



Mapping of spent brewers' grain supply chain in Ethiopia

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Cover photos: cattle eating spent brewers' grain and loading at a brewery.

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1 Background information

1.1 Dairy production and feed supply in Ethiopia

The livestock sector contributes significantly to the Ethiopian growth domestic product and has important economic and social importance at household level and makes considerable contributions to foreign currency earnings. On the other hand, the productivity and economic contribution of the livestock sector is much below the naturally endowed potential. This is to a large extent due to the scarcity and fluctuating quantity and quality of the feed supply side. This makes animal products quantity and quality to be at low level.

Ethiopia has four main dairy production systems: a small commercial sector consisting of large private farms and government institution owned farms; small urban/peri-urban systems raising crossbred or both crossbred and local cattle having access to milk collection centers or cooperatives; smallholder mixed farming systems in the highlands using indigenous breeds, and pastoral/agro pastoral system in the low lands. Except a rough estimate, reliable figures on the relative importance of the dairy production system in terms of number of farms/herds, dairy population, share of milk produced are not available.

The major sources of feed for cattle in the country are natural pasture, hay, crop residues and non-conventional feedstuffs (local brewery by-products called Atella and Brint). Crops residues from cereals such as finger millet, teff, grass pea and maize form the basal diets of the animals in the highlands of the country (Aranquiz, 2019).

The production and use of improved forages such as Napier grass, Sesbania and silages is not a common practice in many parts of the country (Tolera et al, 2018). Similarly, supplying and feeding of cattle with concentrate feeds is found at low level state throughout the country.

In general, inadequate supply of quality feed is the major factor limiting dairy productivity in Ethiopia. Improved feeding is crucial to provide satisfactory environment for animal growth and feed supplements stimulate higher milk productivity. Feed, usually based on fodder and grass, are either not available in sufficient quantities due to fluctuating weather conditions or when available are of poor nutritional quality. These constraints result in low milk yields, high mortality of young stocks, longer parturition intervals and low animal weights.

Feed supply is a major issue for smallholder dairy systems, as most systems operate under conditions of extreme land pressure, feed conservation for dry season supplementation has been a major issue, as most technologies, such as silage, hay making and urea treatment are not suitable for smallholder.

Hence, improved nutrition through adoption of sown forage and better crop residue management can substantially raise livestock productivity. In highland zones, high population growth and density are causing shortage of grazing land on which livestock production by smallholder depends. In the lowland areas, the shortage of feed and water during the dry season forces animals and livestock keepers to trek long distances in search of food. The quality of feed also deteriorates during the dry season in both the mixed farming and pastoral system. Apart from this, there is critical shortage and high cost of feed. There are only few companies that produces feed concentrates and therefore dairy processing firms depend on farmers' scanty produce.

Spent brewers grain is a valuable feed for dairy cows and could be a good byproduct additional to the poor products currently available in the country. To improve the efficiency of the use of spent brewers' grain on farm, the DairyBISS project implemented an on-farm survey investigating current storage and use of spent brewers' grain on dairy farms in Ethiopia (Aranguiz, 2019). As the distribution system between the brewery and dairy farms has a strong impact on the price dairy farmers need to

pay, an additional analysis was made thereof to analyze how price of brewers' grain affects the suitability of spent brewers' grain as cost effective feed input.

1.2 Overview of Brewery Factories in Ethiopia

In Ethiopia there are about twelve breweries owned by six companies, which produce different beer products and residues and supplying into the market through different approaches and strategies. The total installed annual production capacity is estimated to be 12 million hectoliters but there is no data on actual production. The list of brewery factory and respective main products are summarized in the table below:

Table1 List of beer producers in Ethiopia.

Name of the brewery company	Factories owned	Product types	Common residues
BGI Ethiopia PLC	Addis Ababa, Kombolcha, Hawassa and Major shareholder in Raya and Zebidar Breweries	St. George, castle, Amber, and draft beer	Spent grain, yeast and spent malt
Dashen Brewery S.CO	Gondar and Debre Birhan	Dashen beer and Draft beer	Spent grain, yeast and spent malt
Diageo Meta Abo Brewery share company	Meta Abo Sebeta	Standard, premium draft beer, Malta Guinness	Spent grain, yeast and spent malt
Habesha	Habesha in Debre Birhan		Spent grain, yeast and spent malt
Heineken	Harar, Bedele and Kilinto	Bedele regular, Bedele special, Harar beer, Hakim stout, Harar Sofi, Lemon, sofi Harar draft	Spent grain, yeast and spent malt

As main input to produce beer and related products, all the factories have been using water, barley, malt barley and hops. Almost all the residues are similar in type and the volume of the residue in the respective factories depends on the production capacity of the factory. The main residue is used as cattle feed is spent brewers grain. In the process of managing and distributing the spent grain to the beneficiaries, the factories have been exercising different approaches.

1.3 Dairy business information service and support project and its intervention

In Ethiopia Dairy Business Information Service and Support (Dairy BISS) project was implemented from 2015 to 2018, to stimulate private dairy sector development in the country and the project is carried out by Wageningen UR Livestock Research and partners in Ethiopia and The Netherlands. The first phase of the project aim is to increase the numbers of profitable farms and firms in the Ethiopian dairy sector through realizing three strategic objectives.

The first strategic objective was to develop and support a dairy business platform that becomes an effective private sector network for business development, B2B relations, business information, and learning; the second objective is to develop quality business information and examples of successful business cases to support business development and the third objective is to develop a pool of quality of private business consultants/advisors for specialized commercial dairy farms and dairy related firms, as well as training modules for dairy business consultants/advisors, farm managers, staff of milk collection centers, etc.

During the platform meeting of dairy stakeholders conducted on December 12/2017, an issue related to supply, distribution and utilization of breweries residue was raised and discussed in order to pave the way for an effective and efficient utilization of the residue in the country. For a summary on this meeting, see annex 1.

Accordingly, Dairy BISS has taken the initiative to conduct a rapid assessment on the management and utilization of residues of brewery factories through the country by commissioning two consultants.

2 Objectives of the assessment

The main objective of the assignment was to assess the overall production and utilization status and processes of brewery residues in Ethiopia.

The specific objectives were:

- To identify the volume of production and utilization of brewery residues
- To identify and map the supply chain of brewery residues
- To recommend actions to be taken for the proper utilization of brewery residues on dairy farms



Healthy brewers' grain fed cows

3 Methodology of the assessment

Both to understand the operation system and production capacity of the breweries in the country, the assessment team has collected the relevant data from target factories, stakeholders, transporters, wholesaler and retailers through key informant interview, direct observation and documentary researches. Moreover, participatory value chain analysis has been conducted to identify and mapping out key actors and stakeholder of brewery residues in the country.



Silage of brewers grain mixed with teff straw

4 Literature review

Spent brewers grain is the most abundant brewing by-product, comprising of 85% of by-products generated, 31% of original malt weight and 20 kilograms per 100 liters of beer produced. With respect to animal feed, spent brewers grain has been found to be an excellent feed ingredient for ruminants. This material is basically constituted by the barley grain husks obtained as solid residue after the wort (the liquid extracted from the mashing process during the brewing of beer) production. Since spent brewers grain is rich in sugars and proteins, the main and quickest alternative for elimination of this industrial by-product has been as animal feed. Spent brewers grain contains 75-80 percent water and deteriorate rapidly due to the growth of bacteria, yeasts and fungi. It is mandatory to use them as soon as possible after reception and to make sure that they are in good condition before utilization.

Spent brewers' grains contain a large concentration of water (mean = 74%), which requires some special consideration prior to its utilization as a feed resource for cattle. In order to correctly compare spent brewers' grains to different feedstuffs, the comparison must be made on a dry matter basis. Because of the high water content of WBG, proper storage is typically an issue. Most spent brewers' grains are stored either in an on-farm bunker silo or a plastic bag. Regardless of the storage method, spent brewers' grains will have a finite feed out period. Spoilage of spent brewers' grains can occur in as little as five to seven days after the bag or silo is opened, and this leads to increased mold growth, decreased moisture content, and decreased palatability. This can be costly for farms if their feeding rates fall below the rate of spoilage.

Depending on distance from a brewery, the water content of spent brewers' grains also can limit its availability and practicality to producers. The maximum economical distance for hauling spent brewers' grain from a brewery is less than 30 kms; any greater distance increases the delivery cost above what a similar feedstuff could be priced in and will have consequences for the quality of the product.

Variability exists in the nutrient composition of spent brewers' grains just like every other by-product feedstuff. The following table indicates the normal range for each chemical component. The variation associated with the energy and protein content of spent brewers' grains implies that representative samples from each bag or bunker should be analyzed by a reputable laboratory when formulating supplementation programs for cattle.

Table 2 Average chemical composition of spent brewers' grain.

S/N	Item Average	Average	Average
1	Dry matter, %	26.0	19.2–32.8
2	*Crude protein, %	29.6	24.9–34.2
3	*Crude fiber, %	12.0	8.3–15.7
4	*Crude fat, %	9.1	7.6–10.7
5	*Ash	4.5	

Source: Buffington, J. (2014) The Economic Potential of Spent Brewers Grain as a Biomass Feedstock. *Advances in Chemical Engineering and Science*, 4, 308-318. <http://dx.doi.org/10.4236/aces.2014.43034>

* Values from 2 to 5 are on moisture free basis

For an accurate comparison of the costs and utilization of spent brewers' grains, the cost of the spent grains should be adjusted to a similar moisture level as other dry feedstuffs. Many feedstuffs are approximately 90% dry matter, whereas spent brewers' grains are 20 to 32% dry matter.

Since spent brewers' grain is delivered in bulk, appropriate feed storage and handling systems need to be available. The physical form of spent brewers' grains is a loose, fibrous grain residue, and this necessitates the use of a front-end loader or similar equipment for handling, feed wagons for transport, and adequate feed bunk space for delivery. Spent brewers' grains can be a good feed-

resource-based nutrient composition for beef cattle. Comparison of spent brewers' grains with other feedstuffs should be made based on price per unit of energy, protein or labor on a similar moisture or dry matter.

5 Findings of the assessment

5.1 Production of brewery Residues in the Ethiopia

Beer production capacity of brewery factories varies from factory to factory. The volume of beer production is directly related to the quantity of inputs used and the volume of residues to be produced. The main residue of the brewery factories is called spent brewers grain. Although spent malt and yeast are the residues of the factory, they are not as such significant both in terms of quantity supply and preference of the customers of the product. Usually, spent malts are sold to the cart horses and yeast residue is simply added to spent grain.

Even though there is no compiled data available from brewers, literatures reviewed has showed that, the ratio between finished product beer and brewer's spent grain is 5:1. Using this data and the context of the Ethiopian current annual beer production is about 12 million hectoliters (Reporter English, Feb 10,2018) the amount of spent brewers' grain produced expected to be 240,000 tons annually. The following table summarizes spent brewers grain production in 2017 at each beer production facilities.

Table 3 Annual production of spent brewers' grain year 2017.

S/N	Brewery	Total spent grain production in ton (2017)	Additional brewery residue
1	BGI Ethiopia PLC	12,902	Thermalized yeast
		23,411	Thermalized yeast
		14,483	Thermalized yeast
2	Dashen Brewery	20,040	Malt impurities and Yeast residue
3	Diageo Meta Abo Brewery share company	10,360	Thermalized yeast
4	Bedele	1,986	
5	Harar	8,417	Malt impurities and Thermalized_Yeast
4	*Habesha		
5	*Heineken (kilinto)		
6	*Dashen Brewery (Debre Birhan)		

*No data available

Once the residue has been produced and stored in a spent grain silo, beneficiaries are expected to access the residue through the existing distribution channel. Different factories have their own distribution arrangements and channels. The distribution system is discussed in part 5.4.

5.2 Requirements as animal feed and test result of the spent grain

As published by the Quality and Standard Authority of Ethiopia (2005), brewing by-products need to meet the requirements and standards. Some of the requirements are: shall have the characteristic odor of the product and shall be free from any odor indicative of spoilage; shall be free from adulterants, arthropod infestation, visible fungal growth and any harmful materials and shall comply with the requirement given in the table below:

Table 4 Requirements for brewing by-products as animal feed.

S/N	Constituents	Standard level given by QSAE		Laboratory test results	
		Brewers' Dried Grain	Brewers' Dried Yeast	Brewers' Dried Grain	Brewers' Dried Yeast
1	Moisture, percent by mass, max	10	10	X	X
2	Crude protein, percent by mass, min	24	40	X	X
3	Crude fiber, percent by mass, max.	15.5	15	X	X
4	Total ash, percent by mass, max.	9	8	X	X
5	Acid Insoluble ash, percent by mass, max.	.5	.5	X	X

* The requirements from 2 to 5 are on a Dry Matter (moisture free) basis.

It is important to take samples from different beer processing companies to check if the spent brewers grain distributed to users complies with the above standard. There are different testing laboratories that can conduct the test as per the given sample if breweries allow to give sample from their spent grain silos.

The new directive approved by Ethiopian veterinary drug and feed administration and control authority (Directive No 02/2018 (Released in February 2018) regarded spent brewers grain as feed raw material. The directive aims to provide competency license for Feed and Feed raw material producers, importers and distributor and set standard on production and storage facility, transportation infrastructure and personnel qualification.

5.3 Breweries residue Actors in the process of supplying the product

Although it varies from factory to factory, different actors are being involved in the process of supplying and marketing brewery residues. In some factories like Dashen, Bedele and Harar breweries, the supply chain of the residue is very short where the breweries directly distribute the brewery residue to the end users using their own trucks. The only difference is Bedele brewery distribute the spent brewers grain for free, however Harar and Dashen charges users for the spent brewers' grain and transport.

In other factories like BGI (Addis Ababa, Hawassa and Kombolcha plants) and DIAGEO (Meta Brewery), the supply chain is a bit longer. In BGI the Saint George Brewery worker's business share company acts as wholesaler and distributes the brewery residue to retailers and pay back half its earning from the sale to BGI. Meta brewery also uses Meta Brewery worker's business share company as wholesales. The brewery supplies the spent brewers grain in return for spent yeast disposal service by the share company. The share company distribute the brewery residue with different price structure for three groups of users.

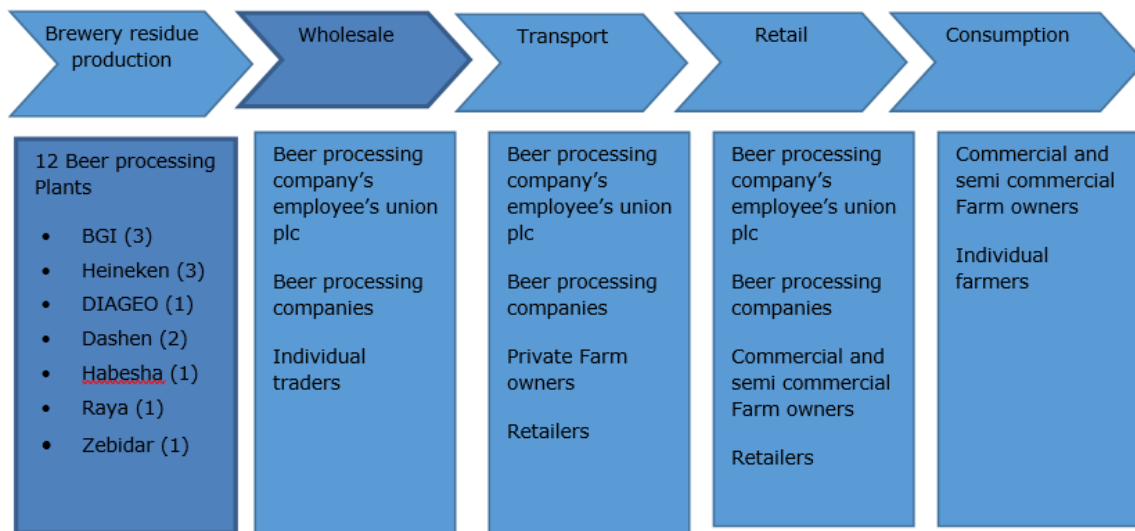


Figure 1 Supply chain of spent brewers' grains in Ethiopia.

5.4 Distribution system, Transportation service and end users of spent grains

The main end users of spent grain throughout the country are dairy farm owners. Since there are different distribution and transportation arrangement of the residue, the study team has tried to categorize and discuss the arrangement into three main options.

Some brewery factories like Dashen, Harar and Bedele, supply the residue within about 10 km radius from the factory. Particularly, Dashen Brewery at Gondar is experienced in distributing the product to beneficiaries found in Gondar town only. To facilitate the distribution system of the residue, Dashen brewery has taken the initiative to discuss with the concerned stakeholders and representative of dairy farm owners to establish the existing distribution system of the residue.

Dairy farm owners found within the town have been divided into two groups of users. Dairy farm owners in group one are those who have dairy cows less than 30 and group two are those who have 30 and above dairy cows. Dairy farm owners in group one who have less than 30 dairy cows are expected to organize in a group/association/cooperative and delegate committee member who could communicate and facilitate the distribution process of the residue in consultation with the factory and the transporter. Accordingly, there are about 16 users' groups/associations/cooperatives within Gondar town that have strong and smooth operational relationship with the brewery factory. Dairy farm owners in group two categories there are about 35 dairy farm owners who are being treated in a special arrangement at individual level.

Every month representative's/committee members of the users groups/associations/cooperatives/ announce their monthly demand and contact person of the month who receive and distribute the product to the rest of the use groups members to the factory.

Just only to facilitate the transportation service and collect fees from the beneficiaries, there is one company called Alfa by-products distributing association. It was established by 16 youths (10 men and 6 women) before three years ago and through time due to different reasons the majorities of members of the association has resigned from and currently there are only four women members who are actively running the transportation service.

Through rental arrangement, the association has one vehicle to transport the residues to the beneficiaries. The vehicle has a carry capacity of 30 quintals and usually transport minimum and

maximum of 60 and 240 quintals of fresh weight per day. The residue is transported and given to only Gondar town dairy farm owners. Since there is high demand for the residue in Gondar town and still there is unmet demand of the product in the town, other dairy farm owners who are located and working outside Gondar town have no any option and chance to access the residue. Alfa by-product distributing association has made contractual agreement with beneficiaries on delivery of products and collection of fees.

The transportation charge is also decided through negotiation with the beneficiaries. Depending on the distance of the dairy farmers' location from the factory, per load of a car (30 quintals) the transporter charges minimum 300 and maximum 700 ETB.

Other factories like BGI and DIAGEO sell the residue to wholesalers and again wholesaler distribute to several retailers. Therefore, end user could access the residue after a long process, which might cause quality deterioration of the product. There is no direct contact or operational linkage between brewery factories and dairy farm owners. Both price of the product and cost of transportation have been decided without any consultation and negotiation with the dairy farm owners.

BGI the Saint George Brewery worker's business share company acts as wholesaler and distributes the brewery residue to retailers with a price of ETB 3000/truck (equals 4880 kg in Addis Ababa, ETB 1250/truck (4880kg) in Hawassa and 1260/truck (6300kg) in Kombolcha. The retailers use their own truck to collect directly from the factories storage soils and dump for a group of farmers at agreed central location. Retailers charge farmers ETB 1500 – 2000 based on the distance and some additional profit they decline to explain. The share company pay's BGI half its earnings every month.

Meta brewery also uses Meta Brewery worker's business share company as wholesaler. The brewery supplies the brewery residue in return for spent yeast disposal service by the share company. The share company distributes the brewery residue with different price structure.

Table 5 *transportation costs of spent brewers grain.*

S/N	Users	Transportation	Price/truck (3133kg)
1	Local community association living adjacent to the brewery	Use their own truck	ETB 150
2	Dairy Farm owners	Use their own /rented trucks	ETB 1200
3	Farmers living far from the factory location	The share company	ETB 350 plus transport (ETB 200 – 300)

Factories like Harar and Bedele use their own trucks to distribute the spent brewers grain to retailers and end users. The only difference here is Bedele brewery distribute the spent brewers grain to user for free, however Dashen and Harar charges users both for the spent grain and transport.

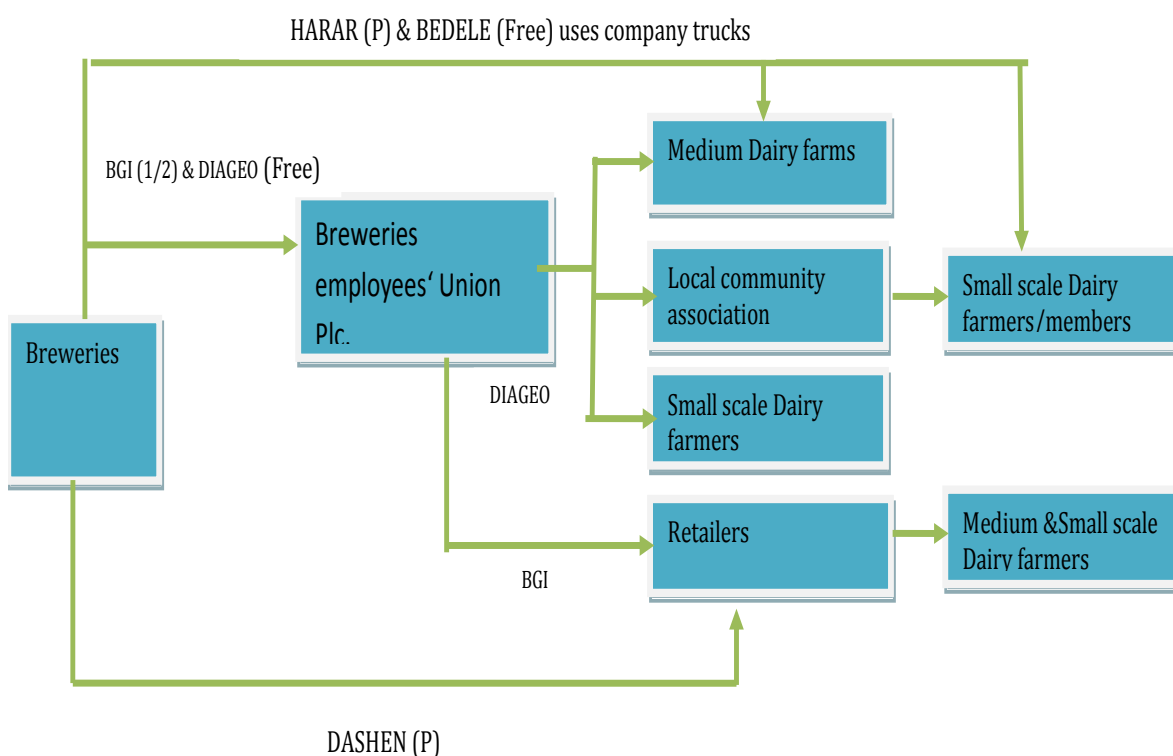


Figure 2 Distribution network for spent brewers' grains in Ethiopia.

5.5 Pricing of brewery residue

Evidences have shown that the prices of brewery residues have been decided with the following three methods.

Method one: by taking into the consideration concern for the community, some brewery factories like Dashen have decided to dispose of their spent brewers' grain by a relatively cheap price as compared to cost of other animal feed stuff. The price of the product is uniform throughout the year and dairy owners directly buy at factory gate price of the product. They only need to pay for the transportation cost of the product to the transport service provider. There is no also fluctuation of transport cost of the products once they have agreed with the transporter.

Method two: Bedele brewery distribute the spent brewers grain for free

Method three: By taking into consideration the supply of the product and demand for it, factories like BGI (Addis Ababa, Kombolcha and Hawassa) and Harar brewery offer different prices at different times. For BGI, even if the factory gate price is fixed for long time, retailers are heavily involved in determination prices that included their transport cost and profit margin. Harar brewery charges end users directly for the spent grain and transport service.

The pricing structure of spent brewers' grain is murky, especially where the distribution chain is longer as compared to short distribution networks. This can be seen in the pricing practices of BGI and DIAGEO owned breweries where employee's share companies are involved in wholesale and transportation.

The following tables summarize prices, distribution and transportation spent grain in each brewery.

I. *BGI Ethiopia Plc.*

Production site	Wholesale	Retail/ Distribution	Means of transport & responsibility	Quantity of one truck load (kg)	Price distribution				
					Price paid bay users /truckload ETB	Transport cost ETB (Average)	Profit margin by retailer ETB(average)	Total price paid by users ETB	Price per kg ETB
Addis Ababa	Saint George Employees Share company	Truck owners	Open truck regularly used for transportation of other goods	4800	4000	1700	250	5950	1.24
Kombolcha	Saint George Employees Share company	Saint George Employees Share company	Open truck dedicated for transportation of spent grain	6300	1250	500	200	1950	0.32
Hawassa	Saint George Employees Share company	Saint George Employees Share company	Open truck dedicated for transportation of spent grain	3215	1200	600	200	2000	0.62
Raya (Maychew)	Freely distributed by the brewery	-	-	-	-	-	-	-	-
Zebidar (Wolkite)	Freely distributed by the brewery	-	-	-	-	-	-	-	-

Notes:

The Saint George Employees Share company made agreement with BGI Ethiopia to share half of the revenue collected from the sale of spent grain.

1. The distribution and transportation is done by Saint George Employees Share company members/close relatives. The distributors benefited from the transportation and additional profit margin they collect from the users.
2. Raya and Zebidar breweries which are recently acquired by BGI Ethiopia freely distribute the spent grain to the local community.

II. Diageo Meta Brewery.

Production site	Wholesale	Retail/ Distribution	Means of transport & responsibility	Quantity of one truck load (kg)	Price distribution				
					Price paid by users /truckload ETB	Transport cost ETB (Average)	Profit margin by retailer ETB(average)	Total price paid by users ETB	Price per kg ETB
Sebeta	Meta Brewery Employees Social security fund	local community association close to the brewery	Open truck regularly used for transportation of other goods	3150	150	250	150	550	0.17
	Meta Brewery Employees Social security fund	Meta Brewery Employees Social security fund	Meta Brewery Employees Social security fund owned truck	3150	350	250	150	750	0.24
	Meta Brewery Employees Social security fund	Meta Brewery Employees Social security fund	Farms owned /rented trucks possibly used for transportation of other goods	3150	1200	Not known	None	1200	0.38

Note:

1. The Meta Brewery Employees Social security fund gets the spent grain in exchange for spent yeast disposal service for the brewery.
2. It implements three types of price arrangement as part of community support and earn a profit to pay for spent yeast disposal service and operational expenses

III. Heineken Brewery.

Production site	Wholesale	Retail/ Distribution	Means of transport & responsibility	Quantity of one truck load (kg)	Price distribution				
					Price paid bay users /truckload ETB	Transport cost ETB (Average)	Profit margin by retailer ETB (average)	Total price paid by users ETB	Price per kg ETB
Harar	Harar Brewery	Harar Brewery	Open truck dedicated for transportation of spent grain	6000	4140	-	-	4140	0.69
Bedele	Bedele Brewery	Bedele Brewery	Open truck dedicated for transportation of spent grain	-	Freely distributed the local community	-	-	-	-
Addis Ababa (Kilinto)	No real data available	-	-	-	-	-	-	-	-

IV. *Dashen Brewery.*

Production site	Wholesale	Retail/ Distribution	Means of transport & responsibility	Quantity of one truck load (kg)	Price distribution				
					Price paid bay users /truckload ETB	Transport cost ETB (Average)	Profit margin by retailer ETB (average)	Total price paid by users ETB	Price per kg ETB
Gondar	Dashen Brewery	Alfa by-product distributing association has	Rented trucks possibly used for transportation of other goods	3000	600	500	150	1250	0.42
Debre Birhan	Dashen Brewery	Dashen Brewery	Open truck dedicated for transportation of spent grain	-	Freely distributed the local community	-	-	-	-

Note:

1. The brewery organises regular meetings with end users and retailers to resolve issues related to price and distribution.

5.6 SWOT analysis of the supply chain actors of brewers' residues

Main actors of the supply chain of the brewery residue are: brewery factories, wholesalers, retailers, transporters and end users of the product. Through considering the participation status of actors in the supply chain of the product and taking into account the possible future actions of the actors, summary of SWOT analysis of the actors is precisely described in the table below:

Actor	Strengths	Weakness	Opportunities	Threats
Breweries	<ul style="list-style-type: none"> • Uses storage silos that is convenient for spent brewers grain • Some of the factories have given due concern to the community in the process of determining price of the residue • Some of the factories have already established good relationship with the end user 	<ul style="list-style-type: none"> • Some factories have no clear direction how to manage the spent brewers grain • Some factories have not given attention to the end users • Their main concern is clearing space for operation in disposing spent brewers grain 	There is high demand for spent brewers grain throughout the year in all areas where the breweries are located	<ul style="list-style-type: none"> • Urban based dairy farm owners have given priority and attention to dry factory residues • Poor handling of spent brewers' grain by end users causes animal illness and death • New directive imposes a number conditions and distribution of spent brewers' grain
Wholesalers	<ul style="list-style-type: none"> • They have good knowledge on the benefit of the spent brewers' grain 	<ul style="list-style-type: none"> • Some wholesalers do not concern about end users specially in pricing of products 	There is high demand for spent brewers grain throughout the year in all areas where the breweries are located	
Retailers and Transporters	<ul style="list-style-type: none"> • They are good at and efficient in providing transportation services • They are working in consultation with brewery factories and end users 	<ul style="list-style-type: none"> • Some of the transporters have no their own vehicle to transport the product • Sometimes they use inappropriate vehicles that waste the product 	Transportation of spent brewers' grain is reliable source of income for truck owners	Increasing price of spent brewers' grain transport may force end users to consider other feed options
End users/Dairy farm owners	<ul style="list-style-type: none"> • Organizing themselves as a group/association/cooperative enable them to negotiate with actors • There is exchange of information and feedback with factories 	<ul style="list-style-type: none"> • Are highly dependent on the spent gain • Sometimes they don't take initiative to be part of solution they encountered • They are not aware of standards of residues 	Breweries willingness to work together with end users	Not well organized to handle all spent brewers grain

5.7 Common challenges and limitations in the process of distributing and managing the residues in the country

The major challenges facing an improved spent brewers grain utilization can be summarized as follows.

- Intermediary parties are non-value adding actors in wholesale distribution of spent brewers' grain (specially Employees unions in BGI and DIAGEO)
- Wholesale and retail business is controlled by closely connected group of people and not open for competition and pricing is made arbitrarily. Since most brewery factories are far apart from each other and the demand for the product is high, distributors largely operate as monopolists in their area of distribution.
- Transportation of spent brewers' grain made in an open truck usually used to transport other goods, which poses risk to contamination during transport (e.g. Salmonella from bird droppings).
- spent brewers grain is not considered as valuable product by the breweries. Their main concern is operational in disposing spent brewers grain.
- Some transporters of the product do not use appropriate and clean vehicles, which results in wastage and spoilage of the product
- Farmers' organizations like dairy cooperatives and cooperatives' unions, which appropriate to be part of the chain are not participating in the spent brewers' grain trade system
- Actors of the chain are not well aware on the Veterinary Drug and Feed Administration and Control Proclamation No 02/2018 and Ethiopian standards of the brewing by-products.

5.8 Recommendations on intervention issues

In order to improve further the distribution system and to properly use the brewing by products, some recommendation points from short-terms and long-term points view are forwarded below:

5.8.1 Quick-win interventions

- Starting from production to final utilization process, there are different actors who have different backgrounds and experiences. Just to minimize the knowledge and experience gaps of actors in the sector, it is good to organize short term basic trainings on feed management, standards of by-products and regulatory issues of the sector and conduct regular consultative meetings at least biannually at the respective operational areas.
- Some minimum criteria that need be fulfilled by wholesalers, retailer and transporters need to be developed and implemented on spent brewers' grain handling.
- Breweries needs to consider working with end users and better understand their situation to reduce prices and to reduce deterioration of the quality of the spent brewers' grain.

5.8.2 Strategic interventions

- Conducting detail study on the possibilities of increasing utilization time of spent brewers' grain by dairy farms/farmers.
- Convincing breweries to take measures that can reduce spent brewers grain prices and improve access of dairy farms/farms by cutting out non-value adding actors.
- Conducting study to compare the cost benefit analysis of using spent brewers grain over other feed items.

6 References

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Annex 1 Summary of round table meeting on spent brewers' grain, 12th December, 2017.

On Tuesday, December 12, 2017 a round table dairy business platform meeting on spent brewer's grain and its importance to dairy production in Ethiopia has was conducted at the Ambassador hotel, Addis Ababa, Ethiopia.

There were 37 (thirty-seven) participants including commercial dairy farmers, feed processing industry owners, brewery companies, Government Ministries, feed regulatory authority, FAO and researchers.

Brief presentations were delivered by sector experts on the following topics:

- Challenges and opportunities using brewery feed for dairy production in Ethiopia,
- Experience of utilizing brewery grain as ingredient of poultry feed in the case of Raya beer in Tigray region,
- Update on Ethiopian feed assessment which is carried out by FAO Ethiopia.
- Draft directives by VDAFACA on brewery residual utilization as animal feed.
- vision on potential, importance and improvements in use of brewer's grain in Ethiopia feed processing industry

After the presentations a panel discussion was conducted with Q&A on presentation. Brewery factories representatives also forwarded their view on how to efficiently utilize the brewery residual as animal feed. There is understanding that brewer's grain is a good protein and energy source for dairy cattle. However, attention should be paid on how to manage and properly use the residue in order to sustain safety and efficient production. With regards to these issues, presenters and representatives have provided multiple ideas on how to use it effectively and how make it accessible and affordable.

On the way forward, the following issues puts as main priorities:

- Conduct field survey that aims to determine the volume of brewery residuals including the share channelled to feed processing factories and dairy farms,
- Assess the existing situation of brewers' residual transportation to farms and storage facility for the best use of the product in compliance with animal feed and food safety
- Assess the challenges and opportunities to access brewery residuals from brewery as animal feed (quality and affordability)
- Assess the brewery yeast potential as sources of animal feed
- Assess the performance of dairy cows in terms of production volume, quality, health, using brewery grain as part of feed ingredient
- Deliver extension model on spent brewery grain utilization

The meeting ended up with by reaching agreement to continue a discussion at all levels to build strong a bridge between farmers and brewery companies.

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