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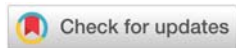
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Research Article

Beef cattle value chain analysis: Evidence from West Hararghe Zone of Ethiopia

Abstract

The study was initiated to identify beef cattle value chain actors and their roles, and investigate the determinants of quantity of beef cattle marketed. To achieve this, primary data were collected from randomly selected 171 cattle fatteners, 14 butcheries, 8 hotel and restaurant owners, 8 traders, and 6 consumers using pre-tested semi-structured questionnaire. Besides, data were collected through Group Discussions and key Informant interviews to substantiate the survey data. And secondary data was collected from published and unpublished sources. Descriptive result indicated that, input suppliers, cattle fatteners, brokers, butchers, small traders, large traders, hotel and restaurant owners, and consumers are principal value chain actors. High broker interference, weak linkage and information flows were observed within and among beef cattle value chain actors. Multiple Linear Regression model revealed that, experience in cattle fattening, education level, land size, access to market information, extension contact, and average lagged price of beef cattle had positively and significantly influenced the quantity of beef cattle supplied to the market. The study suggests the concerned stakeholders to give due attention and policy support for the establishment of marketing cooperatives, strengthen the linkage among chain actors and supportive institutions to improve productivity and revenue derived from sub-sector.

Introduction

Livestock is emerging as a priority focus area and part of ambitious plans under the GTP2 for the Ethiopian government, which is believed to support the country to move towards middle-income status by 2025. Despite the neglect and lack of attention to date, the sub-sector is seen as significant in contribution to overall economic growth, and supporting the country's green growth priorities. In this context, currently, the government clearly acknowledges the need for greater support in the development of this sub-sector to realize its full potential through putting in place the institutional and analytical basis [1].

The sub-sector supports the livelihoods of about 80% from 85% of population reside in rural areas [2]. Based on the result estimated by LSIPT, the direct contribution of the sub-sector to the GDP of the country is Birr (ETB) 150.7 billion per year, and specifically accounts 17% of national GDP and 39% of the agricultural GDP. This rises to about 21% of the national GDP and 49% of the agricultural GDP, if the contribution of processing and marketing (35.6 billion) is taken into account. Besides, the sub-sector contributes 16%-19% of the foreign exchange earnings [3,4].

Cattle production is also among livestock keeping activities and its integral part of the mixed farming, agro-pastoral

and pastoral production systems which accounts about 60.39 million cattle population [5]. Particularly, in both rural and urban areas, beef cattle production are emerging as a significant source of household income, national income, employment opportunities particularly for those vacant farmers due to the limitation of cultivable land and urbanization, and export earnings through both live and processed forms [6]. As a result, cattle fattening gained great attention as vital business scheme of the domestic animals trade to make use of cheap, plentiful farm by-products (Habtamu *et al.*, 2008).

The cattle fattening activity can be undertaken at any level of livestock value chain ranging from small holder farmers rearing livestock for multiple functions [7] and small scale commercial fattening to large scale commercial fattening [8,9], who export live animals and supply fattened animals directly to abattoirs concocting meat for inland and international markets. At the household level, livestock plays vital economic and social roles in the lives of pastoralists and agro-pastoralists. It's used as coping mechanism with shocks, accumulating wealth, and serving as a store of value in the absence of formal financial institutions and other missing markets [10].

Now a days, market oriented cattle fattening business has been gradually emerging concomitant to the increase in demand for beef cattle in both local and export market [11]. To this effect, the government is trying to expand the sector



by inspiring producers' in order to meet the rising demand. Consequently, meat processing factories and export abattoirs are escalating in number and export earnings from the sector are rising in the country (MoRD, 2008). Despite this fact, the level of productivity, and revenues derived and foreign exchange earnings from beef cattle fattening is still not adequate, given the high potential of the country [12]. Cattles are not managed to maximize their value for meat production (Jabbar and Gezahegn, 2003 cited in [13]. Besides, even though the government policy has focused on developing preferable marketing channels, high involvement of brokers distort all the cattle marketing channels through limiting the bargaining power and reliable market information. This violates the principle of equity between traders and producers by denying producers chance to realize economic gains in production [14]. Also, the entire beef cattle supply chain in Ethiopia is further characterized by numerous intermediaries namely: brokers, collectors; animal trekkers; small, medium and big traders; abattoirs; butcheries; exporters; local authority and Department of Veterinary. This makes the supply chain unnecessarily long with increased transaction costs without significant value added activities [10].

Furthermore, due to high illegal flow of livestock particularly beef cattle, the actual performance remained very low, leaving most of the projected livestock off-take for the unofficial cross-border export and the domestic market. These become barriers to understand and analyses the full range of activities required to bring a live animal (beef cattle) to final consumers passing through the different phases. It also creates barriers to identify a market-focused collaboration among different stakeholders who produce and market value-added products [15]. Despite many studies have been conducted on beef cattle value chain in different parts of the country [6,13,14,16-19] there is a still information gap in the study areas. Hence, to link this gap, identifying, analyzing, and understanding those beef cattle chain actors that are responsible for upgrade of products are needed to device appropriate interventions and integrated efforts to combat intermediaries. To this end, the study was made an effort to identify the main actors involved in beef cattle value chain and their functions, and major determinants of quantity of beef cattle supplied to the market.

Methods and Materials

Description of the study area

This study was undertaken in the eastern part of Ethiopia specifically in West Hararge zone of Oromia National Regional State. From the selected zone, tow districts namely Gemachis and Doba districts were selected based on their extent of beef cattle production. Gemechis district is located at 343km east of Addis Ababa and about 17km south of Chiro, capital town of the Zone. The district is situated at the coordinate between 8040'0" and 9004'0" N and 40050'0" and 41012'0" E. It's found within 1300 to 2400 m.a.s.l. It shares borders with Chiro district in the West and North, Oda Bultum district in the South and Mesala district in the East. The district covers an area of 77,785 ha and it has 35 rural and one urban *kebeles* [20]. Agro-ecologically, the district has highland (15%), midland (45%) and lowland (40%) climatic zones and it receives bi-modal average annual

rainfall of 850mm [20]. The average temperature of the district is 20 oc. The total projected population of the district is 235,638 of which 119,485 are males and 116,153 are females [21]. The number of agricultural households in the district is estimated to be 38,500 [20].

Doba district is located at 382km from east of the capital city, Addis Ababa and 45km from Chiro, Zonal capital town and shared boundary with Chiro on the south, Mieso on the west, Somalia Region on the north, Misraq Hararghe zone on the east, and Tulo district on the southeast. The district has 33 rural *kebeles* and three rural towns ((Doba district Agricultural and Rural development office). The district has an altitude ranging from 1400–2500 m.a.s.l. Agro ecologically, the district has highland (*dega*) 40%, medium high land (*weyna dega*) 57% and low land (*kola*) 3%. The district receives bi-modal average annual rainfall ranging from 550mm to 800mm and has daily mean temperature ranging from 18°C to 26°C [22]. The total projected population of the district is 171,458 of which 87,428 are males and 84,030 are females [21]. Among this, 166,181 populations are leaving in rural areas through driving their livelihoods from agriculture and related activities.

Sampling producers and sample size determination

Multi stage sampling procedures was employed in order to generate primary data. Firstly, Doba and Gemachis district was selected purposively after the discussion with the zonal livestock and fishery resource office experts due to their potential (predominant producers) production of beef cattle, potential of market participation and volume of market supply, and their proximity to the main road and local market as compared to other neighbor districts in the Zone. Next, before selecting *kabeles*, potential *kabeles* were identified and listed from both districts with help of experts of respective districts. Following this, six *kebeles* (three from each district) were selected randomly with probability proportional to size of identified *kebeles* from two districts. Before selecting the respondents, sampling frame of beef cattle producers was taken from selected *kebeles* office and updated to the current with help of experts of respective *kebeles*. Finally, the study respondents were selected randomly with probability proportional to size of households in sample *kebeles*. Sample size for producers for this study were determined using appropriate sample size determination formula provided by [23], at 95% confidence level, 0.5 degree of variability and 7% level of precision. Hence, the sample size was calculated as:

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

$$n = \frac{2098}{1 + 2098(0.07)^2} = 185.99 \sim 186.$$

where n is the sample size, N =population size (sampling frame) and e =level of precision considered 9%.

Therefore, considering the resource available and representativeness of this producer's sample, the total sample size of the producer for the study was reduced to 171, and the calculated sample size was distributed proportionally to purposively selected lower administrative *kebeles* from two districts (Table 1).

**Table 1:** Sampling frame and sample size determination.

Districts	Kebeles	Producer (number)	Proportion of sampled HH (%)	Numbers of sampled HH
Gemechis district	Qunii-segeriya	261	12.44	21
	wol-argii	322	15.35	26
	Sire gudo	412	19.64	34
Doba district	Woltanee	423	20.16	35
	Wolqixumaa ibsa	312	14.87	25
	Wolqixumaa woji	368	17.54	30
Total		2,098	100	171

Traders sampling method

The place for trader surveys was market towns in which a good sample of beef cattle traders and value addition activities existed. On the basis of flow beef cattle traders and limited number of local collectors, small and large traders, two town markets namely Hirna and Chiro town were selected purposively. Following this, traders are identified and listed. Finally, 6 farmer traders, 8 small and large traders, 8 butcherries, 8 hotel and restaurant owners, and 6 consumers were selected by employing simple random sampling techniques. Willingness of the actors to participate was also a very important selection criterion used since they would have to be willing to spare time and discuss with the researchers to make the information needed for the study realistic.

Type and source of data

The aim of this study is to analyze beef cattle value chain. In order to explore this, primary and secondary data sources were used. Primary data were collected from beef cattle producer household heads, farmer traders/collectors, small traders, large traders, butchers, hotel and restaurant owner, consumers, and respective district and zonal officers using semi-structured questionnaire and checklists prepared for this purpose, respectively. The secondary data including both published and unpolished documents that are available and relevant for this study was collected to substantiate the primary data. Besides, personal observation was undertaken on different cattle management, feeding aspects, and marketing activities during survey period to get general information on cattle fattening activities.

Method of data collection

The major instrument used for primary data collection was semi-structured interview schedule. The questioner was administered by trained enumerators through face-to-face interview with respondents. Questionnaires was pre-tested on similar different area from the study location on randomly selected ten non-sampled respondents to ensure its validity and reliability of generating necessary data in line with the objectives of the study, and necessary amendments was made prior to conducting the formal survey. After pre-testing, two days training were given to the enumerators on briefings of the objectives, contents of the interview questioners and to acquaint them with the basic techniques of data gathering. The enumerators for the data collection were selected based on their educational background and data collection experience, local knowledge and ability of speaking local language. The

interview questions were focused on demographic and socio-economic characteristics of sample households, institutional services, health care service, agro ecological factors, market participation, and quantity of beef cattle supplied to the market.

Subsequently, the survey was conducted under the close supervision and assistance of the researchers. One focused group discussion consists of a people from different background were conducted in each selected *kebeles*. This is to get in-depth information from the respondents and fill the gaps observed during personal interviews. Besides, key informant interview were undertaken with knowledgeable people to get overall information regarding beef cattle value chain in the study areas using checklist prepared for this purpose. Key informant participants were includes extension agents, model farmers regarding beef cattle business, traders, and Zonal and district officers.

Method of data analysis

Descriptive analysis: Descriptive statistics (percentages, frequencies, means, and standard deviation) and inferential statistics (Independent sample *t*-test and *F*-test) were used for the analysis of quantitative data.

Value chain analysis: Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning [24]. Following this, the present study was employed value chain analysis which is very effective in tracing beef cattle flows along the chain with identified key actors, and their relationships with other actors in the chain. This could be captured through mapping the value chain to visualize networks in the chain and get better understanding of connection between actors and to demonstrate interdependency between actors in the chain. Hence, value chain mapping was analyzed using functional analysis. This analysis was undertaken in qualitative terms. A flow chart was used to represent the activities in the value chain.

Econometric analysis: This part of the analysis deals with the understanding of determinants of volume/quantity of the beef cattle supplied to market. Selection of econometric model requires taking into account the nature of the dependent variable, among others. Hence, the appropriate econometric models that help to identify the factors affecting the quantity of beef cattle supplied to the market is OLS model [25]. It's also selected for its simplicity and practical applicability [26]. However, if participation of all households in marketing of the commodity is not expected, using OLS model by excluding non-participants from the analysis introduces selectivity bias to the model. To overcome such problems, Tobit, Double Hurdle and Heckman two stage procedures have been suggested. Therefore, for this study, Multiple Linear Regression Model (OLS) was appropriate since all sampled households participated on cattle fattening was participated in marketing activities. Econometric model specification of supply function in matrix notation is expressed as follows:

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_k X_k + \epsilon_i$$



where:

Y_i =quantity beef cattle supplied to the market

β =a vector of estimated coefficient of the explanatory variables

X =a vector of explanatory variables

ε =error terms

Before running the specified model, all the hypothesized exogenous variables was checked for the existence of multicollinearity, heteroscedasticity and endogeneity problems which may arise due to different reasons. Though, when some of the assumptions of the Classical Linear Regression (CLR) model are violated, the parameter estimates of the above model may not be Best Linear Unbiased Estimator (BLUE). Thus, it is important to check the presence of multicollinearity, heteroscedasticity and endogeneity problem before fitting the models for analysis. Computer software called STATA version 13 was used to run the Model and descriptive statistics for data analysis.

Results and Discussions

Socio-economic characteristics of beef cattle producers

The data revealed that high percentage of respondents, involved in cattle fattening activities in the study areas were male headed (87.4%) when compare to female's (12.6%) (Table 2). This is may be due to the nature of the cattle fattening activities, it needs intensive energy for proper management and handling of cattle such as watering, feeding, feed collection/purchasing, cattle purchasing for fattening purpose and selling activities. Generally, female participation on cattle fattening business as owner was less as compared to male counterpart which may be due to high burden of females on household chores and non-farm economic activities.

The amount of income generated from off/non-farm activities varied among sample farmers ranging from no additional income to a maximum of birr 20,000 (ETB) per annum. The average amount of non/off-farm income earned by sample farmers was 2075.45. Results revealed that 73.10% and 26.90% beef cattle producer farmers are non-participant and participant on non/off-farm income generating activities, respectively. High non-participation (73.10%) of respondents may be due to labor intensive nature of cattle fattening business. The t-test result also revealed a significant mean difference at 1% probability level between participant and non-participant of non/off-farm activities in terms of the actual quantity of beef cattle produced during past three years including the survey year (Table 2).

The survey result shows that, about 25.15% of small-scale cattle fatteners had access to credit services from formal financial institutions, money lenders and relatives or friends in the survey year. Information from formal interview shows that, among the reasons that many had no access to credit was lack of collaterals for enabling them to secure loans, lack of information on how to secure loans and complicated procedures to get loans in the study areas. These at times have left the gap

between cattle fatteners and financial institution, which are supposed to work together so as to uplift the cattle fattening industry. Besides, the result indicated that, cattle fatteners who have access to animal health service accounts (47.95%), which is smaller than those who have no access (52.05%). The independent t-test result indicated that there is a significant mean difference at less than 1% probability level between those who have access to extension service, animal health service, market information, and credit service and not, respectively in terms of quantity of beef cattle they produced last three years including the survey year (Table 2).

The study result revealed that, 56.14% of beef cattle producers had access to market information. Large percentage of respondents reported to depend on actual market day information/through personal observation, market information obtained from fellow/other farmers in the neighbors' betrothed on the same activities, and friends for prices and selling decisions. This is a result of information asymmetry where the traders have more information than producers, which is a market imperfection thereby maddening negotiations between the small-scale cattle fatteners and traders (Table 2). The availability of market information would boosts confidence of producers who are willing to market their beef cattle. For all intents and purposes, information is a prerequisite and a required tool on price setting, or available cattle, forecast of future supplies and demand, and general market conditions (LEISA, 2007).

The survey on age provided a clue on working ages of households. The survey result indicated that, the average age of cattle fatteners were 41.27 years with the minimum and maximum age of 23 and 69 years (Table 3). The result indicates

Table 2: Socio-economic characteristics of sampled respondents: dummy variables.

Variables		Frequency	Percent	t-test value
Sex of respondents	M	148	86.55	20.9492***
	F	23	13.45	
Participation in off/non-farm activity	Yes	46	26.90	23.9189***
	No	125	73.10	
Access to credit service	Yes	43	25.15	24.0263***
	No	128	74.85	
Access to animal health service	Yes	82	47.95	22.7278***
	No	89	52.05	
Access to market information	Yes	96	56.14	22.3094***
	No	75	43.86	
Access to extension service	Yes	139	81.29	19.2095***
	No	32	18.71	

Note: *** is statistically significant at 1% probability level.

Source: Own computation from survey result, 2018.

that productive age bracket of the people involved in the cattle fattening business in the study areas.

Related to household assets, respondents' had 0.50 hectare on average which includes both cultivated and grazing land. About 41.5% households' holds less than 0.5 hectare. The minimum and maximum land holding size was 0.125 and 1hectare, respectively which indicates scarcity of this resource in the study areas (Table 3). This has implication of livestock



feed shortage due to limited land size per household. And also, the result show that the average available labor force (labor supply) estimated by adult equivalent scale of [27], was about 4.95 persons per household which is larger than the national average of 4.6 (CSA, 2014). This implies that most households had enough family labor and might not hire labor for their cattle fattening operation, which might assist them for a better participation in the cattle fattening business (Table 3).

The study shows that, about 28.65% were illiterate household heads whereas, the rest accounted for about 32.75%, 20.47%, 11.70% and 6.43% are literate and had education background of 1st cycle primary school (1-4), 2nd cycle primary school (5-8), secondary school (9-10), and preparatory school (11-12), respectively (Table 4). The result also shows that the average education level of respondents were 6 years with standard deviation of 3.125 years. This shows that on average, farmers attended the minimum required education level that is adequate for understanding and adoption of introduced modern cattle fattening technologies.

Education is important to manage the business as well as in decision making [28]. The *F*-test result indicates that education level of household heads were found to be significant at 10% probability level; indicating that there were significant differences between sampled respondent education categories in terms of quantity of beef cattle produced past three years including the survey year (Table 4).

According to the survey result, about 81.29% of cattle fatteners had access to extension services (Table 2). They are on average four times visited by extension agents. They received the services related to input usage such as feeding system, management, up to date information regarding beef cattle market among others. The analysis of variance (ANOVA) test result also indicated the significant mean difference at less than 5% probability level between cattle fatteners regarding frequency of extension contact (Table 5).

The study result indicated that, cattle fatteners had on average 9.44 years of experience with the minimum and maximum experience of 1 and 20 years, respectively (Table 3). This indicates that the sub-sector is very old as compared to other parts of the country where cattle fattening are practiced. The *F*-test result also indicates that experience of cattle fatteners were found to be significant at 1% probability level; indicating the significant differences between categories of producers' year of experience in terms of quantity of beef cattle produced during past three years (Table 6).

Demographic characteristics and value chain mapping of other actors

The value chain analysis starts with the process of mapping out the existed value chain which allows one to visualize the flow of the products from the commencement to the final users [29]. In Ethiopian meat and live animal value chains have developed over the years into a series of complex constituents involving various actors. The main actors in meat and live

Table 3: Socio-economic characteristics of cattle fatteners: Continuous variables.

Continuous variables	Observation	Mean	Std. Dev	Min	Max
Age of HH	171	41.27	11.485	23	69
Distance from market	171	3.89	1.849	0.5	8
Education level	171	6	3.125	0	12
Family size	171	4.95	2.052	1	11
Land size	171	0.50	0.253	0.125	1
Experience	171	9.44	4.787	1	20
Extension contact	171	4.46	2.810	0	12

Source: Own computation from survey result, 2018.

Table 4: Household heads education categories.

Description	Mean	Std. Dev.	Frequency	Percent	F-value
Illiterate	1.80	0.447	49	28.65	2.11*
1-4(1 st cycle primary)	1.63	0.520	56	32.75	
5-8(2 nd cycle primary)	1.75	0.426	35	20.47	
9-10(secondary school)	1.93	0.373	20	11.70	
11-12(preparatory school)	1.63	0.354	11	6.43	

Note: * is statistically significant at 10% probability level.

Source: Own computation from survey result, 2018.

Table 5: Household heads extension agent contact frequency.

Description	Mean	Std. Dev.	Frequency	F-value
No contact	1.82	0.559	15	3.68 **
Weekly	1.55	0.427	33	
Once in two weeks	1.41	0.483	15	
Monthly	1.78	0.408	70	
Twice in a year	1.82	0.575	14	
Once in year	2.09	0.471	8	
Any time I ask	1.82	0.274	16	

Note: ** is statistically significant at 5% probability level.

Source: Own computation from survey result, 2018.

Table 6: Beef Cattle fattening experience in years.

Description	Mean	Std. Dev.	Frequency	F-value
1-5 years	1.42	0.453	41	10.22 ***
6-10 years	1.84	0.402	57	
11-15 years	1.81	0.438	55	
16-20 or >20 years	1.91	0.426	18	

Note: *** is statistically significant at 1% probability level

Source: Own computation from survey result, 2018.

animals include producers, collectors, small private and cooperative fatteners/feedlots, brokers/middlemen, livestock trading cooperatives, individual traders and exporters [30]. Thus, the current value chain map the potential well-known beef cattle actors, relationships, marketing and associated support service providers; their roles and functions was developed and portrayed in Figure 1.

Primary actors in the beef cattle value chain

The primary actors are those directly involved in beef cattle value chain starting from input suppliers, producers, local collectors, traders, butchers, hotels and restaurants to end users. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor, and some actors perform more than one role.

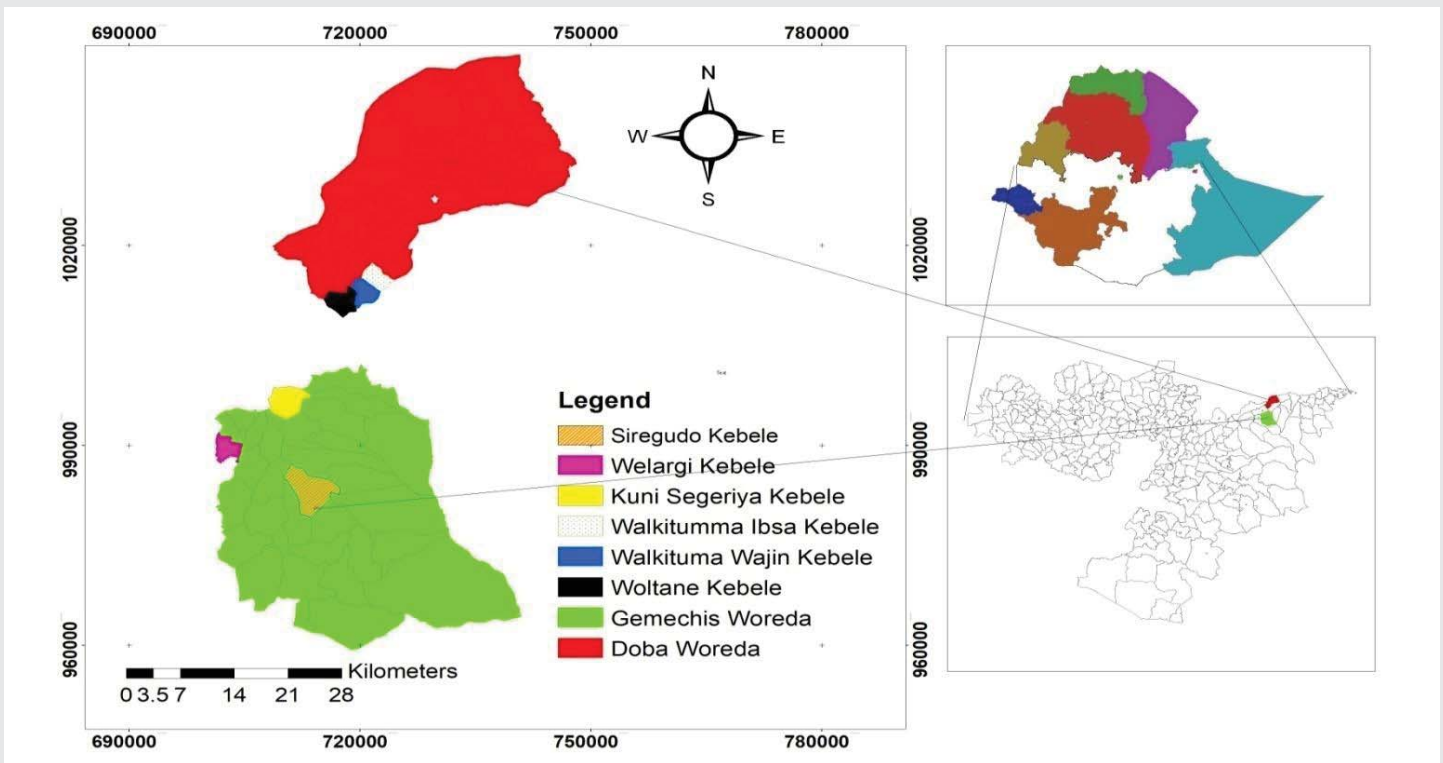


Figure 1: Location map of the study areas.

Source: Adopted and manipulated from Ethiopian map.

Supply of inputs: At this phase of the value chain, there are many actors among others who are involved directly or indirectly in input supply for beef cattle production including supply of credit, cattle for fattening purpose, animal feed, veterinary service, training and advisory services. The study revealed that, credit service is provided by different governmental (Micro-Finance Institutions (MFIs), local banks, cooperative agents, etc.) and non-governmental (Individual money lenders) institutions for the different value chain actors. But, the availability of credit to the actors in the chain is hardly any in the area. The MFIs operating in the area, as beef producers and farmer traders explained, do not have a clear program to give credit for such ventures since the overall capital required by individual farmers to start the business are relatively high.

Producers: Is one among value chain actors who are involved in fattening of different age categories of cattle for a limited period of time usually 3-6 months and finally supply for sell when the cattle conditioned. They fatten the cattle by traditional fattening system through utilizing available feed resources mostly in semi-intensive type of feeding system. The sources of cattle for fattening might be from own herd or could be purchased from local cattle market based on different selection criteria's such as breed, frame size, age, body condition, horn size, initial price, health, adaptation, and physical appearance among others.

Brokers: Are mediators between sellers and buyers in beef cattle market. They are usually expected to link buyers with sellers and facilitate the terms of exchange. They are often criticized for creating a communication gap between buyer and

seller and then mediate them in the way they like. Farmers are usually price takers and loss negotiation power while brokers are act as price setters in the beef cattle markets in the study areas. The problem is very serious especially for those who do not have much information on market price and experience of such markets. And also, the brokers can charge as they like the amount of money from both sellers and buyers. Usually they get more benefit than the producers and traders per head of beef cattle sold at a time. The activities of brokerage particularly in the study areas livestock markets are usually abused (Figure 2).

The result from KIIs and FGDs also point out that, beef cattle market was bursting of brokers in which beef cattle owner has no privacy to sell without the influence of brokers in the market. There is locally adopted Amharic word called 'masser' which means, if one broker comes and see Mr X cattle, other brokers may not come see since Mr X cattle already hold by the former broker, such process locally called in Amharic 'tasserewal or tayitewal'. Occasionally, if other broker came and purchases the cattle, the former broker report for the market society 'ene yaserkuten esu afarso gezabign' which means 'after I negotiate the owner, the latter broker alter his idea and fighting may happen. With this condition, brokers ask large many from both seller and buyer. Usually, brokers collect better benefits than the cattle fattener with an hour in the study areas. If the brokers are not satisfied with the benefit they try to misguide the purchaser called 'mafares'. Finally, the beef cattle producers forced to return back the proposed cattle to sell. Such precondition leads additional management cost and discouragement for producers. Besides, in all marketing areas in the zone there was no other option to sell the already fattened beef cattle like live-weight based cattle marketing.



The entire market participants were forced to exchange via agreement with the influence of brokers. Such limited options expose producers for the influence of brokers in the study areas in particular and West Hararge Zone in general. Hence, they suggested the urgent intervention by concerned bodies to correct this market frailer of beef cattle marketing in Zonal market in general.

Farmer traders: Are usually buying beef cattle from farmers at farm gate, and same times from bush markets to sell on to butchers, hotels and restaurants, consumers, small and large traders in the study areas. They may or may not have their own capital for marketing process. Their main functions include purchasing, price setting, controlling the marketing process and providing market information. All farmer traders were found to be male headed household (Table 7), with average age of 41.67 years with average education level of 3.67 years of schooling (Table 8).

Small traders: Are traders who purchase beef cattle

from producers and farmer traders at local markets through broker interferences. After they purchase mostly they sell to butchers, hotels and restaurant owners, and large traders who transport to other large cities outside of the study areas. Most of the purchasing power of the small traders is up to a maximum of five to ten beef cattle. They sometimes make a portion of payment to the producers and farmer traders, and make full payment after they sell out showing little trust and linkage between them. Their purchasing capacity and price determination role through broker interference is relatively higher than that of farmer traders, but less influence than large traders. All are male headed households (Table 7). The average age and education level of small trader was 39.83 years and 7.17 years of schooling (Table 8).

Larger traders: Are those traders purchasing mostly the beef cattle from farmer trader, small traders, and sometimes from the producers at local markets through high broker interferences. They sometimes give capital to other traders to buy on their behalf. Some of their main functions include

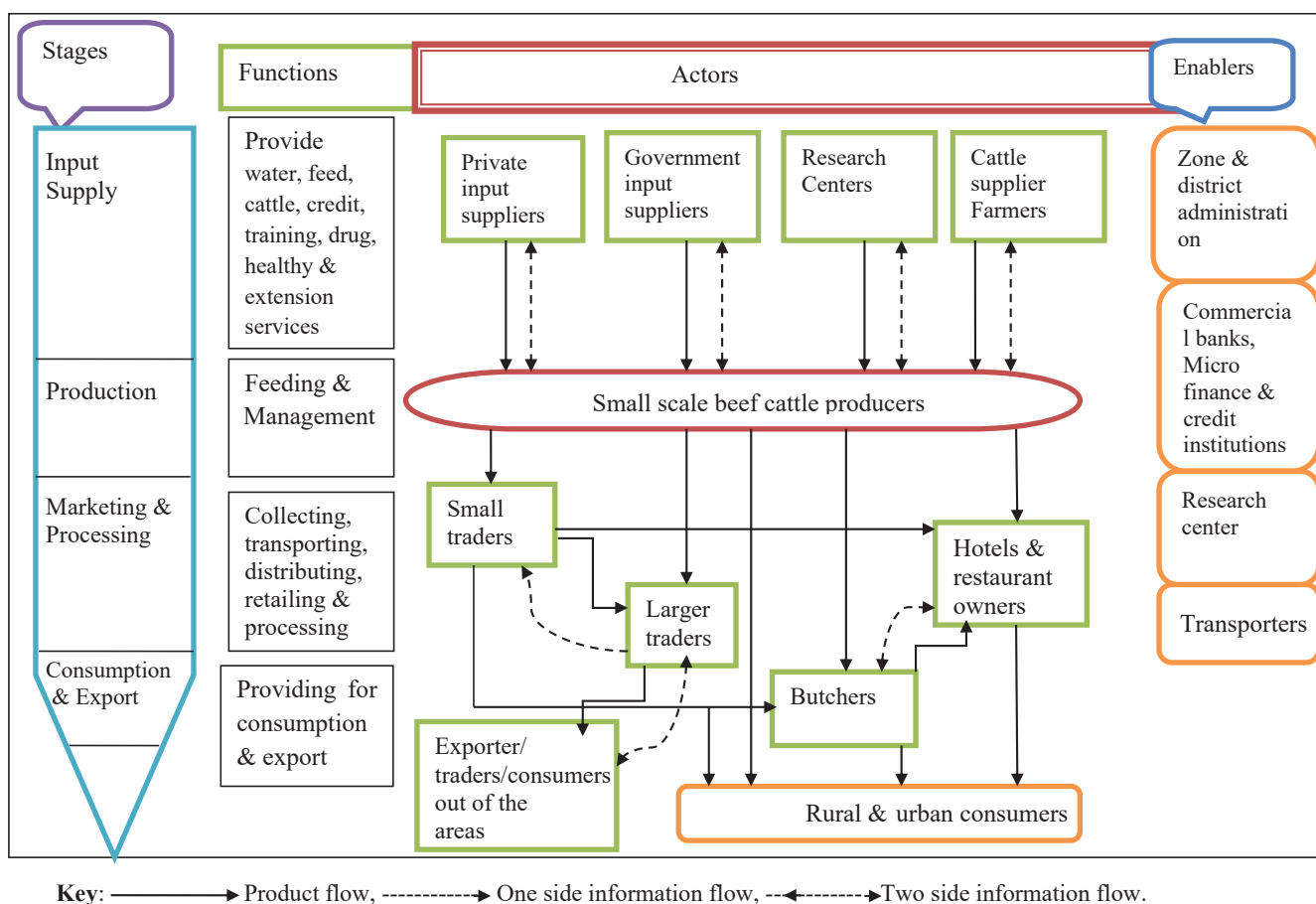


Figure 2: Value chain mapping of beef cattle in the study areas. Source: Own construction based on survey result.

Table 7: Demographic characteristics of butchers, hotel and restaurant owners, consumers, and traders.

Description	Butchers		Hotel & Restaurant Owners		Consumer		Farmer traders		Medium traders		Larger traders		
	N	%	N	%	N	%	N	%	N	%	N	%	
Sex	Female	0	0	2	25	1	16.67	0	0	0	0	0	0
	Male	8	100	6	75	5	83.33	6	100	6	100	4	100

Source: Output from survey data, 2018.



buying, market searching, controlling marketing processes, providing market information and beef cattle for local consumers out of study areas and export market mainly to the Middle East and others African countries among others. Large traders usually use trucks for transporting beef cattle. In the beef cattle market other actors believe them as the ultimate source of market information. All the large traders are found to be male headed (Table 7), with an average age and education level of 39 years and 7.5 years of schooling, respectively (Table 8).

Butchers: Are those among beef cattle value chain actors who usually purchase fattened beef cattle from producers, farmers' traders, and small traders to slaughter at abattoir and provide same part of beef for hotel and restaurant, and the other for local consumers at specified place. They provide usually for customers in the form of Ethiopian tibs and raw beef (Ethiopian kurt). The selling price of beef per kg in the study areas town varies which may be due to the service, beef quality and the price of beef cattle purchased. At the time of the survey, all butchers are male (Table 7), and their average age and education level was found to be 35.13 years and 5.75 years of schooling, respectively (Table 8). As reported by beef retailers, shortage of working capitals, lack of credit service and poor linkage between the chains actors are the major problems encountered in beef retailing in the study areas.

Hotel and restaurant owners: Are those who invest and control the hotel or restaurant business which belongs to the sole proprietor or partnership. They sometimes buy beef cattle from producers, farmer traders and small traders through broker interference. They slaughter the beef cattle at abattoirs, cook them and serve them as meals to their customers. Sometimes they directly purchase beef from butcher shops to serve the consumers in different forms. The means of beef transportation after slaughter to the retailing shop varied between towns in the study areas. During the survey time, 75% of these businesses are being owned by male headed households and the remaining 25% was owned by female headed households (Table 7). Besides, the average age and education level of the hotel and restaurant owners was found to be 43.5 years and 7.3 years of schooling, respectively (Table 8).

Consumers: Are the final users who buy beef directly from butchers or value added beef product from hotel and restaurants or who, as group buy beef cattle either from producers or farmer traders to slaughter and share beef during

the holidays/religious-based ceremonies, festivities and other informal institutional occasions in the study areas. There are various categories of consumer in the area: festival and non-festival; religious and non-religious. In the study areas, some respondents preferred to buy beef from butchery shops due to their convenience whereas others consume directly different value added beef from hotels/restaurants, and others again as a group purchase and slaughter beef cattle during festivities or others.

Secondary actors/enablers

In a value chain, enablers include all chain-specific actors providing regular support services or representing the common interest of the value chain actors. The supporting function players are those who are not directly related to the beef cattle value chain but provide different supports to the value chain actors. The study revealed that, Zonal livestock and fishery office, District Agriculture Offices, District and Zonal Trade and Market Development Offices, Oromia Micro Finance Institutions, Private transporters, and Agricultural Research Center (Mechara), and Non-Governmental Organizations (NGOs) are the most common enablers of beef cattle value chain among others in the study areas.

Econometric results

Prior to fitting Multiple Linear Regressions Model, the hypothesized variables were checked for existence of multicollinearity, heteroscedasticity and endogeneity problem. The test result indicated that, all values of VIF are by far less than 10 showing no serious multicollinearity problem among exogenous variables. Besides, heteroscedasticity problem in the data set was tested by using the Breusch-Pagan/Cook-Weisberg test, and the result of the test indicates constant variance in the model (Prob > chi2 = 0.8906) showing absence of heteroscedasticity problem in the model and the parameter estimates of the model was BLUE. The test result also shows the absence of endogeneity problem in the model.

Among variables included in the model, experience in beef cattle fattening, education level, land size, access to market information, extension contact and average lagged price of beef cattle were affects positively and significantly the quantity of beef cattle supplied to the market. The result shows that the model was statistically significant at 1% (Prob>F= 0.0000) level indicating the goodness of fit of the model to explain the relationships of the hypothesized variables. Coefficient of multiple determinations (R2) indicates that 70.4% (R2 = 0.7035) of the variation in the dependent variable was explained by the explanatory variables included in the model.

Education Level of households (EDUCLev): Education has showed positive effect on beef cattle quantity supplied to the market with positive sign and significance level at 1%. The survey results revealed that, as level of education of beef cattle producer increase by one year of schooling, the amount of beef cattle supplied to the market increases by 3.37% TLU, keeping other variable constant. This might be because majority of the farmers in the study area have minimum education

Table 8: Demographic characteristics of other beef cattle value chain actors.

Descriptions	Statistics	Age of HH	Family size	Education level
Farmer traders	Mean(SD)	41.67(6.06)	6.33(2.42)	3.67(3.01)
Small traders	Mean(SD)	39.83(4.17)	5(2.097)	7.17(2.79)
Larger traders	Mean(SD)	39(3.46)	3.75(2.062)	7.5(2.65)
Butchers	Mean(SD)	35.13(4.02)	2.25(1.17)	5.75(3.24)
Hotel & restaurant owners	Mean(SD)	43.5(5.95)	6.5(2.2)	7.38(2.07)
Consumer	Mean(SD)	42.67(8.62)	4.5(2.43)	6.5(5.50)

Source: Output from survey data 2018; **Note:** SD represents standard deviation



requirements which make them produce market oriented beef cattle and enable them to have better skills and access to market information to increase the quantity of market supplied. This is also in line with previous studies conducted by [31,32], who argued that if household head gets educated, the amount of agricultural output supplied to the market increases. The current result also corroborates the result founded by [33]. They affirmed a positive relationship between years of formal education and higher bargaining power for educated cattle keepers since learned cattle keepers are more likely to use the existing market information more efficiently thus negotiate for a higher price and have more sales rate.

Experience in beef cattle fattening (EXPERIA): The result showed that beef cattle fattening experience has significant effect at 1% significant level for beef cattle quantity sold with expected positive sign. Thus, the result implied that, as farmer's experience in beef cattle production and marketing increase by one year, the quantity of beef cattle supplied to the market increased by 2.77% TLU, keeping other variables constant. This means that farmers with more experience in beef cattle fattening have higher ability to increase the quantity of market supplied than counterparts due to more marketing network and information. Besides, the proper use of drug/medications will highly depend on experience and knowledge of the producers. The result is in line with the study of [34], who claimed that, experience has a vital role in the farmer's choice for better market channels and levels for receiving good prices. And also they argued that, long experience in cattle keeping would enable the livestock producers to increase productivity and improve quality of cattle produced. Furthermore, the result of [31,35], argued that, experience of farmers is an important human capital that can influence the production efficiency, profitability, business performance and market conduct of an individual and the society at large (Table 9).

Land size (LANDSIZ): The result has showed significant effect at 10% significant level for quantity of beef cattle supplied to the market with expected positive sign. Increase in the size of land owned by one hectare resulted in an increase in quantity of beef cattle supplied to the market by 20.5% TLU, keeping other variables constant. The result implied that, an increase in land size owned leads to increase smallholder farmer's engagement in beef cattle production which accompany to increase marketed surplus. Particularly in the study area, generally in the zone mixed farming was a dominant and common practice were the major sources of household income was crop and livestock production. With the shortage of grazing lands, beef cattle fattening activity is highly linked with crop production in the areas. That means, households with larger land size are relatively better off because it allows the household to have a surplus crop residues and grazing land for cattle feeding. The more land owned the more could be the feed availability for the beef cattle fattening so the quantity of market supply of beef cattle is high. The result corroborates with previous study by [36,37]. They argued that, land holding size significantly and positively affected farm level marketable supply of outputs.

Access to market information (ACCTMInf): Access to market information significantly and positively influences

Table 9: Determinants of volume of beef cattle supplied to market (Multiple Linear Regression Model estimates).

Variables	Coef.	Std. Err.	t-value
Cons	-1.389587***	.4991366	-2.78
DTNLivM	.0226822	.0166305	1.36
1.SEX	-.0409809	.0911895	-0.45
EDUCLev	.033664***	.0100053	3.36
HHSIZE	.0037648	.015764	0.24
EXPERIA	.027645***	.0065997	4.19
1.OFFNFI	-.0455576	.0731328	-0.62
LANDSIZ	.2049061*	.1205279	1.70
1.ACCVETS	-.0282393	.0613768	-0.46
1.ACCTCR	.0718442	.0701512	1.02
1.ACCTMInf	.1170108*	.0602189	1.94
EXTCO	.0268518**	.0109888	2.44
LnAVLPBC	.2802882***	.0579012	4.84
Number of observations		171	
F(12,158)		7.57	
Prob > F		0.0000***	
R-Squared		0.7035	

Note: Dependent variable is volume/quantity of beef cattle supplied to market in TLU.

***, **and * indicates significance at 1%, 5% and 10 level of probability, respectively.

Source: Survey output, 2018.

quantity of beef cattle supplied to the market at less than 10% significance level. The result shows that increase in access to market information increases the quantity of beef cattle supplied to the market by a factor of 11.7% as compared to counterparts, keeping other variables constant. This may be due to its decisive instrument during beef cattle marketing because it informs the farmers about marketing conditions on all aspects. Farmers who have price information prior to marketing tend to increase quantity of cattle under fattening and supply more than its counterparts. The finding is consistent with the results of [38], who argued that access to market information reduces traders risk aversion behavior of getting a market and decreases marketing costs of traders that affects the value addition. The study by [39,40], also confirmed the existence of positive relationship between the market information and the quantity of sale in Ethiopia and Kenya, respectively.

Extension contacts (EXTCO): As expected a priori, an increase in the frequency of extension contact significantly and positively affected quantity of beef cattle marketed surplus at less than 5% significance level. The result indicated that a unit number increase in extension contacts/visit would increase the beef cattle market surplus by 2.7% TLU. This could be attributed to the fact that an increase in the number of extension contacts/visit would avail up to date information regarding current available beef cattle marketing opportunities, market information, feeding and management system that might improve beef cattle fattening system and productivity and therefore increase the beef cattle marketed surplus. The finding corroborates that of [31], who found that frequent extension contact increased the likelihood of increasing the quantity of market supply. The authors reasoned that frequent extension visits provided current information on production and marketing the produce, and this made the farmers conscious of production techniques and more production hence increased market supply of produce.



Average lagged price of beef cattle (LnAVLPBC): As expected a priori, an increase in the annual average lagged price per unit of beef cattle significantly and positively affected quantity of beef cattle marketed surplus at less than 1% significance level. The result indicated that if farmer considers price of beef cattle marketing attractive and increase on average by 1%, quantity of beef cattle marketed would increase by 28.03% TLU, making other variables constant. If a unit market price of beef cattle was relatively high in the previous consecutive years, there is a possibility of increasing quantity of beef cattle supplied to the market. This result supports the finding of [41]. They found that average price of paddy received by farmers' affected marketed surplus of the crop positively. This is related to farmer's decision to sale more when there is high price to increase their income. Besides, [42], found that lagged price of cattle has a positive effect on cattle market participation and volume of cattle marketed. The study by [39], also confirmed higher probability of fish market participation and volume of supply with an increase on price of fish in Nigeria. Moreover, the result corroborates the finding of [31,43].

Conclusion and Recommendations

Generally, the west Hararghe zone, were this study was conducted, is highly well known beef cattle producing areas and known by locally called Harar Sang in Ethiopia. Following this, the present study was initiated to identify the major actors and their roles in beef cattle value chain, and determinants of volume/quantity of beef cattle supplied to the market. At the time of the survey, all cattle fatteners are market participant. The study revealed that, cattle fatteners, farmer traders, small traders, large traders, brokers, butchers, hotel and restaurant owners, consumers are the main primary actors in beef cattle value chain. The study also identified enablers of beef cattle value chain such as macro finance institutions, research centers, and veterinary and government extension service providers among others. The study also identified un-accessibility of credit service and beef cattle market, weak linkage among chain actors, low information flow, and high illegal broker interference in beef cattle value chain. Besides, the model result revealed that, volume/quantity of beef cattle supplied to market is influenced positively and significantly by education level, cattle fattening experience, land size, access to market information, extension contacts and average lagged price of beef cattle. Based on the study findings, the following recommendations are provided:

At all stages of the beef cattle value chain only the butcher men graded and sold meat in the study areas, even if the laws and regulations governing livestock state clearly all cattle should be sold upon use of weighing machines. Thus, the study recommends strict enforcement of existing laws and regulation governing beef cattle marketing through weighing machines in the areas.

The finding of the study stress the need for appropriate policy formulation and implementation which improves un-accessibility of credit service, beef cattle market, marketing price information, and stiff/high illegal broker interference in beef cattle value chain in the study areas since it has multiple

effect ranging from increasing the income of all actors engaged on beef cattle industry to amplifying the government revenue.

Besides, the zonal Livestock and Fishery Office should augment cattle fatteners bargaining power through launching marketing cooperatives which is believed to be the best measure to reduce long beef cattle value chain and increase producers' income from sell of their beef cattle. Finally, the study recommends the governments to change in to action existing policies and strategies or set new policies and strategies (or amendment of existing) in order to foster generally the cattle sub-sector and particularly beef cattle industry thereby enhance small scale farmers income from the activities.

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