randomly. For the second stage by using a population list of malt barley producers of the household in sampled kebeles from district agricultural office report simple random sampling technique were employed for selecting of representative sample household due to its homogeneity. Hence, the sample size of the study was determined based on the scientific formula that designed to find out the appropriate size of the survey research. In this study, Yamane (1967) formula were used in order to decide the size of sample population.

\[
n = \left( \frac{N}{1 + N(e^{2})} \right) \frac{6406}{(1 + 6406(0.09)^{2})} = 121
\]

Where:

- \(n\) is the sample size.
- \(N\) is size of target population including sampling frame.
- \(e\) is acceptance sample error (\(e = 0.09\)). For this study 91 % precision level were used to manage sample of the respondents.

Based on the number of target population (6406) appropriate formula was equated and reached a minimum of 121 respondents to be drawn.

In addition to former households other value chain participants such as input suppliers, primary cooperatives, unions, and processors (Gondar malt factory) are few in the study areas. Thus, there was no need of sampling procedure rather interviewed through key-informant interview using checklist. Similarly district agriculture offices and other enablers and supporting actors were contacted mainly through key-informant interviews. As a result four primary cooperatives, one union (Merkeb union), one processor (Gondar malt factory) were selected purposively due to the purchasing power of malt barley in the district and no other cooperatives, union, and processors that purchase malt barley from the district.

2.4. **Method of data analysis**

Two types of statistical methods (both descriptive and econometrics analysis) were employed to analyze the collected data.

**Descriptive analysis/value chain analysis**

The analysis consists of identifying different chain actors at each stage of value chain with discerning functions and their interaction; identifying value adding activities in the chain; assigning costs and added value to each of those activities. This method also helps to identify financial profitability, flow of product along the chain, key marketing channel and estimate marketing
margin. It helps to computations of the financial profitability of farmers by using the average reported quantities in quintal, costs and prices per quintals on different actors the value chain. Income was estimated as gross value less costs (both production, purchasing and marketing cost) of all inputs. However, for the economic analysis opportunity cost of each item was considered for the estimation of value added and return. Marketing margin, profit margins and value added were among the indicators used for financial and economic performance of the actors and the value shared by each actor.

**Econometrics analysis**

All the sampled malt barley farmers in the study area supply malt barley to the market. Hence, the dependent variable is the quantity of malt barley supplied to the market in Estie district, which is a continuous variable measured quintal. In this study, multiple linear regressions model were fitted for survey data to identify the determinants of small holder producers supply level in malt barley market.

\[ Y_i = \beta X_i + U_i \]

\[ \beta = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \ldots . \beta _{12} X_{12} \]  \hspace{1cm} (1)

Where \( Y_i \) = a vector malt barley supplied to the market by the sample farmers measured in quintals.

\( \beta \) = a vector of estimated coefficient of the explanatory variables.

\( X_i \) = a vector of explanatory variables.

\( U_i \) = disturbance term.

Before executing the final model regressions, all the hypothesized explanatory variables were checked for the existence of statistical problems.

2.5. **Hypothesis of variables**

For the course of identifying factors influencing malt barley supply, the main task is to analyze which factor influences and how, as shown in Table 1.

3. **Results and discussion**

3.1. **Value chain analysis of malt barley**

3.1.1. **Characteristics and roles of malt barley value chain actors**

Malt barley value chain encompasses four major functional segments includes: input provision, production, marketing and processing that spread in different territorial/geographical locations. Value chain analysis of malt barley may be upstream or downstream, upstream includes use of improved seed, recommended fertilizer rate, better agronomic practice, … etc, to improve the productivity of malt barley in production season. Whereas downstream value chain include delivering the required quality and quantity of product based on customer requirement that is preferred for malt or other valuable product.

The study confirmed that malt barley value chain in the study area goes to malt industries and some limited proportion of the malt barley is also sold to local consumers for preparation of local foods (e.g., enjera, kollo and bread) and local drinks (e.g., Tella and Besso) in addition to its use for malting.

Malt barley value chain in the study area follows modern chain structure. Because the transaction is buyer driven and characterized by vertical coordination between smallholder farmers and processors through a bridging role of aggregators (PC and union) as contract based farming
system without the involvements intermediaries such as local collectors, grain wholesalers that decrease the profit margin of farmers as well as processors. But there are no written contracts used to arrange the vertical coordination between malt factory and smallholders rather based on trust and subject to social enforcement without any formal procedures and guaranty.

Value chain analysis of malt barley is operated by both primary and secondary actors. Primary actors are involved in direct commercial activity of malt barley and its product which includes (input suppliers, producers, primary cooperatives, unions, processors, and final user). They have the ownership status on the product they handled. On the other hand, secondary actors play a role either supporting or influencing the primary actors.

| Variable | Description of variable | sign | Source |
|----------|--------------------------|------|--------|
| AGE | Age of the household head (year) | ± | Gessesse (2009). |
| EDULEV | 0 = cannot read and write, 1 = can read and write, 2 = primary(1–4 grade), 3 = primary(5–8 grade), 4 = 2ry and above | ± | Ayalew (2015); Samuel et al. (2017) and Belete (2014) |
| LABOR | Availability of active labor force (Number) | + | Medhane (2014) and Adugnaw et al. (2017) |
| CONTRACT | Choice of contract agreement (o = no contract, 1 = contract with GMF, 2 = contract with (GMF)) | + | |
| FARMEXP | Farming experience measured (years) | + | Kefyalew (2012) |
| FRQEXT | Frequency of extension contact (1 = less frequent, 2 = frequent, 3 = more frequent) | + | Demissie (2011) |
| DISTCOOP | Distance to the nearest cooperative (walking hr) | - | Yimer (2015) |
| MKTINFO | Access to market information, (1 = have market information, otherwise = 0) | + | Gashme et al. (2018); and Alemu (2015) |
| LAND | Area allocated for malt barley production (hectares) | + | Belete (2014) and Haymanot (2014) |
| TLU | Tropical Livestock Unit (Number) | +/- | Kefyalew (2012) and Asfaw and Ketema (2014) |
| CREDIT | Access of the HH head to credit services (0 = no, 1 = yes) | + | Weldeyohanis et al. (2017) |
| SEED | Access to improved seed (1 = yes, 0 = No) | + | Samuel et al. (2017) and Osmani and Hossain (2016) |
Primary actors/major value chain actors

Input suppliers
Actors responsible to supply inputs for malt barley production such as: improved seed varieties, fertilizers and herbicides. Because the availability of quality input supply at the right time and place in a sufficient quantity is a prerequisite activity for malt barley producers to improve production and productivity, which results increase the marketable surplus. But as the study confirmed that only around half (53.7%) of the producers have accessed improved seed.

As the data collected during survey and KII from 53.7% of seed supplied, about 37% (majority) of improved malt barley seeds are supplied by Primary cooperative from Amhara agricultural bureau through the agreement of malt factory. But primary cooperatives are often not effective enough to support the farmers for the whole process, which results the participation of private seed multiplier/Guna seed multiplier, which plays an important role for accessing of malt barley seed varieties to smallholder farmers with a contract agreement especially for model farmers, which helps to overcome the credit and off-take market constraints. But most of the farmers are don’t happy with agreement due to higher seed price compared with that of final selling price of their produce 1680 ETB per quintal. This forces the producer use of local seed which have poor quality for productivity.

Despite the availability of preferred improved varieties generated by Ethiopian research institute such as, Holker, Beka, Misccal 21, HB52, HB 120, HB 1533, IBON 174/03, Sabini, Bahati, EH1847, Bekoji-1, Haruna Nijo, CDC Select, Proctor and Traveler (Bayeh & Behrane, 2011) seed suppliers in the study area supply only four type of variety includes Holker, IBON 174/03, EH1847, and Traveler. This is due to the absence private-public partnership malt barley project participated in those potential areas, which needs the whole integration of all stakeholders for dissemination of better quality seeds.

Producers
They are major actor who performs most of the value adding functions starting from land preparation and pass through different agronomic practices such as, plowing, weeding, harvesting as well as postharvest activities and provide their surplus to the market. Farmers in the study area harvest and supply their malt barley product once in a year during rainy season.

The survey result indicated that producers haven’t much opportunity for selling to grain traders or local collectors, directly to malting factories and breweries rather than through a bridging role of primary cooperatives and unions. The major motive factors behind selling majority of their product to primary cooperative immediately after harvest are:

• The cooperative provide better price than current local market price.
• The cooperative reduce the cost by providing different inputs.
• Provide guaranteed market to their members without any reservation.
• Give field service or technical assistance through their expert assigned at the woreda level.

The quality of the product delivered into market by producers differ in color, size, moisture contents results from problem of land preparation up to post harvest practice.

Cleaning and proper packing are among the crucial post-harvest handling and primary processing steps essential for maintaining quality of raw malt barley product done by producers. But almost all of the producers sold their product without any handling and primary processing to maintain its quality, which results high moisture contents and poor quality of malt after primary processing in malt factory.
Multipurpose primary Cooperatives
These are actors who usually buying/assembling larger volume of malt barley product from the producer and serving as storage point of output for member as well as non-member farmer for selling into Gondar Malt Factory through the bridging role of Merkeb union. Acted as the first link between producers and malt factory and use their local knowledge to bulk malt barley from the production area. It is a key to successful integration of smallholder producers in the value chain by organizing peoples for successful participation in modern markets as contract farming and helps to protect illegal traders. Several activities are involved in this phase including handling, packaging, and storage of the product.

According to EWAO (Estie woreda agricultural office) (2019), there are 17 primary multipurpose cooperatives in Estie district that are engaged in grain marketing and other agricultural related activities. All of the primary cooperatives are members of Merkeb union. From 17 multipurpose cooperatives, eight of them were engaged in malt barley marketing in the last 7 years since 2013. From all the primary cooperatives, Agona and Adara primary cooperatives are the top two buyers of malt barley in Estie district. Multipurpose primary cooperative in the study area generally don’t conduct any processing activity except re-packing farm get product and supplying to the next buyers.

Generally, as a value chain actor, PC performs the following activities:

- Supplying of basic inputs such as seed and fertilizer as well as assembling final product immediately after harvesting.
- Give dividend to member farmers helps to improve the livelihood of smallholders.
- Facilitating credit access for model farmers through ACSI.
- By coordinating with kebeles and woredas expert give training for farmers to produce market oriented products.
- Give recognition for model farmers.

Cooperative union
Merkeb union is one of the strongest unions in the region engaged in input and output marketing and provision of different services. First, these actors play an important role in purchasing and supplying agricultural inputs such as seed and fertilizer for the farmers based on input demand reported from primary cooperatives which distributes to the farmer; second, participated in grain marketing including malt barley by creating linkage with farmers through cooperatives, and sell to processors (Gondar malt factory) and also give training for farmers who are a members of cooperatives. In malt barley market Merkeb union do not invest their own capital rather received for the service what they delivered per quintal. Obtaining their reward in the form of margin based on the amount, they facilitate transaction specifically 20 birr per quintal.

Processor
These are actors who are involved in processing of raw malt barley to add some value by changing the raw malt barley product into malt as well as malt into beer and other traditional foods and drinks. Gondar Malt Factory (GMF) was the only malting factory that purchase malt barley from Estie district and carried out both domestic and international procurement of malt barley. In the study area, the factory enjoyed monopsony power (one buyer but many sellers) over the malt barley sellers as well as, enjoyed some price setting power. The entry of new market players such as grain wholesaler and retailer are not appreciated in the study area. This helps both producers and processors to secure its margin without the involvement of middlemen, rather perform its marketing practice in the form of contract farming with smallholder farmers through bridging role of primary cooperatives and union.
The major value adding activities performed by GMF for processing of malt barley involves cleaning, sorting, and grading of raw malt barley mainly done manually on labor as well as by using higher technologies performs some functions includes germination, kilning ... etc.

Based on the information obtained from GMF during KII the detail method of specification, the quality of malt barley is poor almost in all malt parameters and below the requirement (especially from Amhara region), as shown in Table 2. Therefore, it needs government and other stakeholders commitment and to be upgraded by the responsiveness of respective private and public body.

According to the information obtained from Gondar malt factory experts during KII the quality of malt barley for preparation of quality malt should fulfill the following parameter, which is summarized in Table 3.

### Table 2. Measurement parameters of malt barley marketing

| Measurement Parameters | Status of parameter |
|------------------------|---------------------|
|                        | Very poor | Poor | Moderate | Good | Very good |
| Supply volume          | *         |      |          |      |           |
| Quality of barley      | * specially this year |      |          |      |           |
| Timely supply          | *         |      |          |      |           |
| Cost advantage         | *         |      |          |      |           |
| Abiding Contract       | *         |      |          |      |           |
| Responsiveness and business character | * |      |          |      |           |
| Organizational capacity (Financial, institutional, human capacity etc) | * (cooperatives) | * (unions) |

Source: own computation from the survey result of 2019/20.
N.B * (asterisks) indicates the level status of parameters are classified.

### Table 3. Quality measurement parameter of GMF for preparation of malt

| Quality Parameter                                      | Specification                  |
|--------------------------------------------------------|--------------------------------|
| Foreign matter and broken Kernels:                     | Max. 1.0%                      |
| Germination capacity:                                  | Min. 97.0%                     |
| Germination energy, 5 days:                            | Min. 96.0%                     |
| Moisture:                                              | Max. 13.5%                     |
| Protein in dry matter:                                | 9.0-11.5%                      |
| Screening - above 2.5 mm:                             | Min. .85.0%                    |
| - below 2.2 mm:                                       | Max. 3.0%                      |
| Predicted Extract:                                    | Min. 80.0%                     |
| B- glucan                                              | <150 Mg/L                      |
| Micro biological contamination                         | Free From MB poison            |
In general, according to the information obtained from Gondar malt factory, Ethiopian cannot self-sufficient in supplying malt barley for the malt and brewery industry, hence local malt barley suppliers cover only 25% of total annual demand in GMF.

Figure 2. Value chain map of malt barley.

Figure 3. Malt barley marketing channel map of Estie district.

Channel I: Farmer → Consumer (5.3%)
Channel II: Farmer → private seed multiplier/Guna seed multiplier (13.4%)
Channel III: Farmer → primary cooperative → Merkeb union → processor → beer distributor → consumer (81.3%).

In general, according to the information obtained from Gondar malt factory, Ethiopian cannot self-sufficient in supplying malt barley for the malt and brewery industry, hence local malt barley suppliers cover only 25% of total annual demand in GMF.
Table 4. Marketing and profit margin of malt barley value chain actors

| Item(ETB/qt) | Producer | Primary cooperative | Union | Malt factory | Horizontal sum |
|--------------|----------|---------------------|-------|--------------|----------------|
| Purchase price (PP) | 0        | 1540                | 1594  | 1614         | 4748           |
| Production cost(PC) | 672.3    | 0                   | 0     | 0            | 672.3          |
| Marketing cost(MC)  | 0        | 0                   | 0     | 610          |                |
| Total cost/qt (TC)  | 672.3    | 1,540               | 1,594 | 2,224        | 6,030.3        |
| Share of cost (%)   | 11.1%    | 25.5%               | 26.4% | 36.9%        | 100%           |
| Selling price/ qt(SP) | 1,540   | 1,594               | 1,614 | 2,850        | 7598           |
| Marketing margin(SP-PP) | 867.7 | 54                  | 20    | 1,686        | 2,681.3        |
| Margin (%)          | 32.3%    | 2.01%               | 0.74% | 62.9%        | 100            |
| Profit margin (SP-TC) | 867.7  | 54                  | 20    | 626          | 1621.3         |
| Share of profit (%)  | 53.5%    | 3.3                 | 1.2%  | 38.6%        | 100%           |

Consumers
Consumers are the final value chain actors who purchasing raw malt barley product for preparation of local drinks such as tela, beso, and kolo for consumption and final users of beer after final processing of malt into beer.

Secondary actors/supporters and enablers
These are actors that make possible the functioning of markets and enterprises of major value chain actors of malt barley product by providing different financial and non-financial supports. They participate in second-order activities, such as providing finance, different extension and capacity building service, transportation and information, consequently linking smallholder farmers to formal markets, and business development services. It also influence institutional, legal and policy frameworks, in which value chains can operate and intervene to improve the functioning of a chain. The Agricultural office, cooperative promotion office, Trade and industrial office are among the local public organizations which are providing support at Woreda level. Private projects such as Guna seed Multiplier especially working on seed multiplications in the study area. Regarding to financial service ACSI and Gondar malt factory are active financial service providers in Estie Woreda, and they have given agricultural loan.

As influencer regulatory services include license for malt processor issued by the office of trade and investment; collection of taxes and levies by office of finance also play a central role for the improvement of value chain work. Therefore this influencer/enabling environment helps to shape the value chain ecosystem and operating condition.

3.1.2. Value chain mapping of malt barley
Value chain mapping helps to visualizing value chain system by identify main actors, functions, roles and interactions, as well as the role of chain supporters and influencers within the chain.

Therefore malt barley value chain map draws in Figure 2 based on scientific procedures and empirical evidence of the survey result in the study area.
Table 5. Value added by each actors of malt barley product

| Actors          | Cost in ETB/ qt | Revenue in ETB/qt | Gross profit in ETB/qt | Value added in ETB/qt | Value shared in % |
|-----------------|----------------|------------------|------------------------|-----------------------|------------------|
| Producers       | 672.3          | 1,540            | 867.7                  | 1540                  | 54%              |
| Primary cooperatives | 1540        | 1594             | 54                     | 54                    | 1.9%             |
| Union           | 1594           | 1614             | 20                     | 20                    | 0.7%             |
| Malt factory    | 2224           | 2850             | 626                    | 1236                  | 43.4%            |
| Total           | 6,030.3        | 7598             | 1,594.5                | 2850                  | 100%             |

Source: author calculation from the survey result of 2019/20.
Cost = total amount of cost the actors incurred (either production, purchasing or marketing cost).
Revenue = final value of the product after cost is incurred and value addition.
Gross profit = the difference between revenue and cost.
Value added = the value each actors have been added.
Value shared = the percentage of value added based on their contribution.

3.1.3. Value chain governance
The governance structure gives information about the position of the smallholders in the chain and what looks like the relations between smallholders and purchasers. During the focus group discussion producers reported that the producers’ position in price negotiation is not good in the study area. Because malt factory assisted by primary cooperatives is the main malt barley value chain governors. That means the governance structure exercised was favorable to malt factory and leaves smallholders in a weak position. Due to lack of full and valuable market information small holder producers hardly negotiate the price and heavily depend on the buyers, which results producers become price taker. Therefore, the governance structure of malt barley value chain in the study area is buyer driven chain because it is labor intensive and its activity is controlled and organized by the lead firms (malt factory) in the chain.

3.1.4. Malt barley market channels
The result revealed that, three major marketing channels were identified in the study area, as shown in Figure 3. But majority (81.3%) of the product was passed through channel III from producers to malt factory through primary cooperatives and union. includes;

In channel I, producers sell their produce directly to consumers in local market without any involvement and interference of middlemen. Next to primary cooperative and private seed multiplier, local consumer for preparation of local foods and drinks such as tella, kolo, and beso are the buyers of malt barley from the producers. As the survey results depicted that a minimum amount (5.3%) of malt barley product from the total marketable product was sold.

Channel II also short by delivering farmers raw malt barley produce to Guna seed multiplier based on initial agreement. Because Guna seed multiplier provide inputs (especially improved local variety seed) by selecting model farmers to payback after harvesting of their produce. This is a great opportunity to farmers for accessing of improved seed at the time of sowing as well as provide better price (1680 ETB/qt) that is higher than price set by primary cooperative on the harvesting time.

Channel III is the largest marketing channel where majority of malt barley product is passed from producers to processors through bridging role of multipurpose primary cooperatives and unions over product handling.
### Table 6. Multiple linear regression output

| Variable                          | Coefficient | Robust st.error | T value | P>|t| |
|----------------------------------|-------------|-----------------|---------|----|
| Age                              | 0.015       | 0.015           | 0.92    | 0.325 |
| Education level                  |             |                 |         |     |
| Education level 2                | 0.085       | 0.607           | 0.14    | 0.889 |
| Education level 3                | 0.062       | 1.225           | 0.05    | 0.960 |
| Education level 4                | 3.35***     | 1.734           | 1.91    | 0.059 |
| Land for malt barley             | 7.383*      | 2.207           | 3.35    | 0.001 |
| Availability of active labor     | 1.831*      | 0.351           | 5.21    | 0.000 |
| Frequency of ext.                |             |                 |         |     |
| Frequent                         | -0.233      | 0.382           | -0.61   | 0.543 |
| More frequent                    | 0.055       | 0.344           | 0.16    | 0.875 |
| Contract agreement               |             |                 |         |     |
| Contract with GSM                | 1.082*      | 0.384           | 2.82    | 0.006 |
| Contract with GMF                | 2.209*      | 0.790           | 2.79    | 0.006 |
| Access to improved seed          | 0.260       | 0.334           | 0.78    | 0.438 |
| Access to credit                 | 0.615***    | 0.325           | 1.89    | 0.062 |
| Farming experience               | 0.241**     | 0.109           | 2.22    | 0.029 |
| Access to market information     | 0.124       | 0.369           | 0.34    | 0.737 |
| Distance to nearest PC           | -0.003      | 0.007           | -0.45   | 0.652 |
| Tropical livestock unit          | 0.392       | 0.246           | 1.59    | 0.115 |
| Constant                         | -2.793      | 1.245           | -2.24   | 0.02 |

Source: multiple linear regression output from STATA output.
Dependent variable: Amount of malt barley sold in quintal, N = 121, R-squared = 0.9470.
*, ** and *** show the value statistically significant at 1%, 5% and 10%, respectively.

3.1.5. Marketing and profit margin of malt barley value chain actors

For analyzing the benefit of value chain actors from value addition, calculation of profit margin is appreciated. Because the more value addition may not necessarily benefit of the actors rather it depends on cost compared to the value created. Therefore, all the costs incurred to create the product have been included in the calculation of the value added, as summarized in Table 4.

As the result of the survey depicted that, producers and malt factory get the highest share of profit margins with respective value of 53.4% and 38.6%, respectively, followed by primary cooperative (3.3%) and cooperative union (1.2%). The profit margin showed that, the cooperative union had the lowest position followed by primary cooperative, while the producers had the highest position followed by malt factory in the study area. This result is also in line with Weldeyohanis et al. (2017) who showed the minimal role of cooperatives in barley value chain despite heavy public emphasis on them.

3.1.6. Value share of malt barley value chain actors

Value added at each chain was represented by calculating the amount of wealth created and/or added to a product or service at each stage of production, processing and distributional activities. Value is created either use better improved seed and other raw material, improve the efficiency of production on the agronomic practice, postharvest handling, use of better marketing strategies or
through primary and secondary processing, governance (power and bargaining position of actors which in turn determined by factors such as information asymmetry between chain stages and the production technology used).

In value addition of malt barley there is:

Raw product: Malt barley grain which meets specific quality parameters.

Final product: beer, kolo, tela, beso by processing of raw malt barley grain.

Final clients: individual consumers, malt factory, local seed multiplier /Guna seed multiplier.

Major beneficiaries from value addition: producers and malt factory based on the value they shared.

In calculating of the value added at each stage reference has been made to one quintal of malt barley and final product (malt). As the survey result depicts that major value addition was done on channel III product passes from producers to processor (malt factory) through a bridging role of primary cooperatives and union, as shown in Table 5. In this channel highest value (54%) is shared and added by the producers followed by malt factory (43.4%) from malt barley value chain actors.

3.2. Econometrics model results
In this section, factors affecting quantity of malt barley supplied to market are presented and discussed.

Determinants of market supply
Factors that determine supply of malt barley to the market was estimated using OLS model since all respondents used for this study supply their malt barley to the market. As summarized in Table 6 from 12 hypothesized explanatory variables six variables, which include education level of the household head, land allocated for malt barley, farming experience of household head in malt barley production and marketing, choice of contract, availability of active labor force and credit access of the household head exerted significant and positive impact on volume of malt barley marketed. Robust regression option was used in STATA to analyze and correct heteroscedasticity problem. Non-existence of multicollinearity problem was also tested by using VIF for continuous explanatory variables and contingency coefficient for dummy variable as well as Ramsey RESET test indicated that there is no problem of omitted variable test. The model F-tests applying appropriate degrees of freedom indicate that the overall goodness of fit of the OLS model is statistically significant at less than 1% indicating that the independent variables included in the OLS model regression significantly explain the variation in the quantity of market supply level of malt barley producers in the study area by 94.7 % (the coefficient of determination, $R^2 = 0.947$). Therefore, these factor explain 94.7% of the change in households malt barley quantity supply to the market.

4. Conclusions and recommendations

4.1. Conclusions
Malt barley is among the most important cereals grown during rainy season in different parts of Ethiopia as cash and food crop including Estie woreda. Malt barley value chain includes both secondary and primary actors. Malt barley value chain in the study area was buyer driven and characterized by vertical coordination between smallholder farmers and processors as bridging role of aggregators (PC and union) as contract based farming but without any written contract agreement. Even if they have limited capacity primary cooperatives are key to successful integration of smallholder producers in the value chain by organizing peoples for successful participation in modern markets as contract farming and helps to protect illegal traders. The major beneficiaries
from malt barley value addition were producers and malt factory respectively, because they shared majority (54% and 43.4%, respectively) of the value created. Malt factory assisted by primary cooperative are the main malt barley value chain governors and the producer's position in price negotiation (price-taker) and product quality definition is not good in the study area.

Producers supply 82.2% of their malt barley product to the market and majority (81.3%) of the product was passed through channel III from producers to malt factory through primary cooperatives and union, but the product was sold with a minimal handling and without any primary processing to maintain its quality which results high moisture contents and poor quality of malt after primary processing in malt factory. Out of four seed variety supplied in the study area, IBON 174 and EH 1847 variety have poor quality and high seed price forces the producer use of available local seed results affect the final product quality. Detail methods of specification in quality of malt barley for malt factory is poor almost in all malt parameters and below the requirement (especially from Amhara region) needs government and other stakeholders commitment and to be upgraded by the responsiveness of respective private and public body.

Moreover, the econometrics result depicted that education level of the household head, land allocated for malt barley product, availability of active labor force, choice of contract agreement, farming experience and credit accesses are the positive determinant factors of quantity supply level in malt barley market.

4.2. Recommendations and policy implications

Both technical, institutional and policy recommendations are needed for upgrading value chain activities for policy makers, value chain actors and researchers who have strong interest in promoting malt barley production and marketing for equal benefits among value chain actors.

Seed cost is not afforded by majority of farmers, which enforces the producers use local available seed for production results variability in quality; therefore, both private and government seed enterprise is better to reduce the seed price for encouraging producers.

The research institutes need to releasing/develop new malt barley varieties in addition to commonly used variety based on mostly centered attributes such as; yield, grain size, days to maturity for harvesting (short day), disease resistance, and its moisture content should be applied.

Strengthening the capacity of primary cooperatives in terms of physical and human resource development.

Explore feasibility of the crop to grow on dry season, as the study results indicates that malt barley is grown only as a summer crop in rain based system in the highlands areas. Therefore, it is better to introduce into low land areas; malt barley can be introduced as a winter crop where some irrigation is available. This helps to creating additional income for smallholders by increasing of their supply that has lower and fragmented land as well as substitutes imported raw malt barley from abroad.

There should be formal signed contract agreement to improve the integration between farmers and different institutions that are involved in malt barley variety generation, multiplication and dissemination (research institutes, seed enterprises, and extension department of the ministry of agriculture) to solve the seed quality problem as well as improving the contract agreement with Gondar Malt Factory helps the producers increase the market supply level and become beneficiaries.
As the survey result indicates that accessing of credit and farming experience have a positive impact on market supply level in malt barley market. Therefore malt factory should increase its scope by providing a loan on seed-credit basis to small holder farmers helps to fulfill basic inputs such as seed, fertilizers, hiring of labors, and rent of land especially for more experienced peoples in malt barley product.

Based on econometrics result land allocated for malt barley has also a positive influence on market supplied to malt barley market. So concerned bodies should facilitate the smallholder farmers to focus on intensification more portion of land in more valuable cash crop production (malt barley product).

Policies aiming at improving technical knowhow of farmers on malt barley production and productivity through facilitating adult education to increase market supply of malt barley in the study area.

Funding
The authors received no direct funding for this research.

Author details
Metadel Kassaw1
E-mail: metodelkassaw065@gmail.com
Akalu Tesfome2,3
Essa Chanie2
Yonnas Addis1
ORCID ID: http://orcid.org/0000-0002-5880-9721
1 Department of Agribusiness and Value Chain Management, Wolkite University, Wolkite P.O.Box, 07, Ethiopia.
2 Departments of Agricultural Economics, University of Gondar, Gonder, Ethiopia.
3 Bilateral Ethiopia-Netherlands Partnership for Food Income and Trade (BENEFIT), , Ethiopia.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Funding
The authors received no direct funding for this research.

Citation information
Cite this article as: Value chain analysis of malt barley in North western part of Ethiopia, Metadel Kassaw, Akalu Tesfome, Essa Chanie & Yonnas Addis, Cogent Social Sciences (2021), 7: 1980260.

References
Adugnaw, A., Bosena, T., & Mengistu, K. (2017). Analysis of Teff (Eragrostis tef) market chain: The Case of Hulet Ej Enese District, East Gojam Zone, Amhara Region [Doctoral dissertation], Haramaya University.
Alemu, G. (2015). Market performance and determinants of marketed surplus of teff, in the case of Bacha woreda in south west shewa zone, Oromia national regional state [Doctoral dissertation, MSc Thesis], Haramaya University.
Ashfaw, H., & Ketema, M. (2014). Durum wheat value chain analysis: The case of Golocheha District of Bale Zone [Doctoral dissertation], Haramaya University.
ATA (Agricultural Transformation Agency). 2017. Ethiopian agriculture and strategies for growth: Presented to Ethiopia-Norway Agribusiness seminar. Addis Ababa, Ethiopia.
Ayalew, Y. (2015). Factors affecting fruit supply in the market: The case of habru woreda, North Wollo, Ethiopia. European Journal of Business and Management, 7(4), 309–318.
Boyeh, M., & Berhane, L. (2011). Barley research and development in Ethiopia – An overview. Addis Ababa, Ethiopia: Ethiopian Institute of Agricultural Research (EIAR), Holeta Agricultural Research Center (HARC).
Belete, W. (2014). Market chain analysis of coffee in Dale District of Southern Ethiopia. An MSc Thesis Presented to the School of Graduate Studies of Haramaya University.
CSA (Central Statistics Authority of Ethiopia). (2019). Agricultural sample survey report on area and production of major crops. Vol. I. Addis Ababa.
Demisse, M. (2011). Marketing of Kabuli and Desi chickpeas by smallholder farmers in Eastern Shewa Zone [Doctoral dissertation], Haramaya University.
EWAO (Este woreda agricultural office). 2019. Organized report on malt barley product.
FAO (Food and Agriculture Organization). 2009. Agribusiness manuals prepared by the FAO Investment Centre Division, downloaded from www.eastagri.org.
FAO (Food and Agriculture Organization). (2012). Handbook of Agribusiness Manuals. The FAO Investment, Centre Division.
Garomso, T. (2016). The role of smallholder farmers in the import substitution and industrialization of Ethiopia: The case of malt barley producers in Arsi and Bale Areas, Ethiopia [Doctoral dissertation], St. Mary's University.
Gessesse, A. (2009). Analysis of fruit and vegetable market chains in Alamata, Southern Zone of Tigay: The case of onion, tomato and papaya [Doctoral dissertation], International Livestock Research Institute.
Goshne, D., Tegegne, B., & Zemedu, L. (2018). Determinants of sesame market supply in Melakoza District, Southern Ethiopia. International Journal of Research Studies in Agricultural Sciences (IJRAS), 4 (10), 1–6.
Haymanot, A. (2014). Durum wheat value chain Analysis: The case of Golocheha district. Bale Zone Ethiopia (Msc thesis). Harmaya University, Haramaya, Ethiopia.
IBC (Institute of Biodiversity Centre). 2009. Country report on the states of plant genetic resources. Addis Ababa.
ICARDA (International Center for Agriculture Research in the Dry Areas). 2017. Enhancing resilience: Helping dryland communities to thrive. ICARDA Annual Report 2016 International Center for Agricultural Research in the Dry Areas. 80 pp
Keyfulew, G. (2013). Analysis of smallholder farmer’s participation in production and marketing of export potential crops: The case of sesame in Diga district, east Wollega zone of Oromia Regional State [Doctoral dissertation], Addis Ababa University.
Lapitan, N. L., Hess, A., Cooper, B., Botha, A. M., Badillo, D., Iyer, H., & Tahir, M. (2009). Differentially expressed genes during malting and correlation with malting quality phenotypes in barley (Hordeum vulgare L.). Theoretical and Applied Genetics, 118(5), 937–952. https://doi.org/10.1007/s00122-008-0951-8

Medhane, M. (2014). Determinants of commercialization of teff and its factor productivity outcome: The case of Tahtay Qoraro woreda, northwest zone of Tigray regional state [Doctoral dissertation], Haramaya University.

Mulatu, B., & Grando, S. (2011). Barley Research and Development in Ethiopia. Proceedings of the 2nd National Barley Research and Development Review Workshop. 28-30 November 2006, HARC, Holeta, Ethiopia.

Mulatu, B., & Lakew, B. (2011). Barley research and development in Ethiopia – An overview. Addis Ababa, Ethiopia: Ethiopian Institute of Agricultural Research (EIAR), Holeta Agricultural Research Center (HARC).

Osmani, A., & Hossain, E. (2016). Smallholder farmers’ market orientation and the factors affecting it in Bangladesh. Economic Insights-Trends and Challenges, LXXVIII(3), 9–18.

Poole, N. (2017). Smallholder agriculture and market participation. Food and Agriculture Organization of the United Nations (FAO).

Rashid, S., Abate, G., Lemma, S., Warner, J., Kasa, L., & Minat, N.(2015). Barley value chain in Ethiopia: Research for Ethiopia’s agriculture policy (reap): Analytical support for the Agricultural Transformation Agency.

Samuel, W., Rijalu, N., & Fikadu, M. (2017). Value chain analysis of malt barley (Hordeum vulgare): A way out for agricultural commercialization? The case of Lemu Bibilo District, Oromia Region, Ethiopia. Journal of Economics and Sustainable Development, 8(13). www.iiste.org

United States Agency for International Development (USAD). (2014). Agricultural Growth Program-Agribusiness and Market Development (AGP-AMDe). Addis Ababa, Ethiopia.

Weldeyohannis, S., Negash, R., & Mitiku, F. (2017). Value Chain Analysis of Malt Barley (Hordeum vulgare): A Way Out for Agricultural Commercialization? The Case of Lemu Bibilo District, Oromia Region, Ethiopia. Journal of Economics and Sustainable Development. www.iiste.org 2222-1700 (Paper) 2222-2855.

Yamane, T. (1967). Statistics: An introductory analysis(2nd ed., p. 919). New York: Harper & Row, Publisher.

Yimer, A. (2015). Factors affecting fruit supply in the market: The case of Habru Woerda, North Wollo, Ethiopia. European Journal of Business and Management, Vol.7(4).
