

Ethiopian Dairy and Animal Health Policy Sector: A Stakeholders' Network Analysis

Tilaye Teklewold^{1*}, Adam Bekele¹, Henrietta L. Moore² and Stefan Berg³

¹ Ethiopian Institute of Agricultural Research (EIAR), Ethiopia

² Institute for Global Prosperity, University College London, the United Kingdom

³ Animal & Plant Health Agency, the United Kingdom

* Corresponding Author; Email: ttddeneke@yahoo.com

አህፅሮት

ፖሊሲ ቀረጻ ስራ ለዙፈውን ጊዜ በርካታ ባለድርሻ አካላትን ያካትታል። በነዚህ በርካታ ባለድርሻ አካላት መካከል ያለው ግንኙነት ይዘት ትብብርም ይሁን የመቀናቀን ሁኔታ ፖሊሲው የሚያስከትለውን ውጤት ይወስናል። በምርምር ውጤቶች ላይ ተመስርቶ የፖሊሲ ማሻሻያ እንዲደረግ ተፅዕኖ ማሳደር የሚፈልጉ ተመራማሪዎች በፖሊሲ ቀረጻ ላይ የትኞቹ አካላት እንደሚሳተፉ፣ የፖሊሲ ለውጥ ለማምጣት ያላቸውን ፍልጎት፣ የመለወጥ አቅምና በመካከላቸው ያለውን ግንኙነት ሁኔታ ጠንቅቀው ማወቅ ይኖርባቸዋል። ይህ ጥናት የኢትዮጵያን የእንስሳት እርባታ ፖሊሲ ዋና ባለድርሻ አካላትና በመካከላቸው ያለውን ግንኙነት በተመለከተ የተደረገ ጥናት ነው። ጥናቱ ተሳትፎአዊ የባለድርሻ አካላት ትንተና እና የግንኙነት መረብ ትንተና ዘዴን በመጠቀም በተለይ በውተት ላም እርባታ እና ተያያዥ የእንስሳት ጤና ጉዳይ ላይ ያሉ ባለድርሻዎችን የመለየት እና በመካከላቸው ያለውን ግንኙነት ተመልክቷል። ውጤቱም እንደሚያሳየው በኢትዮጵያ የውተት ከብት እርባታ ፖሊሲ ላይ በርካታና የተለያዩ ፍላጎት ያላቸው ባለድርሻ አካላት የሚሳተፉበት ደካማና መካከለኛ ደረጃ አፍጣሪ ያለው በአስተዳደራዊ መዋቅር ላይ የተመሰረተ የግንኙነት መረብ ያለው ሆኖ አግኝተነዋል። ከዚህ በተጨማሪ ከልላዊ የአስተዳደራዊ መዋቅርን የሚሻገሩ የፖሊሲ መረብ ግንኙነቶች የሌሉ መሆኑን አረጋግጠናል። ነገር ግን እንዳንድ በአለም አቀፍ እና በፌዴራል መንግስት ደረጃ ያሉ ተቋማት ሌሎች በተለያዩ ደረጃ ያሉ ባለድርሻ አካላት በማግኘት፣ የፖሊሲ ውይይትና እንዲካሄድና ማሻሻያ እንዲደረግ የማካሳት ከፍተኛ ማዕከላዊ ሚና እንዳላቸው አረጋግጠናል። ይህም ማለት በኢትዮጵያ የእንስሳት እርባታ ፖሊሲ ቀረጻ የሁሉም አካላት ፍላጎት ከግምት የሚገባበትና አካታች የማድረግ እድል መኖሩን የሚያመለክት ሲሆን የፖሊሲ ማሻሻያ በዚህ ስኬት ሲታሰብ ከእነዚህ በአለምአቀፍ፣ በፌዴራልና በክልል ደረጃ ያሉ ቁልፍ አካላት ጋር መስራት እንደሚያስፈልግ ያመለክታል።

Abstract

Public policy making often involves a multitude of actors. The level and nature of interaction among these actors, be it cohesion or friction, determines policy outcomes. For outsiders with the aim of influencing policy based on empirical evidence, it is imperative to know who are involved in the policy making process, the interest and influence of each actor as well as the nature and extent of their interaction. A study was conducted to analyze the Ethiopian livestock policy sector in terms of the main actors and their interaction in the dairy and animal health policy subsector. The study applied participatory stakeholders and social network analysis to identify the most important actors, their salience and network characteristics. The results indicate that a multitude of actors with diverse interests is involved in the Ethiopian dairy sector in a loosely connected network with medium level of clustering aligned along administrative tiers. The results also showed that in the existing federal administrative structure, there are no policy networks in the Ethiopian dairy policy landscape that cut across regional boundaries. However, the international and federal level government actors play important role as central actors with bridging role connecting the decentralized regional and local level actors as well as in initiating policy engagement and change. This implies that there is a room for pluralistic policymaking and any attempt to influence policy in the livestock sector need to work with these international, federal and regional level actors.

Introduction

Public policy making often involves a multitude of actors. The level and nature of interaction among these actors, be it cohesion or friction, determines policy outcomes. Hence, for projects with the aim of influencing policy based on empirical evidence, it is imperative to know who are involved in the policy making process, what is the interest and influence of each actor as well as the nature and extent of their interaction. Understanding these features enables outsiders with policy suggestions to influence the policy process and speed up desired changes. In the context of the Ethiopian livestock policy making, which the Ethiopian Bovine Tuberculosis Control Strategy (ETHICOBOTS) project aims to influence, understanding the complexity of stakeholders to be involved in policy change, implementation, outcome analysis, linkage, cohesion, collaboration, assessment of impacts on the dairy sector, and management of the animal diseases within an intensifying dairy sector is very crucial.

The ETHICOBOTS project aims at understanding the epidemiology of bovine tuberculosis (bTB) in the urban and peri-urban dairy sector in Ethiopia and how it affects people involved in the dairy sector as well as consumers and the economy at large. It also aims at coming up with cost effective, sustainable and integrated control strategies that would work in the high-risk areas and in the entire dairy sector of the country with similar risk of exposure to the pathogen. In line with this, it aims at influencing public policy in the bTB control and dairy policy field based on empirical evidences obtained from selected research sites. For this aim to be accomplished, it is important to understand the stakeholders involved in the dairy and animal health sector in the selected project sites and the entire policy landscape in the livestock sector in general. With this background, a study was conducted to investigate the role of actors at different levels (local, regional, federal) in the Ethiopian livestock sector with a focus on the dairy subsector as well as the control of animal diseases especially the zoonotic ones. It had also specific objectives to identify actors involved in the livestock sector, their perceived priority problems, their salience in influencing policy in the indicated sector and subsectors as well as the networks of the actors involved. The network analysis was undertaken with the aim of investigating the level of cohesion and collaboration among these actors. The following section presents the method used for the study. The third section elaborates the results obtained in terms of the identification of the actors involved and their interests and power as well as the nature of their interactions. The final section will draw conclusions from foregoing discussion of results obtained.

Methods

We employed both stakeholder analysis and social network analysis to answer our research questions that were reflected in the specific research objectives and test our hypothesis of existence of strong collaboration, cohesion and performance among the existing actors. Stakeholders' analysis is used to understand a system by means of key actors or stakeholders and assessing their respective interests in the system (Grimble and Wellard, 1997). It often involves two separate steps, namely: identifying stakeholders and

their interests; and assessing stakeholders' influence and relationships (Varvasovszky and Brugha, 2000 and Reed, 2008). In line with this, we applied participatory methods to collect data such as who are the actors involved in the Ethiopian livestock sector in general and in the dairy and animal health control sectors in particular? Who plays an important role? What are the relative salience (stake as well as power) of actors to influence policy in this policy field? and what is the nature of their interaction? Following our preliminary survey, we established the list of relevant actors. Consequently, we organized a one day workshop involving experts and, when possible, officials from various governmental and nongovernmental organizations who have stake in the livestock sector. The workshop participants undertook a number of groups exercises involving homogenous and heterogeneous groups. There were three main exercises: the first was the name generation exercise aimed at identifying actors involved in the livestock (particularly milk, meat and animal health control) value chains. The second was mandate analyses where participants were asked about their expert knowledge on issues of interests, mandates and priority level of the policy fields for each actor they have identified in the first exercise. The third exercise involved what is called salience or power analysis (Olander, 2006), which aimed at analysis of each actor's vested interest and influence levels in the various livestock, dairy and animal health related policy issues.

In the power analysis, the workshop participants were made to evaluate each actors' vested interest on various livestock, dairy and animal health issues in a 1 to 5 scale where 1 stands for low interest while 5 stands for very high interest. Similar scale was used for assessing each actor's capacity to influence policy on various livestock, dairy and animal health issues. Then salience of each actor in terms of each specific livestock issues raised (such as milk production, milk processing, meat production, cattle marketing, zoonotic disease control.), s_i was calculated as a square root of the product of the vested interest score, v_i and the power to influence policy, p_i divided by 25; i.e.,

$$s_i = \frac{\sqrt{v_i p_i}}{25}$$

That gave us the power score of each actor on all the separate issues raised and a value of 1 meant very high power.

Since bTB is a complex agricultural-cum-public health issue, which involves multiple stakeholders (producers, traders, processor, regulators, consumers as well as academicians) at different levels across the administrative tier, it was essential to investigate the nature of relationships in terms of existence and level of linkages, cohesion and collaboration among these actors. Social network analysis is often used in the analysis of institutional capacity in such a multi-level governance settings (Kenis and Schneider, 1991) where relations among actors are deemed important (Wasserman and Faust, 1994). In the social network analysis, organizational actors, rather than individuals, are considered as the relevant nodes for stakeholder analysis. Social network analysis is helpful for explaining policy processes and outcomes in a given sector, particularly in complement to and in support of qualitative studies (Luzi *et al.*, 2008). We used structured questionnaire survey to generate both qualitative and quantitative data from the major actors identified in the first exercise. The survey generated social network related

data such as who has links to whom? What is the strength of this link? What is the nature of this link? We employed the open source software named Gephi for social network data analysis.

Results and Discussion

Identification of Actors, Actors' Mandate, Interest and Problem Perception

Our result shows that a plethora of actors is involved in the livestock sector in general and in the dairy, meat and animal health sectors as well. In our name generation group exercise, we identified 32 actors with role at the national level, 27 at sub-national levels, 32 at the local level and 4 at the international level. We identified 8 major categories: these are; producers (milk, meat), input suppliers, processors (meat and milk), traders (meat, milk, cattle), support service providers, regulators, consumers and zoonotic diseases control. Each of these actors' categories is described here.

Producers

In this category, we found rural, peri-urban and urban smallholder dairy producers (≤ 5 animals), medium level dairy producers (5-20 cattle) and large producers (>20 cattle). Among these, it was obvious that the smallholder rural dairy producers make up the vast majority though it was difficult to put in number. Large farms make up small proportion and the participants tried to identify some of the prominent ones. The majority of these farms are mainly located around Addis Ababa. As a report indicated, there were 294 large farms around Addis Ababa (AGP, 2013). The participants listed some of these farms such as Genesis, Holland Dairy, Adaa Cooperative, Selalle Dairy, Ellemtu Dairy and Lemma dairy plc.

Our data showed that, in general terms, dairy producers largely operate at local level except for a few with regional and national reach. For the rural smallholders, dairy and livestock production, in general, is a way of life and livelihood. They keep mainly zebu cattle and their milk production is mostly for household consumption with few going out to the market raw via local cooperatives and milk assemblers or in processed form. The urban smallholders keep a few crossbreds and supply fresh milk to households, processors and cafes. The medium farms are often located in peri-urban areas and small towns and are mostly privately owned farms keeping Zebu-Holstein Friesian crossbreds and supply milk for local consumers, marketing cooperatives or assemblers. The large farms are a few hundred in number and mostly private limited companies, some of them are owned as corporate business and a few of them are owned by public institutions such as colleges and research institutes or multiplication centers. They operate mostly at local and regional levels with very few of them having national reach. These farms are primarily milk producers supplying for processors yet a few of them have their own milk processing facilities. Milk producers, large or small, are not organized in association and when they have organization, it is mainly in the form of marketing cooperative and have very little leverage in terms of directly influencing policy. Often, they raise problems of feed

shortage, high price of improved feeds, animal diseases, waste management, land acquisition, getting legal status for holdings and lack of support services such as vet service, extension and business advices.

With regard to the meat production, no large producer was identified except some businesses mostly known as feedlots or engaged in fattening of animals for the domestic market or for live animal export or meat export abattoirs. These farms are mainly located around urban centers. The workshop participants identified some of the farms that include Verde beef (Abernosa), and a number of small and medium Adama and Mojo fattening farms. Apart from this, no ranch has been identified and the vast majority of meat producers are smallholder pastoral, semi-pastoral and sedentary farmers who produce meat by way of rearing livestock as a way of life, as a store of value or as an integral part of mixed farming system where livestock give draft power for the main crop production activity. The main problems that these farms face are shortage of feed and rising feed costs, pastureland, water supply and market distortions, which they think, are created by illegal intermediaries.

Input Suppliers

This category includes feed producers, feed processors, veterinary drug suppliers and distributors as well as dairy equipment suppliers. The feed producers are apparently not primarily organized for feed production rather they are food and beverage factories such as sugar, beer, flour, oil producing plants that have by products such as molasses, bran and noug cake that are often used in the urban and peri-urban dairy production and fattening. These actors mostly operate at local level where their plant is located but some of them have wider reach beyond their locality. The feed processors are those public, private and cooperative enterprises, which are engaged in, concentrate feed production. A number of them are found scattered all over the country but they are found mainly around Addis Ababa where the dairy industry is also found in conglomeration. The workshop participant experts listed some of these actors by name, which include: Eltu, Damota, Leecha, Ambricho, Alema, Mojo and Kaliti. Like the feed producers listed above, the feed processors operate primarily at the sub-national levels such as at regional and zonal levels yet some of them especially the publicly owned ones have wider reach and serve the entire country. Their primary perceived problems in the policy field are found to be inadequate energy supply and frequent blackouts of the supply leading to sub-optimal operation and subsequent financial loss.

With regard to the drug suppliers and distributors, the main actor is the national Veterinary Institute (NVI), which mainly supplies vaccines. There are also few privately owned large drug-importing companies with national coverage. Among these Neway plc, Equatorial Business Group and Wise team are worth mentioning. The drug distributors are small and large in number and operate largely at local levels. Yet, there are a few large veterinary drug distribution companies such as Desalegn, a parastatal company, with nationwide reach. These actors have high interest and have high influence in the policy field. The resources they have to influence the policy field is primarily organized interest group pressure through their membership in local and national chambers of commerce.

Their primary perceived problems in the livestock policy field from their perspective is lack of foreign exchange and high taxation for importation of veterinary drugs.

Product Processors

This category includes a multitude of actors ranging from household and small-scale milk processors to medium and large-scale milk and meat processors. Millions of Ethiopian rural households almost entirely are engaged in the processing of milk produced at home. They process milk produced at home in excess of consumption to make yoghurt, cheese and butter. Some of their output is consumed at home and the rest often brought to local markets or sold to assemblers. They have high interest in the livestock, dairy and animal health policy issues as their livelihood depends much on the sector yet their influence, if any, is very low. Their perceived problem in the policy field is lack of support services such as extension, credit, processing and product preserving technologies and knows how. The resources they have for influencing the policy field is political power emanating from their sheer large number; yet, they are not organized in a meaningful form and can be regarded as voiceless.

The small-scale milk processors are mainly cooperative societies and privately owned small business often promoted by local governments and non-governmental organizations with the aim of stimulating the small-scale dairy industry, technology transfer as well as creating jobs locally. They are engaged in milk processing using intermediate technologies and produce yoghurt, cottage cheese and butter. They serve as important market outlets for smallholder dairy producers and employ local youth and women and the landless. They have high interest in the livestock, dairy and animal health policy issues but have low influence. Their primary concerns are inadequate supply of milk, narrow markets and lack of support services in the form of extension advice and small business incubation.

A number of medium and large-scale milk processors were listed down by the workshop participants. The total number of large-scale processors was found to be around 30 mostly located in and around Addis Ababa. Among the large-scale milk processors, Lame dairy farm, Alem Dairy, Ruth, Ellemtu, Ada, Family, Chuye, Holland Dairy, Genesis, Sellalie and Sululta are worth mentioning. They are engaged in pasteurization and packaging of milk and milk products. They assemble milk from smallholders or produce it in their own farm and process it into packed pasteurized milk, yoghurt, mozzarella, cheese and butter.

With regard to meat processors, households again make up the vast majority of meat processors for household consumption. Next to these, there are a large number of small-scale meat processors, which are mainly butcheries and small town abattoirs. The medium and large-scale meet processors are the large town abattoirs and export abattoirs, which mainly deal with mutton. They face problems of waste management, lack of supply of animals, lack of legal status of holdings especially for small ones and lack of support services such as extension advice and capital.

Traders

This category is composed of milk and milk products traders, meat traders and animal traders and sub-categories of assemblers, transporters, wholesalers, itinerant traders, retailers, live animal smugglers and legal exporters. They are engaged in collection, processing, transporting and distribution of milk, meat and live animals. In all these sub-categories, there are small and large dealers.

The small milk and milk products traders are mostly the large number of sedentary mixed farming practicing smallholders, semi-pastoralists or pastoralists. Those close to urban centers such as Sullulta areas supply their produces to medium and large-scale milk processors at the local milk collection points operated by the processors.

The medium and large-scale milk traders are producers and processors themselves. Mostly they operate their own retail shops in the urban centers or supply pasteurized and packed milk to supermarkets with cold chain. They have high interest in the dairy sector and enjoy high policy support from government, yet they have limited influence on policy.

In the meat trading value chain, there are export abattoirs selling their products mainly to the Gulf States. The other important actors are the domestic abattoirs that are owned by municipal services, privately entrepreneurs or cooperatives, which supply meat to retail butcheries. The main concerns of these actors in the meat industry are supply of livestock, disease control and management, systems of keeping Sanitary-Phytosanitary requirements, illegal trade of live animals and meat. The export abattoirs get high policy support and have high influence on policy through their commercial chambers and the Ethiopian Meat and Dairy Industry Development Institute, which was established to render technical and institutional support to the meat and dairy industry.

The main actors in live animal trading are rural traders who are large in number but deal with small transactions. They deal with both cattle and other kinds of livestock. They bring to the local markets what they have bought from producers and sell it to assemblers. The assemblers vary in size; some deal with large number of livestock while others deal with a few animals. They sell their animals to other traders and butchers. There are also smugglers of live animals mainly to Somaliland, the Sudan and Kenya. In both the legal and illegal livestock marketing, brokers are involved. They match buyers and sellers, facilitate transactions, have high role in price negotiations, and earn in most cases large fees. Traders, in general, have high interest in the livestock, dairy and animal health policy issues but have low influence.

Consumers

The consumers are the millions of dairy and meat products consumers who are largely atomized and unorganized households and small business in the rural area and urban centers. The dairy and meat market exhibits pervasive imperfection as it is plagued by dearth of supply, high seasonal fluctuation of demand, lack of competition, lack of quality control, absence of registration of transactions and products traceability system. Being unorganized, the consumers are apparently price takers in the largely non-competitive dairy and meat markets. The vast majority of meat and milk consumers has a deep rooted

and age old tradition of consuming dairy and meat products in an uncooked form. A large number of them also lack basic knowledge of mode of transmission of zoonotic diseases such as brucellosis, bovine tuberculosis and internal parasitic infections. The consumers, in general, are regarded as having high interest in the policy sector but are not regarded as having high influence on policy process as they are atomized entities without voice. Their primary concerns in the policy field are rising product prices, inadequate supply and lack of quality assurance and safety regulation systems.

Support Services

This category includes a range of actors and services such as extension advice giving governmental and non-governmental organizations, research organizations, AI and bull supply services as well as financial services such as micro-finance, banking and insurance. Extension service provision is the mandate of the newly established Ministry of Livestock and Fisheries (MoLF) and its departments such as the dairy development directorate. Its regional counterpart is organized differently. In Oromia and Southern Nations, Nationalities and Peoples Regional State (SNNP), it has the status of a bureau while in Amhara, it is an agency and in Tigray, it is just a directorate. At the zonal level and woreda level, we also find the livestock department separately functioning by its own or as a directorate under the bureau of agriculture.

The Ethiopian extension system is one of the largest in Africa with an army of extension agents stationed in every *Kebele*. The extension system is often criticized for being biased in favor of crops and gives inadequate service for livestock system in general and to the pastoral system in particular. In addition, it is based in favor of small farms giving scanty service for the large farms. The actors in the extension system are the most important actors with immense interest and influence on livestock policy. Their influence comes from their political power, technical expertise and the wider reach they have to all corners of the country. Some non-governmental organizations are also involved in livestock extension; among these the UK based Send A Cow, World Vision, and Action Aid which focus on promoting smallholder dairy development for the rural poor, the women and other marginalized groups are worth mentioning. The NGOS have high financial and technical resources to influence policy.

In addition to the extension advisory support, there is an elaborate micro-finance support for smallholder farmers in the regional states. However, for the medium and large sectors, as well as for the urban dairy farms that do not have legal and policy support, financial support is found to be limited. The Ethiopian Development Bank and other private financial institutions render financial support especially for the large-scale milk and meat industry. Yet, customers complain about bureaucratic red tape and tight regulations to access financial support services. As a result, the informal financial market, with its easy access and high interest rates, has flourished in many urban and rural settings.

Veterinary service is largely provided by the woreda livestock office with clinics located in every *Kebele* or one serving not more than three *Kebeles*. These clinics supply drugs, vaccines and provide animal health related training and advisory services to farmers in their jurisdiction. The service is often constrained by lack of work force, supplies and

financial resources. To deal with the financial problem, some regions establish revolving funds for drug supply. The private sector is also increasingly being involved in the veterinary service. There are now private vet clinics and drug stores in rural areas and small towns. In the private and public sectors, the veterinary services are poor as there are no set quality standards and the system to enforce these standards is weak.

The other important institutes providing vital technical and policy support for the dairy and meat industry are the Ethiopian Meat and Dairy Industry Development Institute (EMDIDI) and the Agricultural Transformation Agency (ATA). These have very high interest and high advantage in the dairy and meat policy sector as they have the prime objectives of reducing milk products importation and increasing meat exports and export earnings. Their main concerns in the policy field are markets, product quality and technological transfer.

The National Artificial Insemination Center (NAIC) supplies semen of Holstein Frisian, Jersey and Borena cattle breeds to regional livestock agencies/bureaus. Regional AI centers and private companies supply AI service. The lack of cattle breeding policy is perceived to be one of the major problems in the sector. The lack of technical capacity for improved quality and quantity of semen production is also a major challenge. In addition to this, there are a few heifer supply service centers such as Chagni, Abernosa, Sodo, EMDIDI and Jersey farm ranches that supply a few hundred Holstein Friesian and Jersey cross-bred heifers. As compared to the national demand, their supply is meager and the government does not take the heifer supply as a viable strategy for the wide scale genetic improvement. Apart from this, the heifer supply ranches and researcher centers also give bull service to the farmers in their vicinity.

The National Veterinary Institute (NVI) provides vaccine production and distribution support service. It produces vaccines for 16 types of diseases. In general, the AI service is insufficient in terms of supply as compared to demands especially from smallholders located all over the country. The primary problem is the lack of capacity to produce some essential vaccine, which are not produced at present.

Animal Disease Diagnostic and epidemiological study service is mainly undertaken by the National Animal Health Diagnosis and Investigation Center (NAHDIC) and by regional laboratories. In addition to NAHDIC, there are 14 regional veterinary laboratories in the country. Of these, 9 are found in the project regions (5 in Oromia, 2 in Amhara, one in Tigray and another one in SNNP). Yet, reports indicate that only 45% of the country has veterinary service coverage (Shapiro *et al.*, 2015). The problems in the sector as perceived by NAHDIC and the regional laboratories are widespread animal disease, lack of capacity to deal with all animal health issues, input, technology and absence of livestock movement control leading to spread of diseases and making it difficult to establish disease free zones. One of the priority agendas of NAHDIC and regional laboratories is building capacity to export testing and quarantine disease surveillance and control. They have high interest and capacity to influence the livestock and dairy policy sector in general and the animal health sub-sector in particular.

Research support on livestock breeding and genetic improvement, feed and health is provided by federal and regional research institutes, which have livestock research directorate. Universities also undertake livestock research primarily by graduate students. The International Livestock Research Institute (ILRI) is also a major actor in terms of undertaking research, national research system capacity building as well as policy advisory and influencing livestock policy. There are also professional associations such as the Ethiopian Society of Animal Production (ESAP) and Ethiopian Veterinary Association (EVA) that are professional associations aiming at promotion of livestock production and animal health issues in Ethiopia. The research system in general has a very high interest and influence on policy field. The resource they have to influence policy is mainly technical expertise and information generation.

Regulators

The main body for regulation is the federal Ministry of Livestock and Fisheries (MoLF). It has two main subdivisions headed by state ministers. These are production and marketing subdivision and the animal health and feed control subdivisions. Under the production and marketing subdivision, there are a number of directorates such as Dairy Development Directorate, Genetic Improvement Directorate, Meat Production Development Directorate, Urban Livestock Development and Investment Support Directorate. Under the animal health and feed control subdivision also, there are four directorates, which include epidemiology, veterinary public health, export abattoirs inspection and certification as well as quarantine, and import-export inspection directorates. Some of these directorates are engaged in extension support and advisory services while especially those in the animal health and feed control subdivision, are mainly engaged in regulatory services such as inspection, certification and accreditation. The regional livestock bureaus/agencies with their zonal, *Woreda* and *Kebele* level tiers also have some regulatory activities. These directorates and the ministry in general have very high stake in the livestock sector and also have very high influence on policy issues as they are the apex body formulating, executing and evaluating policy concerning the livestock sector.

In addition to the MoLF directorates, there is also an autonomous institute accountable to the ministry, which is engaged in regulatory services. This is the federal veterinary drugs and feed quality control agency. It is mandated to regulate the importation, production, distribution, quality and use of veterinary drugs and animal feeds. This institute has high interest and influence in the livestock, dairy and animal health issues. The most important issues in the policy sector from the perspective of this institute are illegal production and distribution of veterinary drugs and feed as well as unregulated veterinary drugs and biological agents production, importation, distribution and use.

Other regulatory organs in the livestock sector, in general, and in the dairy and animal health sector, in particular, include the Federal Food, Drug and Health Control Authority, the Ministry of Trade, Ethiopian Standard Agency and Quality and Standard Authority, which are entrusted with the mandate of regulating livestock and livestock products trading.

Zoonotic Diseases Control

The category is composed of actors providing health extension service, research service, regulatory service clinics drug suppliers as well as traditional healers. The Ministry of Health and the MoLF veterinary public health directorate are important actors providing extension and other related services in zoonotic disease control. Especially high on their zoonosis disease control agenda are one health strategies implementation and the control of diseases such as rabbis, bTB and brucellosis. These actors have high interest and influence on policy issues regarding zoonotic disease control.

The research service is provided by Ethiopia Public Health Institute (EPHI), Ethiopian Institute of Agricultural Research (EIAR), Regional Agricultural Research Institutes (RARIs), Universities, Armour Hansen Research Institute (AHRI), NAHDIC, NVI and ILRI. Zoonotic diseases are not generally high in the agenda of these actors. Yet, some of them have done and important research in the past and some of them has active research projects in the area of zoonotic disease control. Among these actors, Addis Ababa University College of Veterinary Medicine, The EPHI, NAHDIC and AHRI are important actors providing research service in Zoonotic disease control. These actors, in general, have high interest in zoonotic disease control but have medium to high level of policy influence. However, collaboration between these actors in the area of implementing one health such as sharing health resources between sectors, which would reduce overall costs (Grace, 2014), was found to be low.

Saliency of Actors

Saliency of actors is a measure of their interest and influence. It is one of the many variants of tools often used to identify actors with powerful impact on project implementation, outcome and sustainability. It answers questions such as who has relative influence on project or policy implementation and outcome. Workshop participants were asked each actors' level of interest and influence on a range of dairy and animal health related issues. The results indicated that in general terms; i.e., taking the average score on all issue raised, actors like regional livestock agencies, and the MoLF-top management, MoLF directorate as well as federal level support-giving actors are powerful actors in the dairy and animal health issues. Table 1 shows the relative importance of each actor on the livestock sector policy making in general and in the dairy and animal health sector in particular, where a saliency score of 1 indicates the highest level of interest and influence and 0.0 the least or none.

Table 1. Average salience score of actors on dairy, meat and animal health control issues

Actor	Salience score	Actor	Salience score
Regional Livestock Agencies	1.00	EIAR	0.77
MoLF-Top Management	1.00	NGOs	0.77
MoLF-Animal Health directorate	0.99	VDFCA	0.77
NAHDIC	0.97	EMDID	0.72
MoLF- Vet Public Health Directorate	0.95	Medium farms	0.70
Large farms	0.92	ATA	0.59
MoLF-Dairy Development Directorate	0.92	ILRI	0.58
Zonal Livestock Agencies	0.89	small farms	0.48
Woreda Livestock Agencies	0.89	cattle traders	0.40
RARIs	0.88	Abattoirs	0.35
AGP (Agricultural Growth Program)	0.87	Milk processors	0.28
Universities	0.86	MoANR (Ministry of Agriculture and Natural Resources)	0.23
NVI	0.79	Regional Health Bureaus	0.15
NAIC	0.78	Federal Ministry of Health	0.15

We looked into the salience of each actor particularly on the issue of bTB control (Table 2). We found that MoLF-Top management, MoLF-Animal health subdivision, Regional Livestock agencies, Abattoirs, EDMIDI, MoLF-Dairy directorate and NAHDIC are very powerful actors concerning bTB control. Other actors like universities, research institutes, large farms and *Woreda* and zonal level actors have medium level of salience in terms of bTB control. Actors like ATA, ILRI, NVI as well as small and medium level farmers have low power in bTB control.

Table 2. Salience score of actors on bTB control

High power actors on bTB control		Medium power actors on bTB control		Low power actors on bTB control	
Actor	Salience	Actor	Salience	Actor	Salience
Abattoirs	1.00	RARIs	0.89	NAIC	0.69
EMDID	1.00	Universities	0.89	AGP	0.60
MoLF-AH	1.00	Woreda LsA	0.89	ATA	0.60
MoLF-Dairy	1.00	Zonal LsA	0.89	ILRI	0.57
MoLF-TM	1.00	NGOs	0.80	Medium farms	0.45
MoLF-VPHD	1.00	VDFCA	0.80	Small farms	0.45
NAHDIC	1.00	EIAR	0.78	Cattle traders	0.40
Regional LsA	1.00	large farms	0.77	NVI	0.40
				Federal Health Min	0.35
				Regional Health Bu	0.35
				MoANR	0.20
				Milk processors	0.00

Stakeholders' Network Analysis

Social network analysis is a powerful tool for stakeholder analysis in that it has the potential to show the level of integration among actors as well as the potential influence of actors in the policy process (Lienert *et al.*, 2013; Lewis 2006). In our context, social network analysis is aimed at identification of the level of cohesion or fragmentation among the various stakeholders in the Ethiopian livestock sector in general and in the dairy and animal health sector in particular. According to Klijn (2003), networks facilitate interaction, decision-making, cooperation and learning among the actors involved in the network as they provide the resources to support these activities, such as recognizable interaction patterns, common rules and organizational forms and sometimes even a common language. Hence, with the aim of analyzing the patterns of interaction among the actors in the Ethiopian livestock policy sectors, stakeholders were taken as nodes and the flow of information and the strength of linkage among actors were taken as tie or edge data. An actor's salience in terms of information exchange within the network, influencing policy and integrating the various nodes in the network is an important factor we investigate in using social network analysis.

Policy networks do not have clear boundaries. In using social network analysis for policy network analysis, the analyst has to define the boundary. In this study, stakeholders' workshop participants identified the most relevant actors in the livestock sector, dairy as well as animal health subsector. No important actor has been missed especially in the highland mixed farming system. Nonetheless, the data was collected from the federal, Addis Ababa city administration and from Oromia, Tigray, SNNP and Amhara regional states; other important actors outside these regions and those that operate in the pastoral and semi-pastoral farming systems were not included in this analysis.

Network Characteristics

In total 61 nodes or stakeholders in our case, were identified in the network data collection. Respondents to the structured questionnaire survey filled all existing relations among their organization and other actors in the livestock sector. The strength of relationship with each actor was measured on a 1 to 10 scale where 1 stands for weak linkage and 10 stands for strong linkage. Strong linkage indicates frequent interaction. The nature of the interaction can be formal or informal as well as policy, financial, technical, reporting, legal, or any other kind. A total of 798 links among the actors identified were obtained from the data collected.

Figure 1 depicts the graphical representation of the network among actors in the Ethiopian livestock sector in general and in the dairy and animal health sectors in particular. The overall density of the network, which is a measure of connectedness of the network or how tightly knit is the network, was found to be 0.218. Ideally, a tightly knit network should have a density of 1 and that of a completely unconnected set of actors would have a density value of 0. The density value of 0.218 shows that the Ethiopian livestock policy network is a loosely connected one.

The modularity of the network, which shows the existence of subgroups or cliques, indicated that there are six strongly connected components within the network and one

found to be 2.33. Ideally, this number should be 1, yet in reality nodes are far apart from each other due to administrative tier and division of labor and hence the average value would be higher than one and the average path length in our network can be taken as a fair level of connectedness within the network.

The average clustering coefficient, which is a measure of the degree to which nodes tend to cluster together, the network was found to be 0.604. It is the average of individual nodes clustering coefficients; the higher this number the more connected the whole network is considered to be. In this regard, the Ethiopian livestock policy network in general and that of the dairy and animal health sector in particular cannot be taken to have very high but a fair degree of clustering.

Stakeholders' Characteristics

Beyond analyzing network characteristics, it is important to look into the characteristics and positions of individual actors within the network. One of the measures of nodal characteristics is the measure of centrality. Centrality shows the relative importance of a node within a network and hence can be used to identify network "brokers" who hold central positions. One of our questions is which actor is central in the network in the sense that it has high connectedness with other actors and hence can facilitate information flow and interaction within the entire network. Measure of centrality includes degree centrality, betweenness centrality, eigencentrality and harmonic closeness centrality (Table 3).

Degree centrality is a count of the number of direct connection an actor has with other actors and hence it measures the popularity of an actor within the network and is known to have positive effect on the actor's influence (Degenne and Forse, 1999). Using this measure to identify the most important actor showed that ILRI, NVI, MoLF-EPD, EIAR, NAIC, NAHDIC, MoLF-DDD and other federal actors play important role in influencing policy in the livestock sector in general and in the dairy and animal health sector in particular. By virtue of having high degree centrality; i.e., ties with many actors, these stakeholders connect other actors who would otherwise not be linked.

Betweenness centrality shows an actor's position in connecting other actors. It shows the position an actor has in terms of controlling, facilitating or influencing the interaction between other actors and the flow of information in the network (Freeman, 1979). With regard to this measure, the regional livestock agencies/bureaus (SLA, OLA, ALA, TLA, AABA) and research centers such as ILRI, EIAR, RARIs, NAHDIC and the regional animal health laboratories have higher values. These actors serve as a bridge to connect other actors. The regional livestock agencies connect the zonal, *Woreda*, *Kebele* level actors among each other as well as with the national level actors such as MoLF. The research institute such as ILRI and EIAR as well as RARIs also does have connections with regional level actors as well as those at the grassroots though the projects they themselves implement. Table 3 shows centrality measure for some of the actors in the Ethiopian livestock policy network.

Table 3: Centrality measures of some stakeholders in the Ethiopian Livestock Health Policy Network

ID	In-degree	Out-degree	Degree	Closeness centrality	Harmonic closeness centrality	Betweenness centrality	Eigenvector centrality
MoLF-TM	27	0	27	0.000	0.000	0.000	1.000
NVI	27	28	55	0.652	0.733	0.032	0.982
MoLF-VPHD	25	20	45	0.600	0.667	0.019	0.961
MoLF-PCD	26	21	47	0.600	0.672	0.020	0.947
ILRI	26	34	60	0.698	0.783	0.085	0.947
NAIC	25	24	49	0.625	0.700	0.024	0.944
MoLF-DDD	24	23	47	0.619	0.692	0.016	0.926
NAHDIC	24	25	49	0.625	0.706	0.050	0.921
MoLF-EPD	24	26	50	0.638	0.717	0.024	0.911
EIAR	22	28	50	0.652	0.733	0.066	0.863
ATA	24	23	47	0.612	0.689	0.024	0.850
AGP	24	0	24	0.000	0.000	0.000	0.850
MoANR	23	0	23	0.000	0.000	0.000	0.842
EMDIDI	20	27	47	0.645	0.725	0.029	0.815
AAU-VF	20	23	43	0.619	0.692	0.008	0.781
South LA	20	25	45	0.600	0.694	0.084	0.737
Oromia LA	19	23	42	0.566	0.667	0.066	0.712
Amhara LA	18	25	43	0.577	0.683	0.064	0.695
Tigray LA	18	25	43	0.600	0.694	0.074	0.652

The harmonic centrality measures the accessibility of an actor by other members of the network. This measure also shows that ILRI, EIAR, NVI, EMDIDI and other federal level actors have high accessibility; yet of the federal level actors such as AHRI, MoH, MoANR, AGP and MoLF-Top management have low harmonic centrality for the reason that either the sector is marginal to them or due to division of labor and administrative tier. The MoLF-Top management has low accessibility due to administrative tier, yet for the other actors listed here the sector is marginal for them due to division of labor and hence has low accessibility to other members in the network.

Among the centrality measures used to analyze the position of an actor in a network, eigenvector centrality is often the most elaborate one as it takes into account not only the degree centrality of the actor; i.e., the number of ties it has, but also the quality or strength of those ties. Using this measure, the most central actor with immense influence in the network were found to be MoLF top management and the various directorates of MoLF (MoLF-PCD, MoLF-VPHD, MoLF-DDD, MoLF-EPD) as we as NVI and ILRI.

Conclusions

A multitude of actors with diverse interests are involved in the Ethiopian dairy and animal disease control policy field categorized under producers, processors, input suppliers, traders, support services, regulators, consumers and zoonotic disease control. Milk and meat producers, large or small, face problems of feed shortage, high price of improved feeds, animal diseases, land acquisition, getting legal status for holdings and lack of support services such as veterinary service, extension, business advices as well as waste

management. They are unorganized and atomized entities, which makes their advantage on policy to be low. At present, rather than the medium and large farms, where the intensification of the dairy industry is taking place, have low policy impact as compared to the smallholder farmers, which are the centers of poverty reduction policy interventions. The input suppliers have better voice on policy as compared to the producers by dint of being organized in chambers of commerce such as feed processors association. Their primary problems are lack of foreign exchange and high taxation on imports. The processors are important market outlets for smallholder dairy producers and employ local youth and women and the landless and their primary concerns are lack of inadequate supply of milk, narrow markets and lack of support services in the form of extension advice and small business incubation. The traders are engaged in collection, processing, transporting and distribution of milk, meat and live animals. Meat, Milk and live animals marketing is plagued by a number of problems such as the pervasive influence of brokers and intermediaries, extended fasting periods that reduce demand and price for livestock products significantly and problems of smuggling and traceability of animals and animal products. Traders in general have high interest in the livestock, dairy and animal health policy issues but have low influence. There are a number of well-organized support giving organizations for the dairy and meat sector as well as the livestock sector in general yet the services they render are inadequate, of poor quality and biased against large and urban-based small farms. With regard to regulatory service, both the regional and federal livestock and fisheries ministry and bureaus play the major role and have very high influence on policy issues as they are the apex body formulating, executing and evaluating policy concerning the livestock sector.

With regard to consumers, by dint of being unorganized, the consumers are apparently price takers in the largely non-competitive dairy and meat market. The vast majority of meat and milk consumers has a deep rooted and age old tradition of consuming dairy and meat products in an uncooked form. A large number of them also lack basic knowledge of mode of transmission of zoonotic diseases such as brucellosis, bovine tuberculosis and internal parasitic infections. There are also a number of actors involved in zoonotic diseases control, and they have high interest in zoonotic disease control but have medium to high level of influencing policy. Consumers and processors should have more ways of influencing policy than they do – since if changes are to be brought in with regard to quality of product, health, etc., it is likely to be the groups who will be most significant. With regard to the analysis of salience of actors in the livestock sector, in general, and in the dairy and animal health sector, in particular, actors like regional livestock agencies, and the MoLF-top management, MoLF directorate as well as federal level support services giving actors are actors that are more powerful. And on the particular issue of bTB control, found that MoLF-Top management, MoLF-Animal heal subdivision, Regional Livestock agencies, Abattoirs, EDMIDI., MoLF-Dairy directorate and NAHDIC are very powerful actors. The social network analysis showed that the Ethiopian livestock policy network is a loosely connected network of actors with medium level of clustering. Our analysis also showed that ILRI, NVI, MoLF-EPD, EIAR, NAIC, NAHDIC, MoLF-DDD and other federal and regional level actors play important role in influencing policy by virtue of having high centrality, accessibility, and bridging role connecting other actors who otherwise would not be linked.

In general, it can be concluded that in the existing federal administrative structure, there are no policy networks in the Ethiopian dairy policy landscape that cut across regional boundaries. However, the international and federal level government actors play important role as central actors with bridging role connecting the decentralized regional and local level actors as well as in initiating policy engagement and change. This implies that there is a room for pluralistic policymaking and any attempt to influence policy in the livestock sector need to work with these international, federal and regional level actors. These findings imply that any attempt to influence policy on bTB control strategy in Ethiopia need to engage these actors.

References

- AGP (AGP-Livestock Market Development Project). 2013. Agricultural Growth Project - Livestock Market Development Value Chain Analysis for Ethiopia: Expanding Livestock Markets for the Small-holder Producers. USAID: AID-663-C-12-00009.
- Degenne A and M Forse. 1999. *Introducing Social Networks*. Sage Publications, London.
- Freeman, L., 1979. Centrality in social networks conceptual clarification. *Social Networks* 1, 215–239.
- Grace D. 2014. The business case for One Health, *Onderstepoort Journal of Veterinary Research* 81(2), Art.#725, 6 pages. <http://dx.doi.org/10.4102/ojvr.v81i2.725>
- Grimble R and K Wellard. 1997. Stakeholder methodologies in natural resource management: a review of principles, contexts, experiences and opportunities. *Agricultural Systems* 55 (2) 173–193.
- Klijin EH. 2003. Networks and governance: A perspective on public policy and public administration. In: A. Salminen (ed.), *Governing networks* (pp. 29-38). Amsterdam: IUS Press.
- Lewis JM. 2006. Being around and knowing the players: Networks of influence in health policy. *Social Science & Medicine* 62 (2006) 2125–2136
- Lienert J, F Schnetzer. and K Ingold. 2013. Stakeholder analysis combined with social network analysis provides fine-grained insights into water infrastructure planning processes. *Journal of Environmental Management* 125 (2013) 134-148.
- Luzi S, MA Hamouda, F Sigrist, and E Tauchnitz. 2008. Water Policy Networks in Egypt and Ethiopia. *The Journal of Environment Development* 2008; 17; 238. DOI: 10.1177/1070496508320205
- Olander S. 2006. "External Stakeholder Management. PhD Thesis, Lund University, UK.
- Tegegn, A. 2004. *Urban Livestock Production and Gender in Addis Ababa, Ethiopia*, UA-Magazine.
- Shapiro BI, G Gebru, S Desta, A Negassa, K Nigussie, G Aboset, and H Mechal. 2015. *Ethiopia livestock master plan*. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI).
- Varvasovazky Z and R Brugha. 2000. A stakeholder analysis. *Health Policy and Planning*, 15(3) 338-345.