



## **Review on assessment of feed resource and feeding system of commercial feedlot farms in Ethiopia.**

**Tekalign Woldehana Uro**

University of Gondar, Faculty of Veterinary Medicine, Gondar, Ethiopia, P.O.B 196

### **Abstract**

Ethiopia is believed to have the largest livestock population in Africa. Large proportion of Ethiopian population directly or indirectly depends on livestock farming. Draft animals provide the power for the cultivation of nearly 96% of the cropland in the high lands. The results obtained from this study demonstrate that agro industrial by products lentil husk, rice bran, cotton seed cake, wheat bran, maize flour, fababean husk, wheat middling were the highly utilized concentrate feeds and vetch, groundnut husk, sorghum flour, soybean husk, noug seed cake were the rarely used concentrate feeds by commercial feedlot farms. Teff straw was the highly utilized roughage feed and wheat straw and grass hay were the rarely used roughage feeds. Age, fattening stage and market were found to be factors that determine amount of concentrate feeds to be given and body size of the animal, feed price and market availability were found to be factors that determine type of concentrate feeds. Non conventional feed stuffs, growth promoters and vitamin supplements were not practiced at all. Salt and Bole (local name for mineral soil) were used as mineral supplement Water was given in ad libitum manner. Confined feeding was practiced by all commercial farms. There were a lot of limitations related to the feeding system some of them were know how of ration formulation and ration formulation was not practiced at all, concentrate to roughage ratio was not known. Daily feed intake and weight gain was not known. Both concentrate and roughage feeds availability were affected by season mainly during summer and there was water shortage problem.

**Keywords:** Assessment, Feedlot, Feeding system.

### **1. Introduction**

Ethiopia is believed to have the largest livestock population in Africa. Large proportion of Ethiopian population directly or indirectly depends on livestock farming. Draft animals provide the power for the cultivation of nearly 96% of the cropland in the high lands (MoA, 2010). In terms of their contribution to agricultural GDP, cattle are by far the most important ruminant species. Live animals and livestock products such as meat, hides, and skins are the third major export accounting for 11% of the export revenue (Hurrissa,. and Legesse, 2008). However, the productivity and economic contribution of the livestock sector is much below the potential due to

various technical and non-technical constraints. The major technical constraints include inadequate feed supply and inefficient feed management and utilization, widespread diseases and poor animal healthcare and poor breeding practices. Among the non-technical constraints poor financial and infrastructural resources and inadequate policy support with respect to extension, marketing, as well as credit facility are taken as the main issues (Ayele *et al.*, 2003)

Among the various livestock production activities, In Ethiopia, beef cattle fattening activity could be one potential source for employment opportunity and to increase the volume and quality of meat produced and

to alleviate poverty in the country (Yitaye *et al.*, 2007; Adugna, 2008.). Moreover, Cattle fattening is offering an opportunity to serve the vast cattle and meat export market as well as Ethiopia's domestic market and also it add value on simple livestock herding (Habtamu, 2012). Hence, it had been argued to be considered as the pivot for rural development planning and enhancing income of small holding farmers of developing countries (Habtamu and Akalu, 2012). Farmers can derive substantial income from cattle fattening as well as maximize use of farm resources if provided with adequate support services to manage their stock. Providing appropriate technical support in selecting stocks for fattening, and efficient feeding management using locally available feed resources are important services in boosting farmers income from cattle fattening (Hurrissa, and Legesse, 2008). In line with this, (Berhanu, *et al.* 2009.) argued that small holders development planning to be win-win strategy to national development in a country where large number of small holding farmers production contributes a lot to total national economy.

However, in Ethiopia, small holder farmers producing the largest share of national livestock herd were precluded from its largest contribution to overall national earning due to underdeveloped infrastructure (Helina and Emily, 2012). Furthermore, the shortfall of maximizing small holders share from the sector is attributed to low level of farmer's value adding activities before they supply their livestock to market. Despite their large number holding, whose sum gives the largest number of national herd in Africa (Sintayehu *et al.*, 2013), it is not contributing in their household economy as much it could be particularly when evaluated at sell price level (Habtamu and Akalu, 2012). Researchers attributed this gap to the sectors production orientation, being subsistence at producers level, which can be alleviated with re-orientation of the production system to be market responsive or market driven system ( Berhanu *et al.*, 2009; Micheels, 2010; Habtamu, 2012;). Aligned Market orientation is characteristic of a business where it is by encourage the emergence of commercial-oriented livestock production systems such as the development of commercial feedlot operations, improved pastures, small-scale fattening , large-scale ranching, and dairy and beef operation with the industry's market intelligence development. This means, it is the way to adjust production system to respond to what customers need, particularly at market place. Market oriented agricultural production system requires intensification in management or

production system (Azage *et al.*, 2011) and improvement of production efficiency in its outset (Micheels , 2010. ).

Fattening can be regarded as important entry point to adjust subsistence oriented livestock production to market orientated system (Habtamu and Akalu, 2012). Any actor participating in fattening undertakes the activity setting its goal to increase the value that the fattened animal can fetch at market . Regarding this, ( Habtamu, 2012) stated that the sector is promoted by government to increase income of the participants as one of the reason among others. Improving the market supply of quality live animals is to understand the livestock producers ownership patterns and marketing behavior and factors affecting them.

The fattening activity can be undertaken at any level of livestock value chain ranging from small holder farmers rearing livestock for multiple functions to the level of enterprises engaged in fattening (Adugna, 2008) who export live animals and supply fattened animals directly to abattoirs concocting meat for inland and international markets. Hence, Different level of fattening activity is undertaken by different actors of livestock market value chain. Depending on the difference of methods of fattening activities employed at different level, researchers classified the type of fattening in different categories. Of this, classification of fattening practices as small and large scale fattening is used differently among different researchers. Some use small scale fattening practitioners as small holding farmers engaged in fattening (Adugna, 2008; ). Whereas others use it to present small sized commercial feed lots which only differ with large scale fattening projects on bases of employed capital (Hurrissa, and Legesse, 2008). Hence, The enterprise characteristics of small-scale and large-scale fattening projects activities are similar; therefore, both and can be categorized under commercial fattening practice.

Even though Ethiopia is exporting a large number of fattened live animals to abroad there are some backward practices that are not supported with scientific knowledge and understanding from which feed resource and feeding system is one side of the limitation in the country and these limitations have great negative effect on the country export potential. Since the problem is observed all over the country Adama was selected because it is a potential area to the feed lot industry. The study is designed to assess

feed resource and feeding system of commercial feed lot farms in the area. The study is significant as it helps to understand the feed resource and feeding system of commercial feedlot farms in the area and there problem. And useful insights towards the designing and implementation of strategies to alleviate the shortage of feed resource and limitations of feeding system. Therefore this study was proposed based on the following objective..

### Objective

❖ To assess feed resource and feeding system of commercial feedlot farms which are found in Adama town

## 2. Literature Review

### 2.1. Livestock Production in Ethiopia

The diverse agro-climatic conditions of Ethiopia make it very suitable for the production of different kinds of livestock. Most of the livestock are produced by pastoralists, agro-pastoralists, and smallholder mixed crop livestock farmers and sold to private entrepreneurs operating in a marketing chain involving collection, fattening and transportation up to terminal markets (Getachew *et al.*, 2008). Cattle and sheep are the major livestock in highland areas and camels and goats are the prominent domestic animals in the pastoral lowlands below 1500 m.a.s.l (Ayele *et al.*, 2003). The predominantly highland (above 1500 m.a.s.l) regions of Tigray, Amhara and Oromia also contain pockets of lowland (areas below 1500 m.a.s.l) and such lowland pockets may contain production systems and livestock populations which are slightly different from those found in the highland areas. On the other hand, there are mainly lowland regions such as Borena, Somali and Afar where pastoralists predominate.

Thus, while pastoralists are usually located in lowlands, all lowland livestock producers, especially those in lowland pockets of highland regions, may not be pastoralists. In general, livestock are kept for multiple purposes as sources of draft power, milk, meat, skin and hides. They are also the main sources of income and are closely linked to the social and cultural lives of the community. The number of livestock owned per household varies from location to location depending on the diverse agro-ecological conditions and factors like feed availability, disease condition and resource status of the farmers. In Ethiopia cattle, goats, sheep, camel and poultry, in

order of magnitude, are used as resource base for meat production. However, the first three species are the most common. The annual growth of livestock is estimated at 1.2 percent for cattle, 1 percent for sheep, 0.5 percent for goats and 1.14 percent for camels while annual off take is estimated at 10 percent for cattle, 35 percent for sheep, 38 percent for goats and 6.5 percent for camels (Belachew and Jemberu, 2003).

### 2.2. Contribution of Cattle Production in Ethiopia

Ethiopia is a largely rural country with an agrarian economy. Livestock are of economic and social importance both at the household and national levels, and they have been providing significant export earnings. Although estimates vary widely, livestock is thought to contribute 15-17% of Ethiopian gross domestic product (GDP), 35-40% of agricultural GDP and 37-87% of the household incomes; the large variations are due directly or indirectly to climatic variation. Livestock have multiple uses aside from income generation, including cash storage for those beyond the reach of the banking system, draught and pack services, and manure for fuel and fertilizer. In addition to these non-market values, a thriving informal export trade in live animals further emphasizes the significance, albeit unrecognized by official statistics, of livestock (and particularly cattle) in the Ethiopian Economy. The country is ecologically diverse, featuring 18 distinct agro climatic zones, but it has two major recognized livestock production systems: highland with predominantly mixed farming; and lowland pastoral and agro pastoral systems. Ethiopia borders half a dozen countries in the Horn of Africa, and in all cases cultural, linguistic, clan and family links span the boundaries. Such connections employ physical and organizational trading arrangements that predate modern frontiers, and serve Middle Eastern markets for imported cattle and beef.

Ethiopia's domestic meat consumption for 2006-07 has been estimated at 2.4 kg/capita per year for beef capita (Jabbar and Negassa, 2008). Aside from economic factors, rural and urban consumption differences can be explained by social and demographic characteristics such as age structure and the rigor of adherence to religion-based fasting (Jabbar and Negassa, 2008). Overall production for sale has proven difficult to estimate, but production and export volumes indicate approximate self-sufficiency in beef, necessitating exports as an outlet for any future increases in production. However, meat production per head of livestock is low by the standards of other

significant livestock producing African countries. For instance (Hurrissa, and Legesse, 2008). shows that production of cattle meat in Ethiopia is just 8.5 kg/head of cattle per year, which is significantly lower than in Kenya and Senegal (21 and 16 kg, respectively).

### 2.3. Challenges of Cattle Production in Ethiopia

Ethiopia has the lowest livestock productivity of the least developed countries and one of the lowest in the world (Negassa, Rashid and Gebremedin, 2011). There is not much specialization in the livestock sector, which lowers its productivity potential. Any observed productivity growth happens because of increases in the total number of animals, not because of increases in the efficiency of livestock production. The commercial off- take rate is only about 8 percent for Ethiopia. Such off take rate indicates that household keeps animals for other purposes (prestige, social status, liquid investment) but not for sale. The majority (about 60%) of the Ethiopian small-scale livestock producers use green fodder as a main source of livestock s feed. Some supplement it with the crop residues available on their farms. The use of animal feed mixes (oilseed cakes, wheat bran etc.) is still very low. There exist significant regional productivity differences as well as productivity differences between various livestock breeds. Ethiopian small-scale farmers cater their livestock production largely to the domestic markets. The majority of sales are made in the local markets usually without establishment of advanced contractual agreements (Negassa, Rashid and Gebremedhin, 2011). Several factors influence the low livestock productivity statuesque in Ethiopia. Livestock feed and water shortages, diseases combined with weak or not available veterinary services, poor livestock feeding and management at farm level due to lack of trainings and financial resources to obtain improved livestock feed, poor market information and lack of marketing outlets, predators and parasites, low level of specialization in the livestock sector.

### 2.4. Beef Cattle Production Systems in Ethiopia

Based on integration of livestock with crop production, level of input and intensity of production, agro-ecology and market orientation, livestock production systems in Ethiopia is categorized as pastoral, agro-pastoral, mixed crop-livestock farming, urban and peri-urban farming and specialized intensive farming systems (Mohammed *et al.*, 2004;

Yitay, 2007). However, the livestock production systems are predominantly categorized as agro-pastoral system in the lowlands, and the mixed crop livestock system in the highlands. Traditionally, fattening of animals in both systems concentrates on male animals and on females which are either infertile or have finished their reproductive cycle. In the lowland agro-pastoral system, grazing is the most common source of feed, with limited use of crop residues, whereas in the highland system, crop residues are the most important source of animal feed. During the wet season, when crop residues are scarce in the highlands, male animals are taken to the lowland areas for grazing (Alemayehu, 2005)

### 2.5. Type of Cattle Fattening in Ethiopia

#### 2.5.1. Traditional Fattening System

Cattle are kept mainly for draft power, milk and manure production and are usually only sold when they are too old for these purposes, or drought or cash shortages force people to sell. Oxen are usually sold after the ploughing season while they are poor quality and returns to farmers are often inadequate. Cattle in the lowlands are rarely fattened and are often sold in poor body condition and at low prices. In the lowland, where pastoralists do not use cattle for draft and sometimes fattened on natural pasture in good seasons however much body weight is lost during long distance trekking to Addis Ababa and the animals may reach market in little better condition than culled highland stock. In average or poor seasons, lowland cattle are rarely fattened and often have to be sold in poor condition at low prices. These traditional systems are very inefficient because they do not use the proven opportunity to add weight and condition to cull animals before slaughter. (MOA, 2004).

#### 2.5.2. By-product-Based Fattening System

This type of fattening system can be under taken based on agro industrial by-products such as molasses, cereal milling by-product and oilseed meals are the main sources of feed (Ministry of Agriculture MOA 2004. began to help peasant farmers in DebreZeit area to fatten purchased cull oxen using molasses and milling by products. This has produced profitable results for the individuals involved and the number of animals fattened has increased every year to about 2,000 per annum. As (Adugna, 2008) ,( Tsegay and Mengistu, 2013) most of commercial feedlot this agro industrial by product fattening system around Adama,

Matahere, Melkessa, Wonji and Mojo are fattened their cattle by wheat bran, oilseed cakes and molasses, which form a major portion of the concentrate mix fed to the animals. On other areas that follow this type of cattle fattening system is in Bale Agricultural Development Enterprise fattened their cattle by using crop by-products such as straw, grain screenings, low grade grain and weed seeds. Wheat and barley straws are abundant byproducts produced on all farms of the Enterprise and comprise a major proportion of the diet of the animals. This fattening system is not recommended for other parts of Ethiopia, except places where oilseed cake is abundant and cheap (MOA, 2004)) and where different crops can be produced potentially and availability of different industry are available.

### 2.6. Commercial Feedlot Fattening in Ethiopia

Most of the feedlot operators are available at central parts of the country. Adama, Dera, Mojo, and Methara and also Bale Agricultural Development Enterprise, with their main role of fattening cattle for different markets. As part of Sanitary and Phyto-Sanitary (SPS) requirements and according to the rules and regulations of animal quarantine, fattening is operated after providing the cattle with necessary vaccines and medication (Getachew *et al.*, 2008 and Tsegay and Mengistu, 2013). They use cattle of different age groups and breed types according to the demands and the type of their customers. Older animals (more than four years old) and some times of highland origin are fattened for domestic market (slaughter houses) while young bulls (three to four years old) and usually of lowland origin are kept for export market. At times of high demand, some exporters buy young bulls that have finished their quarantine requirements from feedlot operators at Adama or Dera (Getachew *et al.*, 2008). The feedlot operators are collecting cattle either from Dera and Adama market or Bale, Arsi and Haraghe high land Ogaden cattle from the main source markets (Getachew *et al.*, 2008 and Tsegay and Mengistu, 2013). They use Borena markets as the main source market because of accessible transportation, relative lower cattle prices and their preference for cattle sourced from these areas due to fast growing, large body size, efficiency in feed conversion and adaptation to harsh environments. According to the discussion with some feedlot owners at Dubuluq market, Boran breed cattle grown in Borena areas are generally preferred for fattening and have superior quality than those coming from other areas such as

Bale lowlands (Getachew *et al.*, 2008). And also Arsi and Bale breeds are the second preferable and Hararghe Highland and Ogaden cattle breeds had least acceptance for commercial fattening because of availability (Tsegay, and Mengistu, 2013).

### 2.7. Feed Source and Feeding System of Cattle Fattening

Ethiopia is known for its huge cattle population, most of the beef is produced under an extensive low input system and in conjunction with crop and small ruminant production (SPS-LMM, 2011). Due to this beef production and productivity are very low as compared to the world average. Farmers can derive substantial income from cattle fattening as well as maximize use of farm resources provide that adequate capital to purchase stocks for fattening, and efficient feeding management using local and available feed resources.

Feed is one of the most important and critical for cattle fattening. Livestock feed resources in Ethiopia are mainly natural grazing lands and browses, crop residues, pasture, forage crop and agro-industrial by products. Feeding systems include communal or private natural grazing and browsing, cut and carry feeding, hay and crop residues. At present, livestock are fed almost entirely on natural pasture and crop-residues. Use of improved forages and agro-industrial by products is minimal and most of agro-industrial byproducts are concentrated in urban and peri-urban areas (Alemayehu, 2005).

The available feed resources are essentially of low digestibility such as tropical pastures (both green and mature), crop residue (straw and stover). The availability of crop residue is closely related to the farming system, the type of crop produced and the intensity of cultivation. Therefore, in integrated crop/livestock systems the potential of using crop residue as feed for livestock are greatest (Alemayehu, 2005). In Harari region, sorghum and maize are the major crops, providing stable food to people and various forms of feed and by products to livestock (Kurtu, 2003).

Feed resources as reported by (Tolera *et al.*, 2012) can be classified as natural pasture, crop residue, improved pasture and forage and agro industrial by-products of which the first two contribute the largest share. The fibrous agricultural residues contributes a major parts of livestock feed especially in the populated countries where land is prioritized for crop cultivation. (Tolera *et al.*,2012) reported that crop residues contribute to about 50% the total feed supply in Ethiopia. Under smallholder livestock production system, animals are dependent on a variety of feed resources which vary both in quantity and quality for optimum livestock productivity.

In Ethiopia highlands, the natural pasture, crop residues, and stubble grazing are the major sources of feed (Alemayehu, 2004), where as in Fogera, the private and communal grazing land, crop residues of teff, rice, finger millet, barley, chickpea, maize stalk, hay, agro-industrial by products and aftermath are the main available feed resources for livestock production (Belete, 2006). According to Adugna (2008) the notable examples of backyard fattening practices are carried out in Wolayita and Hararge areas. Farmers in Wolayita have a long tradition of fattening oxen using locally available feeds. They feed one or two oxen for about 3-4 months and sell during festive holidays such as *Meskel* and Christmas. The main feed resources are crop residues, cut-and-carry grass and various agricultural byproducts such as sweet potato vines and tuber, thinning or whole crop maize, enset supplemented with boiled maize and haricot bean and household wastes such as atella and coffee residues.

### 2.8. Nutrient Requirement of Beef Cattle

Nutrient requirement of beef cattle have become more critical with the shift in beef production practices. As feed represent by far the greatest cost item in beef production, it is important that there should be a basic understanding of the nutritive requirement of beef cattle. Efficient beef production cannot be achieved unless nutrient requirement are met, and these are influenced by a number of factors; body weight gain and frame size are especially important in growing and finishing cattle ( Ensminger *et al.*, 1990).

Conditions and age both affect feed capacity and there is much variation in animals of the same condition and age. Cattle on finishing rations consume daily an amount of feed equal to 2.25-3 % of their live weight with higher intake levels occurring in the early part of finishing period. Older cattle such as cow in good

conditions and fleshy individuals such as mature bulls consume less even low as 1.5% of their live weight. Thin, growing yearling or older steers may consume up to 4 % of their weight daily for short periods. In general, the lower the fiber content or bulk of feed the lower the voluntary intake ( Ensminger *et al.*, 1990).

### 2.9 Feed resources used for commercial fattening

All commercial feedlots were depending on purchased concentrate and roughage feeds for fattening because of shortage of land for feed production. Concentrate feeds were purchased from different agro processing industries which are found in and around East Shoa Zone this could be mainly the main reason why all most all commercial farms found in this Zone this gives them easy access to agro industrial by products which form a major portion of the concentrate mix feed to feeder livestock. . Roughage feeds were brought from different parts of East Shoa and North Shoa Zones.

Concentrate feeds are characterized by high energy and/or protein contents. Concentrate feeds mostly include various agro-industrial by products and occasional surplus grains and grain byproducts .

## 3. Conclusion and Recommendation

The results obtained from this study demonstrate that agro industrial by products lentil husk, rice bran, cotton seed cake, wheat bran, maize flour, fababeen husk, wheat middling were the highly utilized concentrate feeds and vetch, groundnut husk, sorghum flour, soybean husk, noug seed cake were the rarely used concentrate feeds by commercial feedlot farms. Teff straw was the highly utilized roughage feed and wheat straw and grass hay were the rarely used roughage feeds. Age, fattening stage and market were found to be factors that determine amount of concentrate feeds to be given and body size of the animal, feed price and market availability were found to be factors that determine type of concentrate feeds. Non conventional feed stuffs, growth promoters and vitamin supplements were not practiced at all. Salt and Bole ( local name for mineral soil ) were used as mineral supplement Water was given in ad libitum manner. Confined feeding were practiced by all commercial farms. There were a lot of limitations related to the feeding system some of them were know how of ration formulation and ration formulation was not practiced at all, concentrate to roughage ratio was not known. Daily feed intake and

weight gain was not known. Both concentrate and roughage feeds availability were affected by season mainly during summer and there was water shortage problem.

Based on these concluding remarks, the following recommendations are forwarded.

- To overcome concentrate feed availability problem the government and investors should find a solution to produce feed type that could not be eaten by human.
- The number of animal feed processing plants should increase.
- Research centers should find a way to solve calcium and vitamin A deficiencies in most feed types and study the effect of mineral soil on the vital organs.
- Continuous awareness creation should be done to improve the knowledge of feedlot operators on the use of ratio formulation, daily feed intake and weight gain.
- The government should work hard to solve water shortage problem

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