



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



Analysis of Beef Value Chain in Zambia: Challenges and Opportunities of Linking Smallholders to Markets

by

Mary Lubungu, Nicholas J. Sitko, and Munguzwe Hichaambwa

Working Paper 103

December 2015

Indaba Agricultural Policy Research Institute (IAPRI)

Lusaka, Zambia

Downloadable at: <http://www.iapri.org.zm/> or

<http://www.aec.msu.edu/fs2/zambia/index.htm>

Analysis of Beef Value Chain in Zambia: Challenges and Opportunities of Linking Smallholders to Markets

by

Mary Lubungu, Nicholas J. Sitko, and Munguzwe Hichaambwa

Working Paper No. 103

December 2015

**Indaba Agricultural Policy Research Institute (IAPRI)
26a Middleway, Kabulonga
Lusaka, Zambia**

Lubungu is a PhD Candidate in the Faculty of Agricultural Science, Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics, University of Hohenheim; Sitko is Assistant Professor, International Development, Department of Agriculture, Food, and Resource Economics Michigan State University; Hichaambwa is Business Development Manager and Senior Researcher, IAPRI.

ACKNOWLEDGMENTS

The Indaba Agricultural Policy Research Institute is a non-profit company limited by guarantee and collaboratively works with public and private stakeholders. IAPRI exists to carry out agricultural policy research and outreach, serving the agricultural sector in Zambia so as to contribute to sustainable pro-poor agricultural development.

We wish to acknowledge the financial and substantive support of the Swedish International Development Agency (Sida) and the United States Agency for International Development (USAID) in Lusaka. We further would like to acknowledge the technical and capacity building support from Michigan State University and its researchers.

The authors would also like to thank Patricia Johannes for her helpful formatting and editing assistance. Thanks also go to Kennedy Malambo and Mwangala Mufaya who provided assistance during the qualitative data collection

Any views expressed or remaining errors are solely the responsibility of the authors.

Comments and questions should be directed to:

The Executive Director
Indaba Agricultural Policy Research Institute
26A Middleway, Kabulonga,
Lusaka.
Telephone: +260 211 261194;
Telefax +260 211 261199;
Email: chance.kabaghe@iapri.org.zm or info@iapri.org.zm

INDABA AGRICULTURAL POLICY RESEARCH INSTITUTE TEAM MEMBERS

The Zambia-based IAPRI research team is comprised of Antony Chapoto, Brian Chisanga, Cliff Dlamini, Munguzwe Hichaambwa, Chance Kabaghe, Stephen Kabwe, Auckland Kuteya, Rhoda Mofya-Mukuka, Olipa Zulu, Eustensia Munsaka, Thelma Namonje, Nicholas Sitko, Solomon Tembo, and Ballard Zulu. Michigan State University-based researchers associated with IAPRI are Eric Crawford, Steven Haggblade, Thomas S. Jayne, Nicole Mason, Chew Nkonde, Melinda Smale, and David Tschirley.

EXECUTIVE SUMMARY

Rapid urbanization and population expansion, coupled with sustained income growth and the emergence of an urban African middle class are triggering an increase in the consumption of animal protein in Zambia. The sustained increase in the consumption of animal proteins creates a host of new development opportunities to synergistically link small-scale livestock producers into economic growth processes from which they have largely been excluded. In Zambia the beef market is currently segmented between *standard beef* produced by smallholder farmers under generally low intensity production system, and *choice beef* produced primarily by commercial farmers and fattened in feedlots. Standard beef targets low-income groups in urban as well as rural markets and makes up 80% of total beef demand in the country. However, the standard beef market is characterized by high levels of seasonal supply fluctuations, leading to significant seasonal variations in consumer prices. The drastic seasonal supply variations in the standard beef market are considered by industry experts to be the greatest obstacle to improving the performance of the beef market and limit the potential of the sector to act as an engine of growth for smallholder producers. Therefore, this study is motivated by a desire to understand the factors that underpin the sharp seasonal fluctuations in beef supplies from the smallholder sector in Zambia. We explore these factors through a value chain analysis approach.

The primary data used in this study stem from qualitative research conducted in selected districts in Central, Southern, Western, and Lusaka Provinces of Zambia. The data were collected through guided interviews with key actors at each node of the beef value chain. At production stage, farmer focus group discussions (FGDs) were held and key informant interviews with individual farmers and one traditional leader were conducted. At the marketing and processing stage, interviews with cattle traders, abattoirs, and slaughter slabs were conducted. Interviews were also conducted with informal and formal butcheries. The personnel in Ministry of Agriculture and Livestock's Department of Veterinary also provided valuable information regarding the overview of the beef production and marketing within the respective districts. In addition to qualitative research, data from different national representative surveys were used to inform our discussion.

The study highlights four factors limiting smallholder cattle commercialization and investment in the beef sector.

First, smallholder famers keep cattle for numerous reasons beyond just commercialization. This shapes how farmers respond to markets. Farmers perceive cattle to be a safer store of value than money, because there are numerous social proscriptions on sales and transfers that protect cattle owners from parting with their animals when pressured by needy family members. In general, traditional cattle owners only convert cattle to cash when truly pressing needs arise.

Second, small herd sizes coupled with low productivity and disease prevalence limit cattle commercialization, as there is only a limited number of marketable surplus animals. Disease outbreaks and regional quarantines further affect investments in cattle markets as only a limited number of cattle are sold through formalized channels.

Third, poor husbandry methods and lack of deliberate herd management tailored for commercial sales limit commercialization. Farmers often sell old oxen (four or more years old) that have reached non-productive stage. Since farmers only sell old animals, this tends to

limit commercialization, as there are only a limited number of animals available within a herd that can be sold in a given year.

Fourth, there is a lack of market segmentation in the smallholder beef sector. For example, all the cattle in Western Province were considered commercial beef (which fetches a lower price) regardless of quality. Therefore, the lack of quality and price variations in the standard beef sector leads to substantial underinvestment in herd management and limits commercialization.

Addressing the challenges impeding smallholder commercialization requires well-coordinated public and private investment programs aimed at the following:

- i. Coping with factors that affect the herd size such as low conception rates and disease management. This will improve the willingness of farmers to sell cattle;
- ii. There is need to educate farmers on the importance of maintaining a targeted breeding stock from which offspring are selected as replacement bulls and heifers and for training as oxen, with the remainder earmarked for sale when they have grown to an appropriate age/weight for income;
- iii. The government and other stakeholders should continue investing in cattle health management to eradicate the diseases that affect cross provincial trade;
- iv. The beef buyer should segment the smallholder beef cattle pricing and offer premium prices in order to encourage farmers to increase the investment in herd management; and
- v. The introduction of breeding centers for breed improvement and farmer training.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	iii
INDABA AGRICULTURAL POLICY RESEARCH INSTITUTE TEAM MEMBERS	iv
EXECUTIVE SUMMARY	v
LIST OF TABLES	ix
LIST OF FIGURES	ix
LIST OF ACRONYMS AND ABBREVIATIONS	x
1. INTRODUCTION	1
2. DATA AND METHODS	4
3. MAPPING AND DESCRIPTION OF THE BEEF VALUE CHAIN	5
4. INPUT AND SERVICE SUPPLY	6
4. 1. Feed and Water	6
4.2. Extension Service Delivery.....	6
4.3. Prevalence of Cattle Diseases	7
4.3.1. Effects of Disease Outbreaks and Vaccination Campaigns	8
4.3.2. Other Health Problems.....	10
4.4. Challenges of Service Delivery	11
5. CATTLE PRODUCTION	12
5.1. Cultural and Economic Motivations of Rearing Cattle.....	13
5.2. Socio-Economic Characteristic of Cattle Producers by Herd Size.....	15
5.3. Smallholder Cattle Ownership and Commercialization	16
5.4. Herd Composition	17
5.5. Concentration of Commercialization	18
6. BEEF MARKETING/ PROCESSING	19
6.1. Small Scale Traders	19
6.2. Feedlots	19
6.3. Abattoirs.....	20
6.4. Marketing Procedures	21
6.5. Choice of the Buyer and Price Determination	22
6.6. Gross Margin Analysis	22
6.7. Sensitivity Analysis	24
6.8. Limiting Factors Contributing to Underinvestment.....	25
7. RETAILING	27
8. CONCLUSION AND RECOMMENDATIONS	28
REFERENCES	29

LIST OF TABLES

TABLE	PAGE
1. Distribution of Cattle over Time.....	12
2. Characteristics of Cattle Owning Households by Herd Size	15
3. Smallholder Farmer to Abattoir Gross Margin for One Ox.....	23
4. Abattoir/local Butcheries to Retailing Gross Margins for One Ox.....	24
5. Sensitivity Analysis	24

LIST OF FIGURES

FIGURE	PAGE
1. Estimated and Projected Size of Meat Markets in Major World Regions, 2005-2007, 2030, and 2050	1
2. Seasonal Retail Price Index (2010-2014)	3
3. Map Showing Zambia and the Districts where Interviews Were Conducted	4
4. Beef Value Chain Map.....	5
5. Geographical Distribution of Households Reporting Cattle Diseases	7
6. Livestock Mortality Rates due to Disease	8
7. Methods of Disease Control.....	9
8. Sources of Drugs and Vaccines	9
9. Percent of Households De-Worming their Cattle	10
10. Method of Tick Control	11
11. Geographical Distribution of Households Owning Cattle	12
12. Percent of Household Using Animal Draft Power by Herd Size.....	13
13. Percent Cattle Share of Productive Assets by Province among Cattle Owners.....	13
14. Primary Decision Maker of Whether or not to Sell Cattle.....	14
15. Cattle Herd Size among Smallholder Households Raising Cattle	16
16. Herd Size and Cattle Marketing.....	17
17. Herd Composition	17
18. Geographical Distribution of Cattle Sales	18
19. Number of Abattoirs in Sampled Districts.....	20
20. Slaughtered Cattle at an Abattoir	20
21. Municipal Slaughter Slab.....	20
22. Offal Inspection at the Abattoir	21
23. Transporting Cattle Carcass by a Local Butcher	21
24. Number of Cattle Traded by District	25
25. Average Dressed Price/Kg Reported by Farmers (ZMW) and Location of Main Buyer.....	26

LIST OF ACRONYMS AND ABBREVIATIONS

BQ	Black Quarter
CBPP	Contagious Bovine Pleura Pneumonia
CSO	Central Statistical Office
DRC	Democratic Republic of Congo
ECF	East Coast Fever
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
FSRP	Food Security Research Project
HS	Hemorrhagic Septicemia
IAPRI	Indaba Agricultural Policy Research Institute
Kg	Kilogram
MAL	Ministry of Agriculture and Livestock
RALS	Rural Agricultural and Livelihood Survey
SS	Supplemental Survey
SSA	Sub-Saharan Africa
ZMW	Rebased Zambian Kwacha

1. INTRODUCTION

Developments in the economic, social, and demographic landscapes of Sub-Saharan Africa (SSA) are transforming agrifood systems across the region (Tschirley et al. 2014; Reardon et al. 2014; McCullough et al. 2008). In particular, rapid urbanization and population expansion, coupled with sustained income growth and the emergence of an urban African middleclass are changing the scale and composition of urban food markets (Tschirley et al. 2014; Muhammad et al. 2011; Rae and Nayga 2010; Seale, Regmi, and Bernstein 2003). An important dimension of this transformation is the sustained increase in the consumption of animal proteins (Rae and Nayga 2010; Delgado 2003; Delgado et al. 1999). In Africa, meat consumption is expected to increase to 34.8 million tons by 2050 with the annual growth rate of about 2.8%. Compared to the rest of the world, Africa's meat consumption annual growth rate ranks second from South Asia (Figure 1). In Africa, beef and poultry are the most consumed meat. Between 2005 and 2007, the consumption of beef and poultry meat was estimated at about 4.7 and 2.7 million tons respectively. Beef consumption alone is expected to increase by 8.9 million tons by 2050 (Livestock Data Innovation in Africa 2014).

The expanding markets for animal proteins in many SSA countries create a host of new development opportunities and challenges. Because relatively more affluent urban consumers are largely driving growth in demand for animal proteins, this emerging market provides opportunities to synergistically link small-scale livestock producers into economic growth processes from which they have largely been excluded (Steinfeld et al. 2013; Reardon and Berdegue 2002). However, the effects of this increased demand on livestock producers' economic prospects depends in large measure on addressing persistent constraints in livestock production and domestic marketing systems.

Literature on African livestock markets has highlighted several recurrent challenges. These include inadequate and poor infrastructure (such as road networks and marketing infrastructure), which often increases the transaction costs of smallholder market participation.

Figure 1. Estimated and Projected Size of Meat Markets in Major World Regions, 2005-2007, 2030, and 2050

	Estimated consumption 2005/07, million tonnes	Growth, million tonnes		Estimated consumption million tonnes 2050	Annual growth rate 2005/07-2050
		2005/07-2030	2030-50		
Developed	108.1	16.8	6.6	131.5	0.4%
Africa	10.5	10.3	13.9	34.8	2.8%
Near East	7.1	7.0	6.1	20.2	2.4%
Latin America	33.9	17.0	9.7	60.6	1.3%
South Asia	6.7	12.8	21.0	40.4	4.1%
East Southeast Asia	86.6	50.8	22.8	160.3	1.4%

Source: Livestock Innovation in Africa 2014.

In addition, limited access to market information, such as prices, grades, and standards also increases the transaction costs incurred by smallholder farmers and market intermediaries, thus, limiting participation in markets (Costales et al. 2006; Lapar, Holloway, and Ehui 2003; Key, Sadoulet, and de Janvry 2000). In most developing countries, market information systems for livestock are either non-existent or perform poorly (not available to farmers) where they exist. In part, this is attributed to inadequate financing and limited ability of government agencies to collect reliable and timely market information (Gabre-Madhin 2009). As such, smallholder producers operate under conditions of asymmetric price information, putting them in a weak negotiating position when dealing with larger buyers. Finally, a lack of adequate herd management technologies, and the high cost of inputs and information contribute to high herd mortality rates and small animal sizes and thus, reduces the capacity of smallholder producers to meet the quality requirements to participate in more formal supply chains (Regoverning Markets 2008; Lamy et al. 2012). In many ways, these persistent challenges undermine the capacity of emerging livestock markets to benefit smallholder livestock producers and support the development of needed improvements.

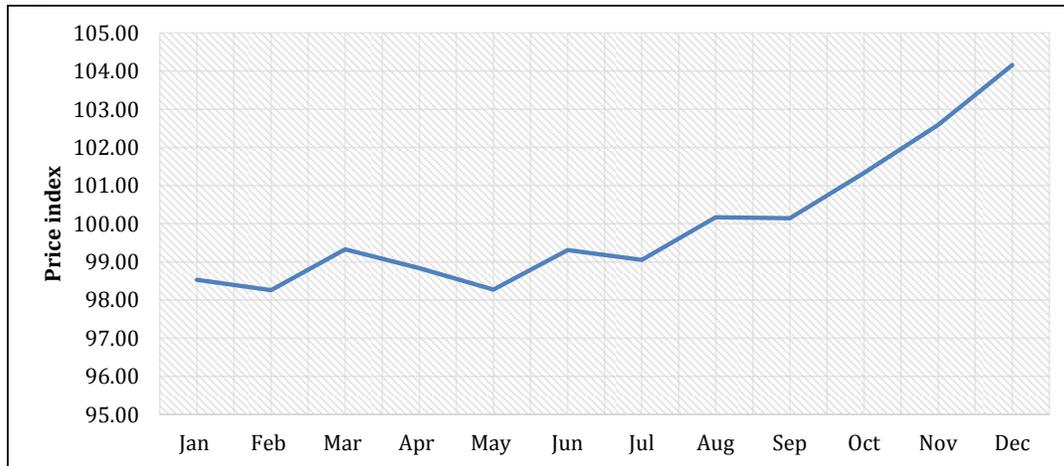
The beef sector in Zambia provides a useful case study for exploring the challenges and opportunities of utilizing livestock markets to link smallholders to rapidly changing consumer markets. Since 2009 Zambia has witnessed one of the highest rates of Gross Domestic Product growth in the region, hovering at or above 6% per year. This growth has coincided with an equally impressive decline in urban poverty rates, from 53% in 2004 to 28% in 2010 (CSO 2011; CSO 2005). The improved income conditions in urban Zambia, coupled with a substantial expansion of the urban population, has contributed directly to a large and growing market for beef and beef products (Hichaambwa 2012).

Under current income and human population growth estimates, Zambia's Ministry of Agriculture and Livestock (MAL) projects that demand for meat will increase from 120,000 metric tons in 2012 to over 600,000 metric tons by 2027 (MAL et al. 2012). With the current production and marketing conditions, this demand growth will create a supply gap of roughly 320,000 metric tons. Therefore, identifying strategies to enable small-scale cattle owners to fill this projected deficit will play a critical role in improving the poverty reduction linkages to urban demand opportunities.

In Zambia, the beef market is currently segmented between standard beef produced by smallholder farmers under generally low intensity production system, and choice beef produced primarily by commercial farmers and fattened in feedlots. Standard beef makes up 80% of total beef demand, highlighting the existing linkages between smallholder beef producers and urban consumer markets. However, the standard beef market is characterized by high levels of seasonal supply fluctuations, leading to significant seasonal variations in consumer prices. Figure 2, for example, shows the seasonal price index for standard beef in Zambia over the period 2010 to 2014. It shows that beef prices tend to peak in December and then drop off sharply by January.

Drastic seasonal supply variations in the standard beef market are considered by industry experts to be the greatest obstacle to improving the performance of the beef market. Erratic seasonal supplies stymie investments in the smallholder beef sector and, therefore, limit the potential of the sector to act as an engine of growth for smallholder producers. Therefore, this study is motivated by a desire to understand the factors that underpin the sharp seasonal fluctuations in beef supplies from the smallholder sector in Zambia. We employ a value chain approach to identify the factors that smallholder cattle commercialization and contributes to seasonal fluctuations in the beef supplies.

Figure 2. Seasonal Retail Price Index (2010-2014)



Source: CSO monthly price data various dates ; authors' computation.

The rest of the paper is organized as follows: the next section describes the data and methods used in this study; Section 3 presents the description of the value chain map; the four subsequent sections discuss the nodes of the value chain, the input and service supply, production, marketing, and processing as well as the retail; and the last section concludes and presents the recommendations for policy interventions.

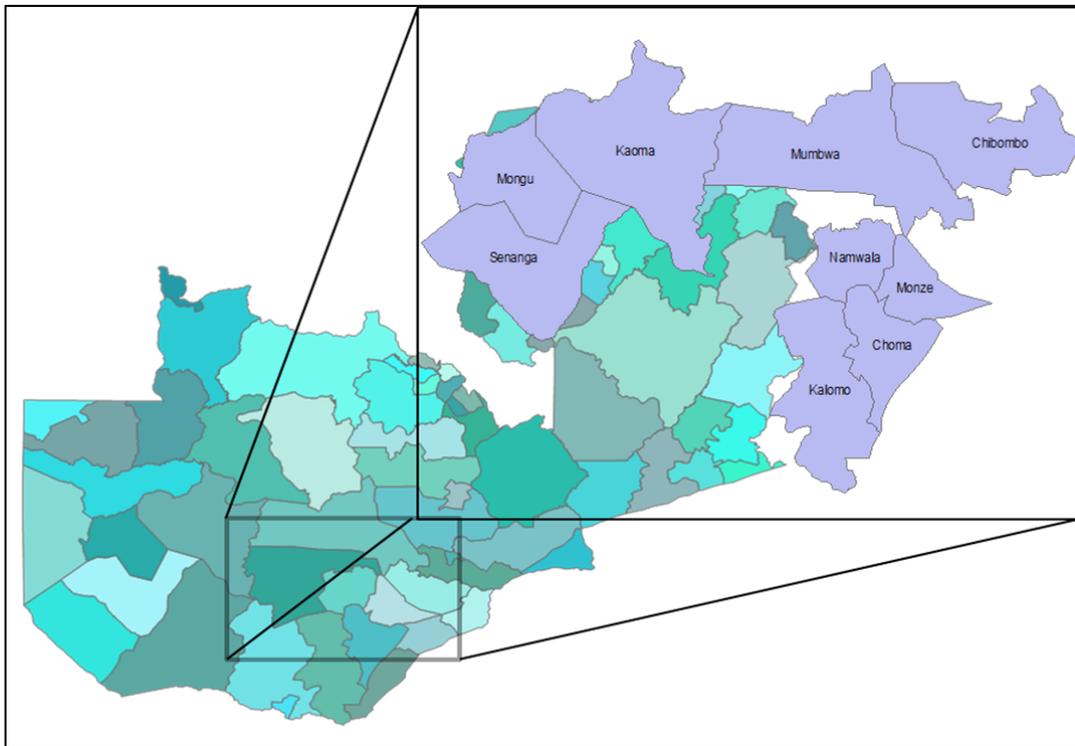
2. DATA AND METHODS

This study uses both qualitative and quantitative data. The qualitative data is drawn from the research that was conducted between February and April 2015 in ten districts of Zambia, namely: Kafue, Chibombo, Mumbwa, Monze, Choma, Kalomo, Namwala, Kaoma, Mongu, and Senanga (Figure 3). The data were collected through guided interviews with relevant value chain actors at each stage. These stages included input/service supply, production, marketing/processing, and retailing.

At the producer level, seven organized farmer focus group discussions (FGDs) were conducted with between 15 and 50 farmers per group. In addition to organized FGDs, key informant interviews with several individual farmers and one traditional leader were conducted. Three interviews with cattle traders, eleven abattoirs, and two slaughter slabs were conducted at marketing/processing stage. Interviews were also conducted with 11 informal and formal butcheries. Lastly, the personnel in Ministry of Agriculture and Livestock's Department of Veterinary provided valuable information regarding the overview of the beef production and marketing within the respective districts.

The quantitative data used in the analysis comes from two national representative surveys. The survey data include Supplemental Surveys (SS) of 2008 and the 2012 Rural Agricultural Livelihoods Survey (RALS). Both surveys were conducted by the Food Security Research Project and Indaba Agricultural Policy Research Institute (FSRP and IAPRI respectively) in collaboration with Central Statistical Office (CSO) and MAL.

Figure 3. Map Showing Zambia and the Districts where Interviews Were Conducted

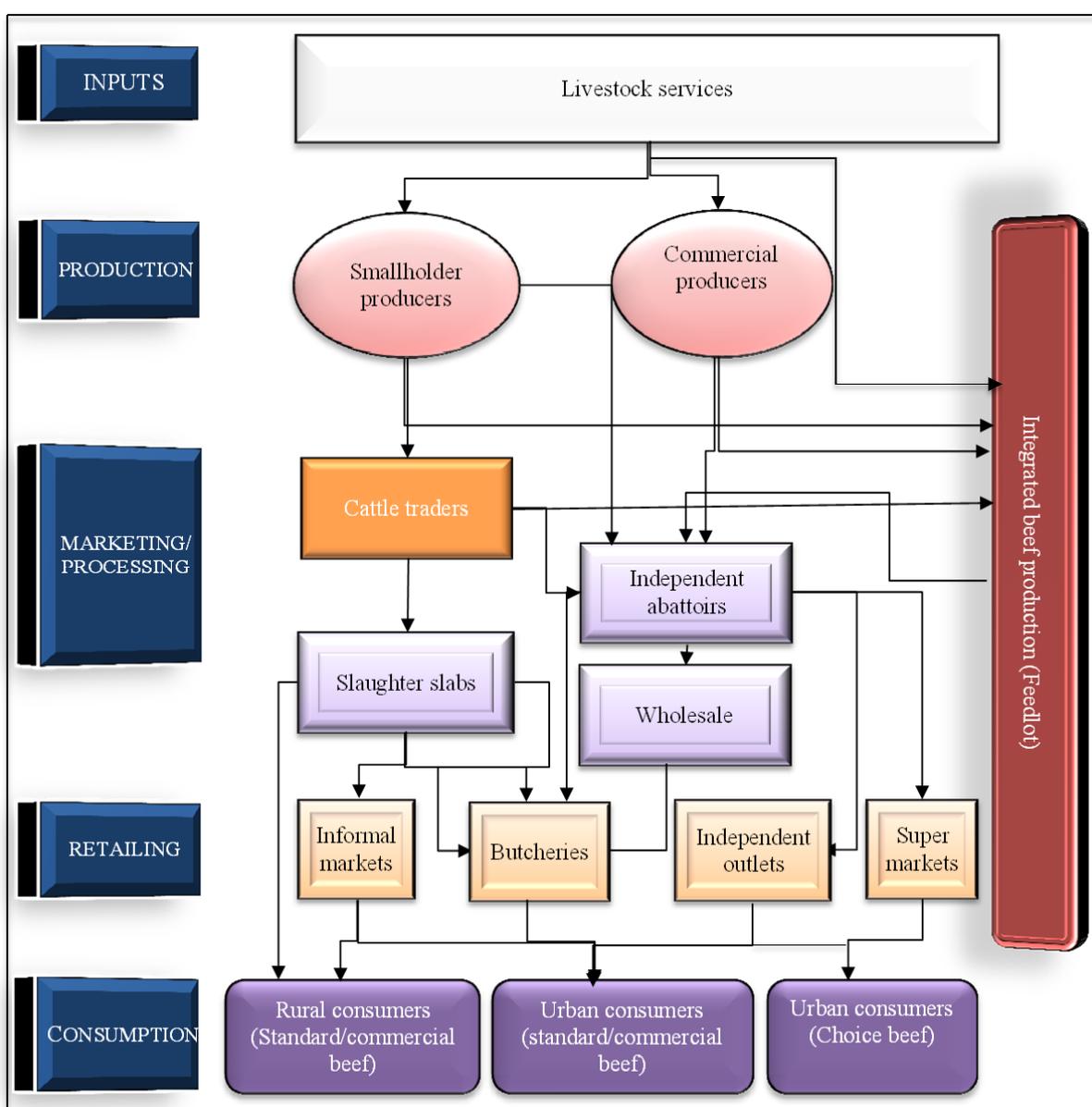


Source: Author's Design.

3. MAPPING AND DESCRIPTION OF THE BEEF VALUE CHAIN

This section presents and discusses the beef value chain map. The value chain map is a visual representation of the connections of all the stages and actors involved in a beef industry. Mapping the beef industry provides an understanding of the process and different channels through which beef moves from producers until it reaches the final consumers. The value chain analysis highlights the importance of each channel in linking smallholders to markets, the challenges, and potential leverage points. From the information gathered through field visits, the beef industry takes the shape as presented in Figure 4. The beef value chain consists of five key stages: input/service supply, production, marketing/processing, retailing, and consumption. We discuss each stage of Figure 4 in the subsequent sections.

Figure 4. Beef Value Chain Map



Source: Authors.

4. INPUT AND SERVICE SUPPLY

Feed, water, and animal health services are the most important smallholder livestock production inputs. If cattle production has to increase, then there is need to address the challenges associated with provision of these inputs and services. In this section, we discuss access to cattle feed and water as well as health services.

4.1. Feed and Water

Vegetation from communal lands and crop residues on harvested fields provide the main feed resource for Zambian smallholder cattle producers. During the rainy season, there is significant amount of pasture. However, farmers lack skills to harvest and conserve the pasture for use during the dry season. In the dry season, the pasture is depleted and only overgrown grasses are available. The over-mature grasses are characterized by low nutrient content, high fiber content, low digestibility, and low voluntary intake by animals (Tolera and Abebe 2007). In most cases, the poor quality grazing grass is burnt by fire, which makes the problem even worse. Therefore, cattle suffer a seasonal nutritional stress that leads to cyclic growth of cattle. The cattle gain weight during pasture availability and lose weight in dry season. This, in turn, leads to a reduction in the value of cattle in the dry season. Though the prices are relatively higher during this period, the loss is due to lean carcass (less body fat) criteria used to determine the price (further discussion in the marketing section). In addition, seasonal fluctuations in weight and slow annual weight gain resulting from limited dry season feed supplementation contribute to delayed onset of estrus in cows. Consequently, smallholder cows tend to be older when they begin reproducing and have fewer calves during their lifetime than animals with access to sufficient dry season feed. These challenges underscore the importance of improving dry season supplemental feeding to improve cattle herd performance. Therefore, providing training in forage management such as hay making and pasture improvement would contribute to alleviation of feed shortages in the dry seasons and maintaining a healthy herd year in and year out.

Water is another important input in cattle production. It is a major component of the cattle body weight and driver of all metabolic activities of the body. Ayalew, Duguma, and Tolemariam (2013) find that access to sufficient water can pose a challenge in cattle rearing areas. Due to the scarcity of watering holes, cattle are often required to move long distances in search of water areas and are often watered at longer intervals¹. This, in turn, inhibits weight gain. In addition, according to information gathered during field visits, cattle and people frequently use the same water points. This not only poses significant human health concerns, but also undermines access to water for human consumption especially in high cattle producing areas. Therefore, one way of addressing this challenge is investing in water stations that both animals and people can access.

4.2. Extension Service Delivery

Extension service delivery is another important aspect in the development of livestock production. These services include provision for animal husbandry and animal health management. In Zambia, the government through the veterinary and livestock development departments is, by and large, the main provider of cattle extension services to the farmers. However, the livestock extension service delivery remains limited when compared with the

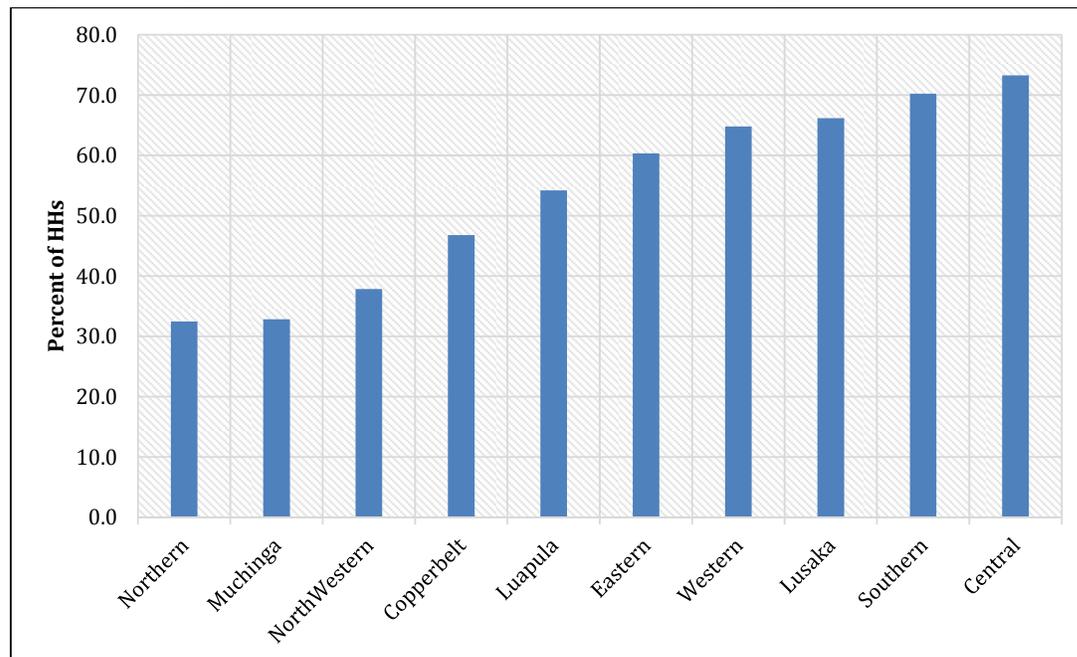
¹The recommended watering interval is at least two days for effective performance of cattle (Kefenie and Zarate 2015). However cattle can tolerate a watering interval of three to four days (Ayalew, Duguma, and Tolemariam 2013).

crop production sector. Government gives priority to the crop sector as reflected in the low number of veterinary assistants and the large size of veterinary extension camps compared to agricultural camps. In some districts, the veterinary camps do not have veterinary assistants. For example, at the time of field visits, Choma District had 16 veterinary camps compared to 27 agricultural camps, and only half of the veterinary camps in the district were manned by the veterinary assistants. This hampers veterinary service delivery especially with the current effort of the government to reduce the Foot and Mouth (FMD) and corrido diseases through the vaccination campaigns. In addition, most veterinary assistants do not have transport, which exacerbates the problem of service delivery.

4.3. Prevalence of Cattle Diseases

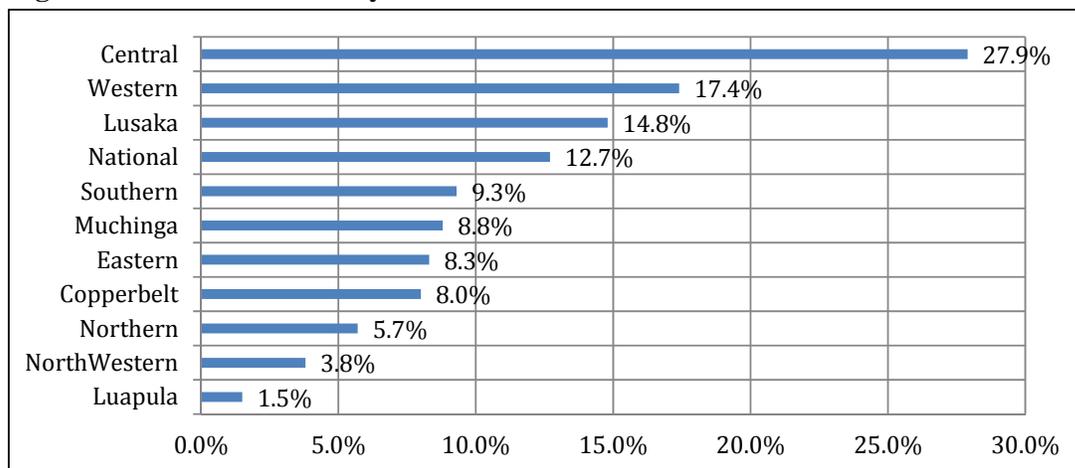
Disease outbreak is one of the major issues that leads to under investments in the cattle supply chain. At national level, over 60% of smallholder owning cattle indicate that their cattle have been affected by diseases (Lubungu and Mofya-Mukuka 2012). Although all the major cattle producing regions are affected by outbreaks (Figure 5), the type and severity of disease outbreak vary from district to district. The information gathered through the field visits show, for example, that FMD and Corridor are the major diseases that affect cattle in Choma District (Southern Province), while anthrax is common in Kaoma District (Western Province). Other diseases common in Western Province are hemorrhagic septicemia (HS) and Black Quarter (BQ). In addition, about 1 out of 50 animals suffer from corrido disease and 1 out of 25 suffers from East Coast Fever (ECF). Furthermore, the cattle mortality rates due to diseases are very high compared to commercial sector. Based on RALS data, it is estimated that out of 1000 cattle, 127 (12.7%) die due to diseases at national level (Figure 6) compared to 2% under commercial sector. In Western, Central, and Lusaka, the mortality rate is higher than national average.

Figure 5. Geographical Distribution of Households Reporting Cattle Diseases



Source: IAPRI/CSO/MAL RALS 2012.

Figure 6. Livestock Mortality Rates due to Disease



Source: IAPRI/CSO/MAL RALS 2012.

4.3.1. Effects of Disease Outbreaks and Vaccination Campaigns

Outbreaks of diseases such as FMD, corrido, Contagious Bovine Pleura Pneumonia (CBPP) and anthrax affect the inter-provincial trade of live animals. As a result, farmers are forced to restrict their sales within home provinces. This in turn severely limits their available market options. In most cases farmers opt to sell to local butcheries and fellow farmers in their communities at lower prices than would be the case if they could engage in formal market channels for live animals.

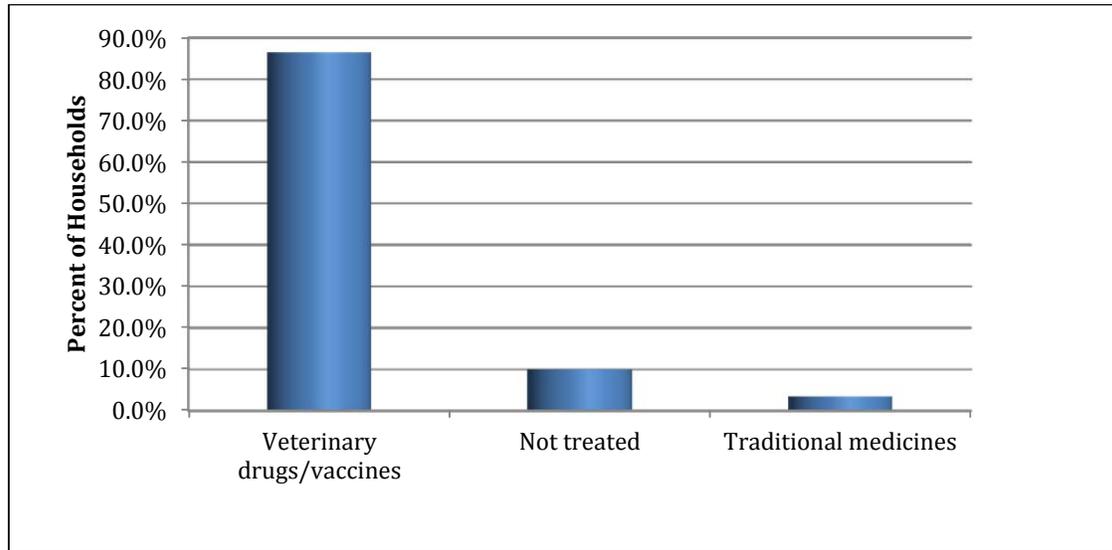
According to the Livestock Development Policy, the government's policy focus is to support the control of diseases that have of national economic importance. These are diseases of an epidemic nature and have transboundary (regional/international) significance.² Otte, Nugent, and McLeod (2004) highlight FMD, CBPP, and Rinderpest (RP) as some of the significant transboundary diseases affecting cattle production. As part of the efforts to contain the outbreak of FMD and CBPP, the government, under the Livestock Development and Animal Health Project, funded by the World Bank has been conducting vaccination campaigns to contain FMD and CBPP. The project targets producers in Eastern, Southern, Western, Central, Lusaka and parts of Copperbelt Provinces. Under this program, farmers pay ZMW15 per dose towards the vaccination of each calf against FMD, while CBPP vaccine is free. As per Livestock Development Policy, other cattle diseases such as anthrax, BQ, and HS are the responsibility of farmers. There is awareness among smallholders of the importance of using veterinary drugs/vaccines in cattle disease management, as evidenced Figure 7. The results show that over 80% of farmers at least use veterinary drugs and only 10% do not.³

² Transboundary animal diseases are epidemic diseases which are highly contagious or transmissible and have the potential for very rapid spread, irrespective of national borders, and they cause serious socio-economic and possibly public health consequences.

³ Despite the awareness on the importance of using veterinary medicines, the number of calves being vaccinated is low. Based on discussions with District Veterinary Officers, all the districts do not meet the targeted number of calves to be vaccinated. For example, in 2014 Kalomo District vaccinated 8,700 out of 15,000 in the first round and 3,270 calves in the second round. The first round is between April to June and second round October to November.

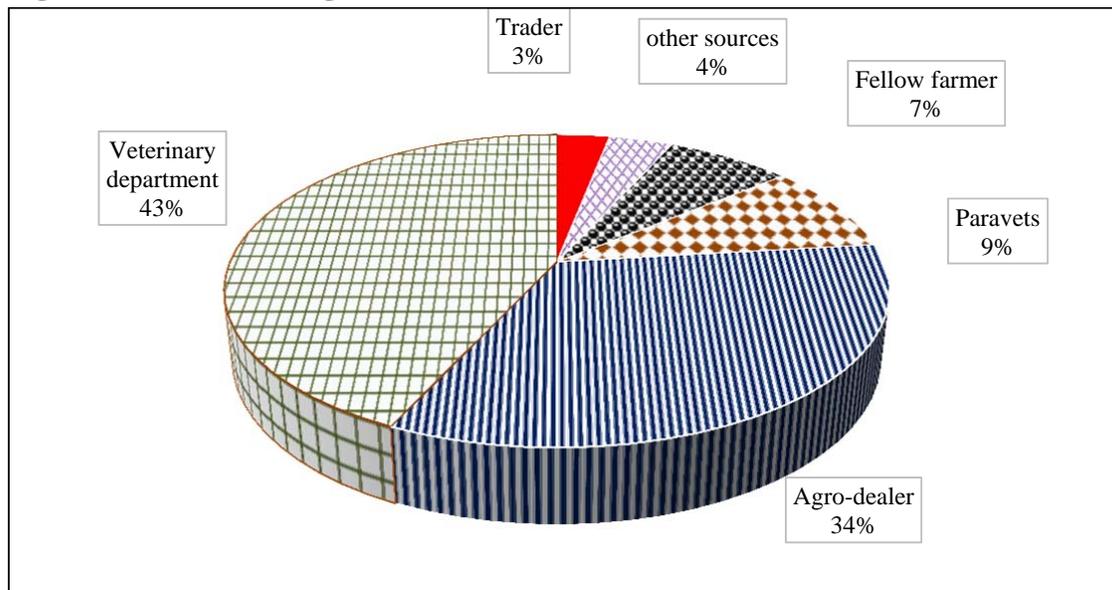
Of these, about 43% depend on veterinary department to access vaccines or drugs, while an additional 34% use private agro-dealers (Figure 8). Even though the drugs are readily available in the agro-dealer shops, the farmers cited long distances to these shops as a major constraint. Lubungu and Mofya-Mukuka (2012) show that famers have to cover 30 km on average to access services provided by agro-dealers. This highlights the need to further support the development of agro-dealers within the rural areas.

Figure 7. Methods of Disease Control



Source: IAPRI/CSO/MAL RALS 2012.

Figure 8. Sources of Drugs and Vaccines



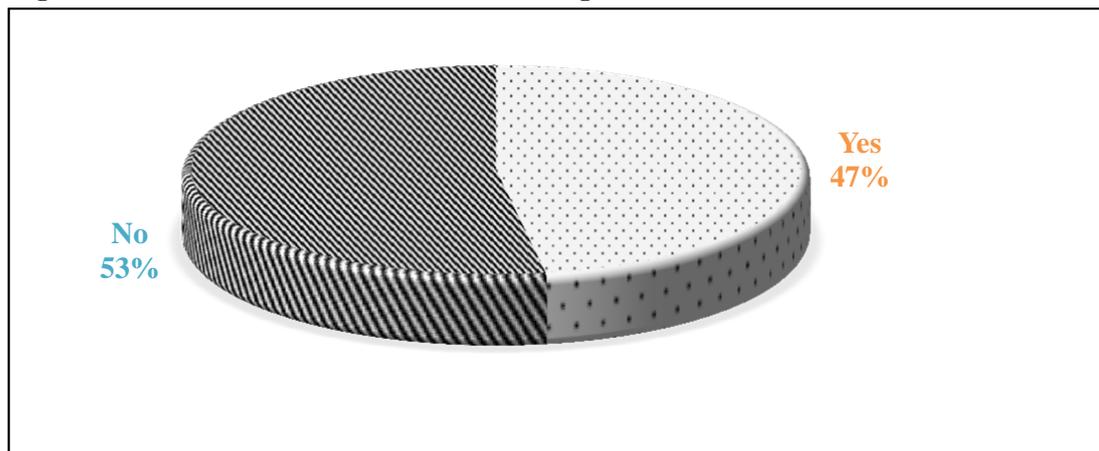
Source: IAPRI/CSO/MAL RALS 2012.

4.3.2. Other Health Problems

Other major cattle health problems apart from FMD, corrido, anthrax, and CBPP are parasites, with liver fluke and giant worms being the major internal parasites, and ticks the major external parasite that cause BQ, HS, and Trypanosomiasis in certain areas. According to livestock health management practice, it is recommended that farmers deworm their cattle at least twice in the year—once at the beginning and again at the end of the each rainy season. However, Figure 9 shows that more than half of the households raising cattle do not deworm them. Worm infestation has negative effects on the market value of cattle due to unthriftiness.⁴ Moreover, field visits revealed that over 70% of the liver, especially from cattle reared in the plains, are condemned due to liver fluke. This substantially lowers the value of cattle being sold, since liver has high demand on the retail market.

Ticks are also a source of concern in cattle production, as they transmit numerous diseases. They cause anemia, weight loss, and death, which in turn affects commercialization. There are several ways of controlling ticks, but dipping of animals is the most effective. Figure 10 however, shows that less than 20% of cattle owning households dip their animals. Farmers attributed this to non-availability of functional dip tanks in rural areas. As a result, over 40% of famers use spraying as the second best alternative method of tick control and about 30% do not control for ticks at all. Although spraying is the best alternative method of tick control, experts within the Ministry of Agriculture and Livestock indicated that spraying is not particularly effective for farmers with larger heads of cattle. This is because animals are not entirely sprayed and the use of multi-purpose knapsack sprayers poses a risk of drug contamination. Therefore, there is a need to invest more in infrastructure such as dip tanks and review the dipping policy in each region.

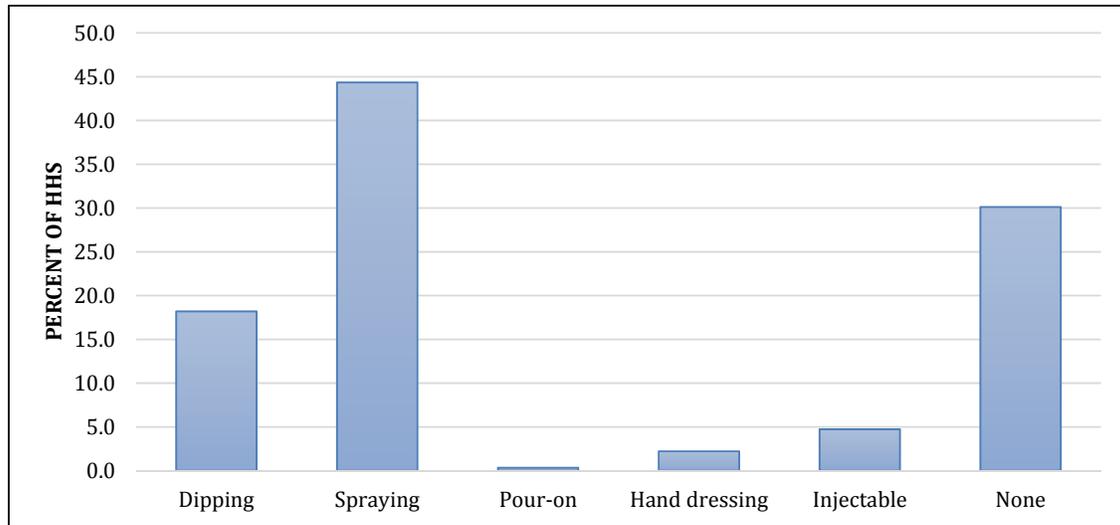
Figure 9. Percent of Households De-Worming their Cattle



Source: IAPRI/CSO/MAL RALS 2012.

⁴ Unthriftiness is the failure to grow or put on weight as well as expected in the presences of adequate quantity and quality of feed and in the absence of overt clinical signs of illness. (<http://medical-dictionary.thefreedictionary.com/unthriftiness>)

Figure 10. Method of Tick Control



Source: IAPRI/CSO/MAL RALS 2012.

4.4. Challenges of Service Delivery

The provisions of animal health services have several challenges. First, the vaccination campaigns are conducted by qualified veterinary personnel. Therefore, the limited number of veterinary personnel coupled with lack of transport at camp level hampers the delivery of health services. In addition, lack of livestock service centers in most rural areas makes it difficult to centrally conduct vaccinations. Second, the information flow to farmers is poor due in part to uncertainty by the veterinary officers as to when they would actually receive the vaccines. Storage of vaccines is also a major problem due to lack of cold storage facilities. Lastly, some farmers do not want to pay for the services.

5. CATTLE PRODUCTION

Cattle are produced by both commercial and smallholder farmers. However, smallholder farmers raise about 80% of Zambian cattle population. Between 2001 and 2012 the national smallholder herd has added over 600,000 animals (Table 1). Even though cattle are reared across the country, a large share of national cattle population is located in Southern, Western, and Eastern Provinces; this pattern has remained stable over time. Cattle are also fairly prevalent in Central Province, while they play a comparably marginal role in the rest of the provinces.

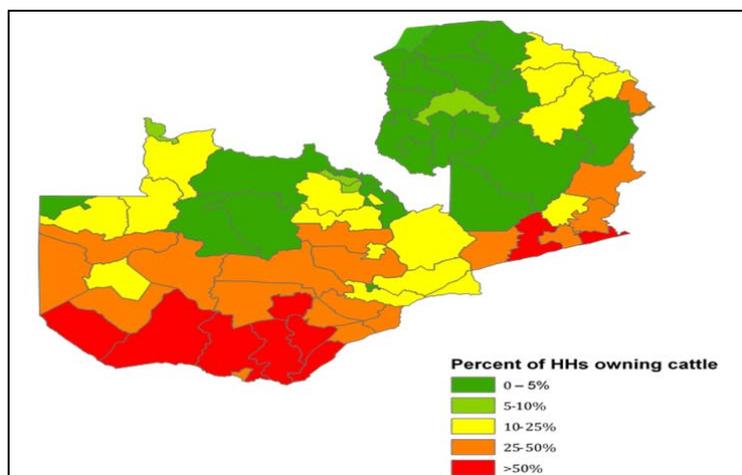
When smallholder cattle ownership is mapped (Figure 11) at a district level we see that in much of southern, western, and eastern Zambia more than 25% of households own cattle. That figure drops-off significantly in the northern and northwestern parts of the country. The geographic location of animals however, has less to do with the ecological viability of cattle production in other parts of the country and more to do with specific cultural motivations in high cattle rearing areas. These regionally specific motivations, in many ways, shape the ways in which markets for smallholder cattle evolve.

Table 1. Distribution of Cattle over Time

	Year	
	2001	2012
National herd	1,489,728	2,162,357
Provincial (%)		
Central	10.2	12.6
Copperbelt	2.3	2.0
Eastern	25.3	20.4
Luapula	0.3	0.7
Lusaka	1.8	3.9
Muchinga	4.8	3.8
Northern	2.8	2.3
N/western	2.1	2.4
Southern	28.8	39.7
Western	21.7	12.0

Source: IAPRI/CSO/MAL RALS 2012; CSO/MACO/FSRP 2001.

Figure 11. Geographical Distribution of Households Owning Cattle



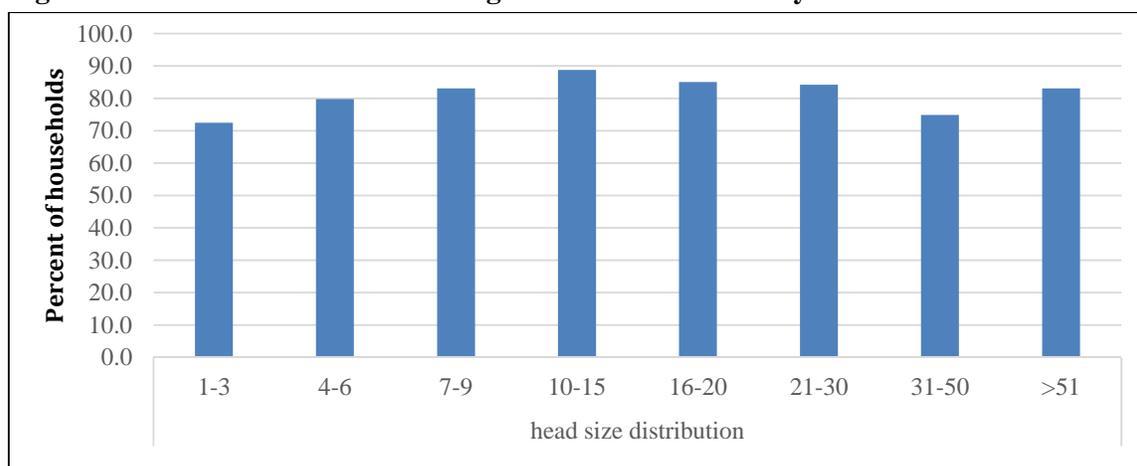
Source: IAPRI/CSO/MAL RALS 2012.

5.1. Cultural and Economic Motivations of Rearing Cattle

Smallholder farmers keep cattle for various reasons and these tend to shape how farmers respond to markets. During farmer FGDs, the following were highlighted as the main reasons for keeping cattle:

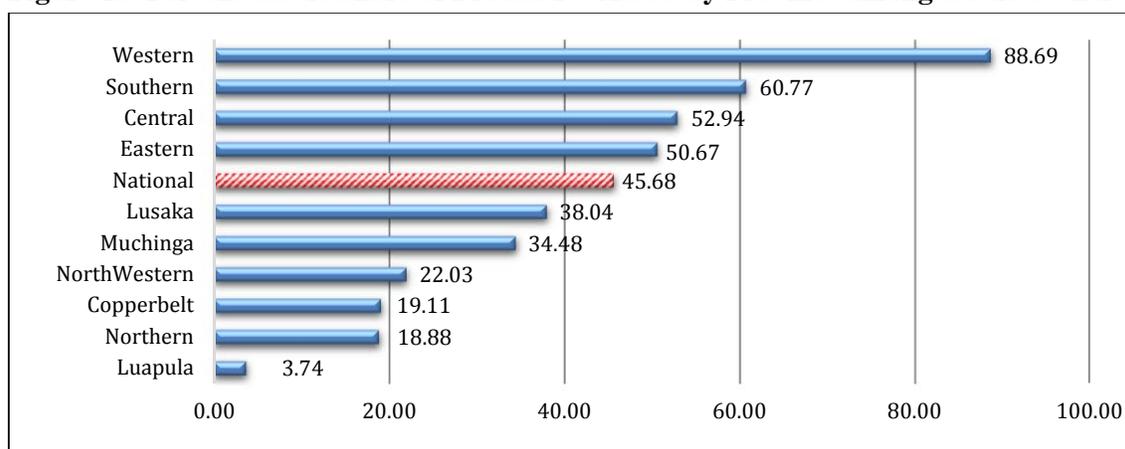
- 1) Cattle are an important source of draft power and transportation. Statistics show that over 70% of smallholder farmers who own cattle use animal draft power (Figure 12).
- 2) Cattle act as a moving bank from which farmers only draw in times of need, such as payments of school fee, medical bills, and purchasing of farming inputs and in some cases as a symbol of wealth. Based on 2012 RALS data, the mean cattle national share of total productive assets at household level among cattle owners was 45.7% (Figure 13). However, households owning cattle in Southern, Western, Central, and Eastern Provinces have cattle accounting for more than 50%. In addition, in Western Province, close to 90% of all productive assets are cattle.
- 3) Traditional uses, including payment in traditional court cases, payments to traditional witch finders when they want to establish the cause of death of a family member, and as dowry payment.

Figure 12. Percent of Household Using Animal Draft Power by Herd Size



Source: IAPRI/CSO/MAL RALS 2012.

Figure 13. Percent Cattle Share of Productive Assets by Province among Cattle Owners



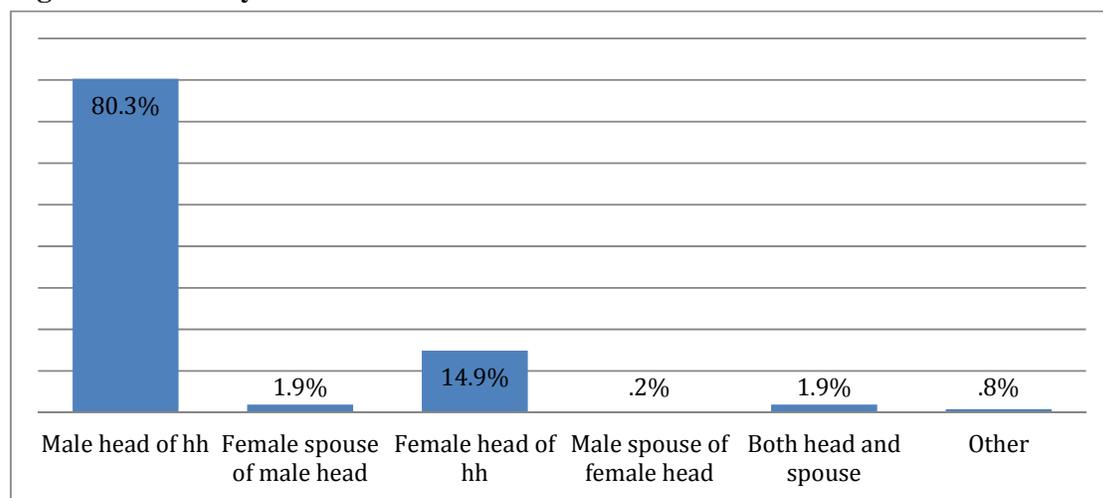
Source: IAPRI/CSO/MAL RALS 2012.

A common refrain heard from actors in the Zambian beef market is that traditional cattle owners do not consider cattle as a commercial enterprise; they do not consider it a business. The pervasiveness of this discourse requires a critical examination. According to farmer discussion, farmers perceive cattle to be a safer store of value than money. One reason for this is that there are numerous social proscriptions on sales and transfers, which protect cattle owners from parting with their animals when pressured by needy family members. Conversely, there is significant expectation that those with cash or food crops will support family members in need. In general, traditional cattle owners only convert cattle to cash when truly pressing needs arise. As such, most of the cattle are sold between December and February. During this period, producers buy farming inputs for the coming season, school fees are paid, and household food supplies often dwindle.

As mentioned earlier, cattle play an important role in dowry payments and other traditional transactions. These transactions are conducted by families or clans, not between individuals. As such, cattle ownership in many of the major cattle producing regions of Zambia is rarely a straightforward matter. Cattle acquired through dowry or *damage* (i.e., fees for elopement) payments are owned by multiple members of extend families. As a result, the decision to sell one of these animals, or its progeny, requires significant family deliberation. This is not a straightforward individual profit maximization decision. Indeed in most cases, animals acquired through these traditional channels are only sold to deal with a specific types of problems, such as those related to children’s health and education.

Because of these traditional exchange systems, cattle being raised by a household may have multiple owners within and outside of the household. An important dimension of this phenomenon is that in matrilineal societies, such as the Tonga of Southern Province, women frequently own cattle independently of their husbands. However, despite owning cattle separately, women are rarely able to sell animals without permission from their husbands or brothers. As shown in Figure 14, about 80% of male household heads are the primary decision makers as to whether the cattle should be kept or sold. In part, this is because women are thought to be holding these animals for future use by their children.

Figure 14. Primary Decision Maker of Whether or not to Sell Cattle



Source: IAPRI/CSO/MAL RALS 2012.

While cattle producers are well aware that cattle prices move seasonally and are consistently highest shortly after the harvest, cultural norms surrounding ownership and surrounding cattle marketing decisions severely constrain the commercialization potential of cattle and contribute to the distinct seasonal pattern of cattle marketing observed in Zambia. Because cattle are often only sold to address specific types of family needs, which are highly seasonal, cattle producers routinely sell at the bottom of the market. Ideally, cattle should be sold in their prime condition around March and May as opposed to December when they are at their wasted condition.

5.2. Socio-Economic Characteristic of Cattle Producers by Herd Size

As shown in Table 2, herd size ownership at a household level is closely associated with a number of socio-economic characteristics. Larger herd sizes are associated with higher levels of education for the household head, and more importantly with the highest level of education of any household member. Thus, more educated household heads appear to invest in and accumulate larger herds, while also investing in the education of their family members. Because cattle sales for payment of school fees is an acceptable social practices, it is likely that cattle owning households are better able to invest in the educational needs of future generations.

Table 2. Characteristics of Cattle Owning Households by Herd Size

	Herd Size Distribution							
	1-3	4-6	7-9	10-15	16-20	21-30	31-50	>51
Household size	5.76	6.29	6.92	7.07	7.64	7.78	7.47	9.37
Education level of HH head (years)	5	6	6	7	7	7	7	8
Maximum education level by any adult in the prime age (years)	7	8	8	9	9	10	9	11
Total land holding size (ha)	3.29	4.47	4.77	5.22	5.88	8.50	9.75	9.47
Value of assets/AE (ZMW)	2,015	3,466	6,886	12,237	14,782	16,015	20,959	55,488
Gross income/AE (ZMW)	3,412	2,847	4,240	4,654	5,848	7,132	7,603	95,307
Crop share (%)	69.59	66.92	63.85	66.96	56.38	49.91	43.62	43.21
Livestock share (%)	9.27	12.72	12.25	13.64	19.81	21.45	34.04	36.99
Off farm share (%)	21.14	20.35	23.90	19.40	23.81	28.64	22.34	19.80

Source: IAPRI/CSO/MAL RALS 2012.

Note: HH=household, AE=adult equivalent.

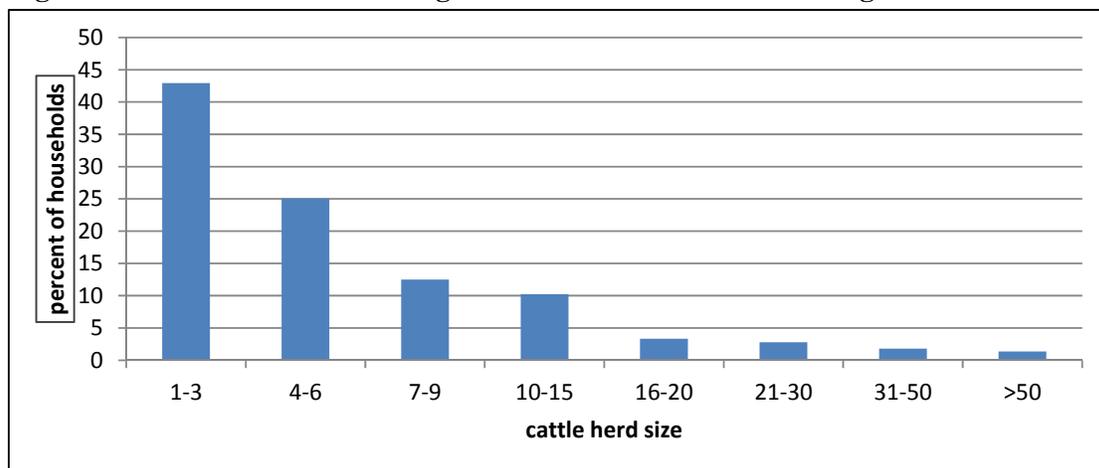
The physical asset endowments, such as land, are critical for cattle production. Table 2 shows a positive association between land and herd sizes. Studies in India and semi-arid area of Bangladesh have also found similar results (Turner 2004; Rahman et al. 2001). Despite the positive association, communal land ownership tends to negate this trend. Therefore, in the context of customary land, large land holdings in Africa are more likely to reflect higher socio-economic status and social power.

Table 2 also shows a positive relationship between household income and herd size. Higher incomes may have contrasting effects on production and marketing. On one hand, higher income may give farmers more buying power, and hence, the ability to acquire additional stock. On the other hand, higher income may discourage farmers from selling their cattle to meet their daily needs and production costs, which may in turn increase their existing herd as they use the extra income to buy additional cattle. It is also worth noting that the share of crop and livestock income moves in opposite directions as the herd size increases. Households with smaller head sizes tend to depend on crop production income. However, the share of livestock income moves in the same direction with household income, suggesting that livestock production has greater effects on rural poverty reduction.

5.3. Smallholder Cattle Ownership and Commercialization

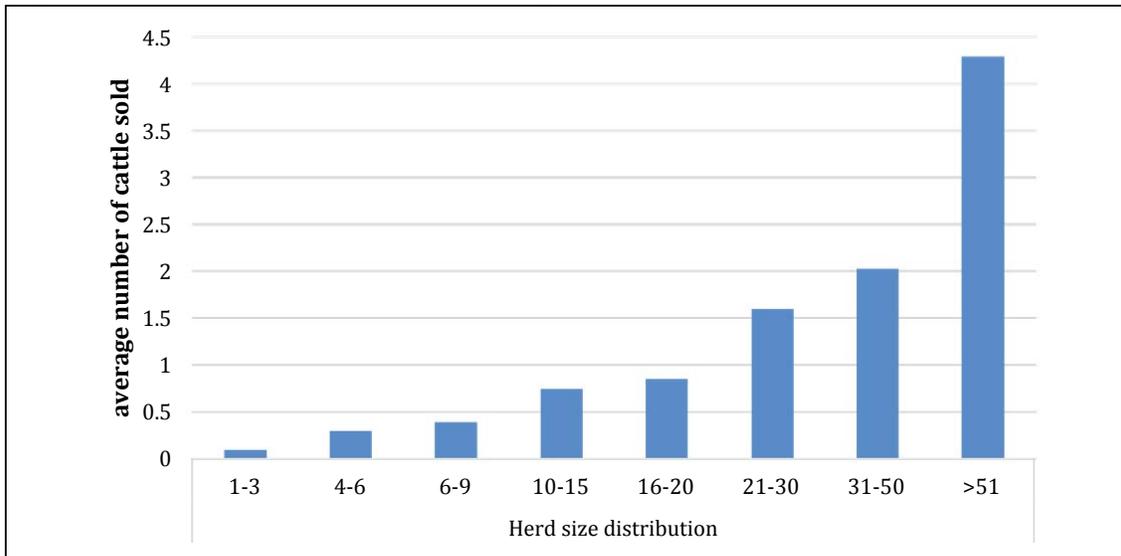
Does cattle herd size affect commercialization? Results in Figure 15 show that over 80% of smallholder households raising cattle own less than 10 cattle and only less than 10% own more than 20 cattle. Figure 16 further shows a positive association between herd size and the level of commercialization. This suggests that small herd sizes limit cattle commercialization as there is limited number of animals to sell in a given year. Therefore, coping with factors that affect the herd size will improve the willingness of farmers to sell cattle. The factors include, among others, low productivity and high mortality rates due to diseases. If we consider the calving interval as a measure of productivity, studies have shown that the reproductive performance of beef cattle under smallholder sector is less than 40% compared to over 80% under the commercial sector (Nowers, Nobumba, and Welgemoed 2013). Sikhweni and Hassan (2014) propose investments in farmers’ education to create awareness of new innovations and practices in breeding and veterinary services as some of the potential investments that could assist farmers in expanding their herds

Figure 15. Cattle Herd Size among Smallholder Households Raising Cattle



Source: Lubungu and Mofya-Mukuka 2012.

Figure 16. Herd Size and Cattle Marketing

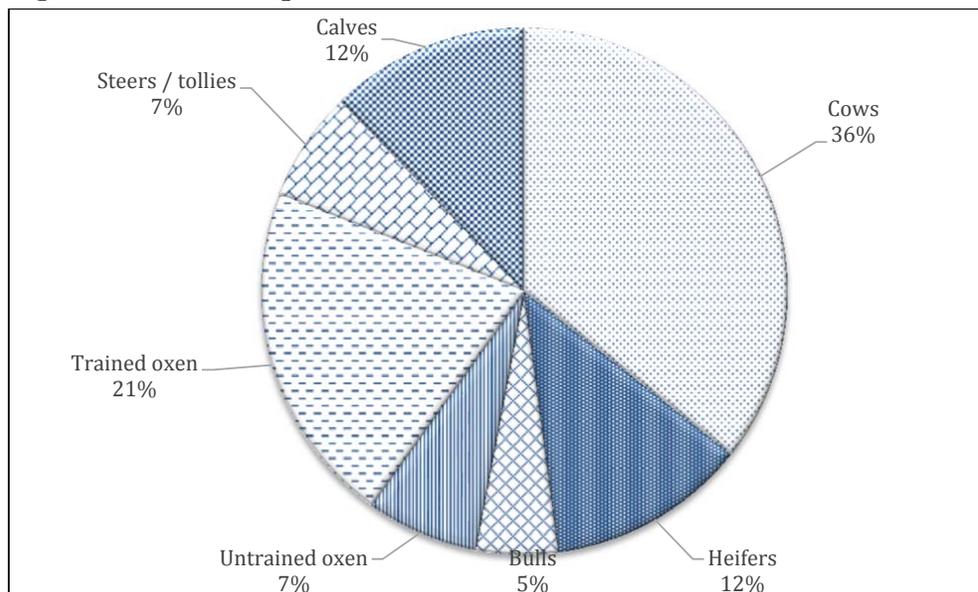


Source: IAPRI/CSO/MAL RALS 2012.

5.4. Herd Composition

Herd composition is an important factor in cattle commercialization. In most cases, farmers sell old oxen and old bulls/cows that have reached the non-productive stage and as shown in Figure 17, oxen and cows take up 28% and 36% respectively of the overall herd size. Oxen are held for four to five years or more to supply draft power before they are sold. Since farmers only sell old animals, this tends to limit commercialization, as there are only a limited number of animals available within a herd that can be sold. In addition, keeping an animal for that period before slaughter may be at a higher risk of dying than selling weaners (less than a year) or steers (1 to 2 years).

Figure 17. Herd Composition



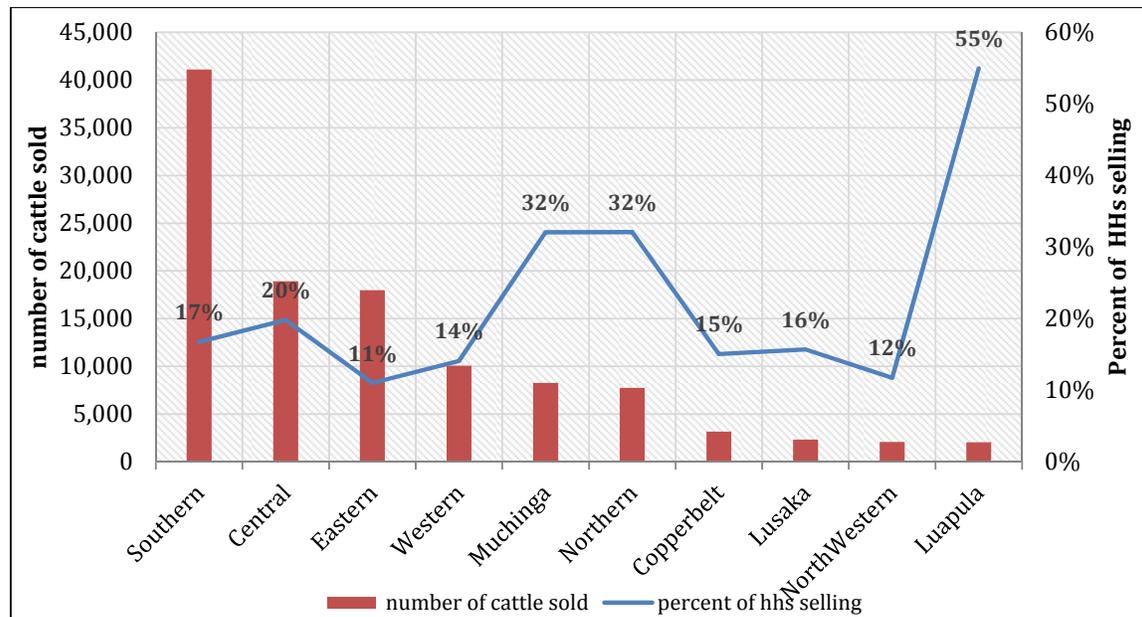
Source: CSO/MACO/FSRP 2008.

Lack of deliberate herd management tailored for commercial sales plays a significant role in limiting commercialization of the smallholder beef sector. Ideally farmers should maintain a targeted breeding stock from which offspring are selected for replacement bulls and heifers and training as oxen, with the remainder earmarked for sale when they have grown to an appropriate age/weight for income. But smallholder farmers in communal land system usually do not consider such practices that increase the value of cattle.

5.5. Concentration of Commercialization

Cattle commercialization follows the same trend as regional distribution of cattle owners. Figure 18 shows that Southern Province leads in terms of the number of cattle offloaded on the market. This is followed by Central, Eastern, and Western Provinces. However, there are a limited number of smallholders participating in markets. For instance, in Southern Province only 17% of cattle owning households participate in the markets. The small herd sizes discussed earlier explain, in part, the highly concentration of commercialization as only household with large herds participate in markets.

Figure 18. Geographical Distribution of Cattle Sales



Source: IAPRI/CSO/MAL RALS 2012.

6. BEEF MARKETING/ PROCESSING

There are three main channels that smallholder beef may follow from the farm level until it reaches the retail market. The first market channel is through the small-scale beef traders operating in rural areas. The second channel operates in commercial farm areas, where commercial feedlots acquire weaned cattle from smallholders to fatten, and the third channel is direct producer sales to abattoirs. In this section we discuss each channel, how the cattle prices are determined, financial profitability, and lastly perform a sensitivity analysis.

6.1. Small Scale Traders

This marketing channel tends to be highly seasonal, with traders intensifying their efforts in the rural areas during the months of September and October. This is the period when roads remain passable and smallholders seek income sources to purchase crop inputs and other household requirements. The number of traders varies across the districts. There are few traders in districts where the abattoirs are well established. For example, there are three abattoirs in Monze District and the operators of abattoirs themselves act as traders. However, traders are important in providing an alternative market for farmers in areas where there is no presence of abattoirs, for example in Chibombo District.

The cattle trader's buying procedure is like any other traders in other value chains. They often set up camp within the villages and transactions are on cash basis as well as bartering. Barter is common especially in years following droughts or poor yields. They have no specific standards that they look for apart from the body size of an animal. The weights are estimated visually as they do not have live weight scales. On average, a trader in Chibombo sells 40 to 60 cattle per month when business is good and 10 to 12 cattle per month in slack periods.

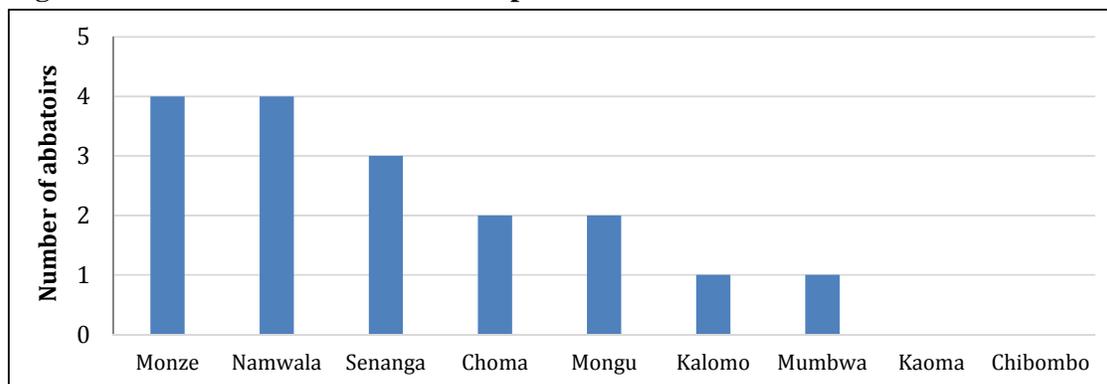
There are three main destinations for cattle purchased by traders and this depends on the location. First, traders frequently opt to sell live cattle to abattoirs within the province where live cattle movement is restricted due to disease control procedures. Alternatively, they slaughter and hire refrigerated trucks and supply butcheries in Lusaka or Copperbelt. In regions where livestock movement is not restricted, as in Chibombo District, traders sell live cattle in the Copperbelt specifically at Chingola abattoir, with some of the beef ending up in the Democratic Republic of Congo (DRC). During data collection, prices in Chingola were ZMW22/kg dressed weight and ZMW27/kg live weight. These prices are higher than Lusaka (ZMW18/kg dressed weight). According to the traders, the higher prices on Chingola are due to a substantial market for beef from the DRC.

6.2. Feedlots

The second channel operates in commercial farm areas. The commercial feedlots acquire weaned cattle of about 250 kg live weight, from both commercial and smallholders, to fatten. They fatten the steers in the feedlots for about 90 days until they attain a weight of 400 kg. The choice beef that forms the 20% of beef production is produced under this marketing channel. The live weight price is ZMW12/kg, which is higher than ZMW9/kg for standard beef cattle.

As the name (choice beef) suggests, farmer have to meet certain management standards. The steers have to be healthy, disease and parasite free. They have to be properly branded and ear tagged, and vaccinated against the all the diseases prevalent within the region. Given these management specifications, coupled with farmer preference to sell old oxen, feedlots face several challenges with the acquisition of steers.

Figure 19. Number of Abattoirs in Sampled Districts



Source: Author's field notes.

6.3. Abattoirs

The final market channel is direct producer sales to abattoirs. Abattoirs form the main local marketing channel for producers in FMD and CBPP infected areas, where live animals cannot be exported by traders to non-infected zones. Livestock movement restriction and the cost of compliance associated with it have fueled growth in the number of abattoirs in disease zones in Southern and Western Provinces. According to the information gathered during field visits, as of April 2015 there were at least one to four registered slaughtering facilities in each of the districts that were visited (Figure 19).

Apart from buying cattle from farmers, some abattoirs also provided a third party slaughtering service to traders and local butcheries at a fee. In addition, large feedlots such as Zambeef own their own abattoirs and have vertically integrated up to wholesale or retail level. Figure 20 shows slaughtered cattle carcasses at an abattoir in Choma.

In some districts, municipal or private rural slaughter slabs form part of the processing stage (Figure 21). Slaughter slabs are mostly linked to local butcheries that slaughter according to their expected sales volume. The smallest butcheries in the remotest areas may even slaughter animals illegally in an open field.

Figure 20. Slaughtered Cattle at an Abattoir



Source for this and the following pictures: Mary Lubungu.

Figure 21. Municipal Slaughter Slab



These slaughter facilities are inspected by Department of Veterinary Services and Health Inspectors from either local government or Ministry of Health. However, these slaughter facilities can be a source of serious health concerns (Figure 21). The inadequate sanitary controls at these facilities means that producers and traders in these areas are unable to direct their beef into more formal market channels.

6.4. Marketing Procedures

Before the animals are sold to the abattoirs or traders, there are procedures that famers have to follow. First, the village headmen inspect cattle to ascertain the rightful owner. Next, Zambia Police Service issues the anti-stock theft clearance. Then, the personnel from MAL’s Department of Veterinary Services conduct a physical inspection as well as a pregnancy diagnostic inspection on the cows. Only healthy and non-pregnant animals are cleared for trade/slaughter.

Figure 22. Offal Inspection at the Abattoir



Offal (liver, heart, lungs, intestines, the four stomachs, tongue, and esophagus) on the floor are condemned.

Once the cattle are slaughtered, the carcasses and the offal are inspected by health inspectors from either the local authority or Ministry of Health and all the condemned ones are discarded, as shown in Figure 22. On average, over 80% of the offal are condemned, thus reducing the overall sales value of the animal.

At each stage of the inspection, farmers pay for the services rendered with the amounts varying from district to district. The details of service fees—price determination and gross margin analysis—are discussed under the next subsection.

Figure 23. Transporting Cattle Carcass by a Local Butcher



Larger meat processors transport carcasses from abattoirs in refrigerated trucks to urban areas such as Lusaka and the Copperbelt where the most organized cold storage system is in place and the meat is cut into portions as well as processed into other meat products such as mince and sausages. Small local butchers, however, transport meat from the abattoirs directly to the butchery in vans as shown in Figure 23.

6.5. Choice of the Buyer and Price Determination

As discussed earlier, there are three marketing choices available for the farmers with the abattoirs being the main marketing channel. In cases where there are more than one abattoir in the district, farmers' preference for the buyer depends on the price, payment terms, and the extent to which they are comfortable with the weighing scales used. The abattoirs buy cattle either live or dressed. The prices for both live and dressed weight vary from buyer to buyer. Whichever form the animal is sold in, the price per kilogram is normally quoted. The buyers set the price of cattle based on weight and/or quality as indicated by the presence of fat on a carcass. The presence of fat is determined by subjective visual examination. The meat with fat is referred to as standard beef while the one with less fat is termed as commercial beef. The commercial meat attracts a lower price than the standard meat. For example, the prices of dressed cattle at one of the abattoirs were ZMW17.00/kg for standard beef with a carcass weight of less than 140 kg; ZMW18.00/kg for standard beef weighing more than 140 kg; and ZMW16.50/kg for commercial beef regardless of the weight. This kind of pricing was more common in Southern Province. In Western Province all smallholder beef is considered commercial thereby attracting a lower price (ZMW14.00/kg).⁵ The prices vary throughout the year depending on the availability of cattle. The prices are relatively high from September to November as very few farmers sell during this period. They are relatively low between January and February when many distress sales occur and between August to September when the animals are thin due to less pasture and disease pressure.

6.6. Gross Margin Analysis

Based on the prices and costs obtained at the time of field visits, we assess the financial profitability of cattle at farmer, abattoir, and retail levels. In the computation of gross margins, we take an average dressed carcass weight of 237.5 kg of a fully-grown non-productive ox (6 years of age) excluding the skin and hides as well as the offal set. The carcass weight is based on the average actual weights obtained from farmers and abattoirs during field visits. To raise an ox to a weight of 237.5 kg, we factor in the production costs that mainly include vaccines and drugs. We assume that the farmer follows all health management techniques, such as deworming and dipping the animal twice in a year, vaccination against FMD every year at a government-subsidized rate, and vaccination against hemorrhagic septicemia (HS) and Black Quarter (BQ). We also assume that the animal falls sick at some point and is given some antibiotics. The production costs are presented in Table 3 part A.

The marketing costs presented in Table 3 part B are also based on the actual district averages obtained from the field. Despite the choice of the buyer, the costs associated with marketing are: headman clearance, loading bay fee (in areas where they have a loading bay), council levy, transport, veterinary inspection, healthy inspection, and police anti-stock theft clearance. Stock movement within the district is usually free, but there is a fee if cattle have to move to another district. Table 3 shows the costs of marketing and production of one animal; it further breaks down the gross margin computations by factoring in the price of cattle per kg as well as production and marketing costs. Table 4 presents the gross margin estimations for abattoirs and local butcheries.

Given the marketing and production parameters, we compute the net positive gross margin of raising one ox to be ZMW 3,207. This equals 338% of the total costs excluding all other non-market functions such as provision of animal draft power that the ox could have contributed

⁵ According to the abattoirs operating in Western Province, the lower price of beef is attributed to the poor quality of beef obtained from the Barotse breed, which is common in Western Province.

to the livelihood of the farmer. The gross margins at abattoir and butchery level are equally positive. The cattle market, therefore, seems profitable. So price incentives do not appear to be a major limiting factor in smallholder cattle commercialization. However, farmers perceive prices to be low and question reliability of the scales. Other limiting factors cited by farmers during field visits include too many marketing charges coupled with a lack of marketing centers, which they perceive to increase the transaction costs.

Table 3. Smallholder Farmer to Abattoir Gross Margin for One Ox

A. Production Costs			
	Unit cost /animal (ZMW)	Frequency	Total (ZMW)
Drugs/vaccines			
Dewormer	3	12	36
Dip	15	12	180
Buterex (antibiotic)	190	1	190
Oxyject (antibiotic)	30	6	180
HS (vaccine)	3	6	18
BQ (vaccine)	3	6	18
ECF (vaccine)	15	6	90
Total			712
B. Marketing Costs			
Parameters	Unit cost /animal (ZMW)		
Transport	192		
Police anti-stock theft	21		
Veterinary clearance	8		
Council/health inspection	16		
Total	237		
C. Gross Margins per ox			
Total Cost (A+B)	ZMW/animal		
Production	712		
Marketing	237		
Total costs	949		
D. Revenue			
Carcass weight	237.5		
Price (ZMW/Kg)	17.5		
Market value of cattle	4,156		
Average Return (D-C)	3,207		
% Return on Total Costs	338		

Source: Field notes-Authors computations.

Table 4. Abattoir/local Butcheries to Retailing Gross Margins for One Ox

Item	Value by player		
	Abattoir Wholesale	Abattoir own retail outlet	Rural local Butcheries
Costs			
Buying price (ZMW/Kg)	17.50	17.50	17.50
Carcass weight (Kg)	237.5	237.5	237.5
Transport (ZMW/animal)			40
Total cost (ZMW)	4,165.25	4,165.25	4,196.25
Revenue			
Selling price (ZMW/Kg)	19	28	29
Carcass weight	237.5	237.5	237.5
Revenue (ZMW)	4,512.50	6,650.00	6,997.50
Margin per animal (ZMW)	357.25	2,484.75	2,691.25
%Margin per total costs	8.3	59.7	64.1
Comment	Sales turnover very high	Some processing done adding value to sales	It takes about 5 days to sell one animal

Source: Field notes-Authors computations.

6.7. Sensitivity Analysis

Since the price and weight of animal vary substantially within Zambia and throughout the year, we, therefore, subject the finding to a sensitivity analysis. This not only helps to check robustness of our findings that cattle production has meaningful positive returns, but will also help to highlight the potential intervention areas. Table 5 shows sensitivity analysis by computing the gross margins with the worst and the best case scenarios. Under the pessimistic scenarios, we use the lowest price or carcass weight that was reported while for the optimistic scenario we used the highest price or weight.

Table 5. Sensitivity Analysis

Scenario Summary	Base Values	Pessimistic		Optimistic	
Changing variables					
Price (ZMW/kg)	17.50	<i>14.00</i>	17.50	<i>18.50</i>	17.50
Carcass weight (kg)	237.5	237.5	<i>150</i>	237.5	<i>250</i>
Result					
Market value of cattle (ZMW)	4,156	3,325	2,625	4,394	4,375
Average return (ZMW)	3,207	2,376	1,676	3,445	3,426
%Return on total cost	338	250	177	363	361

Source: Field notes-Authors computations.

Note: Changing parameter are in italics.

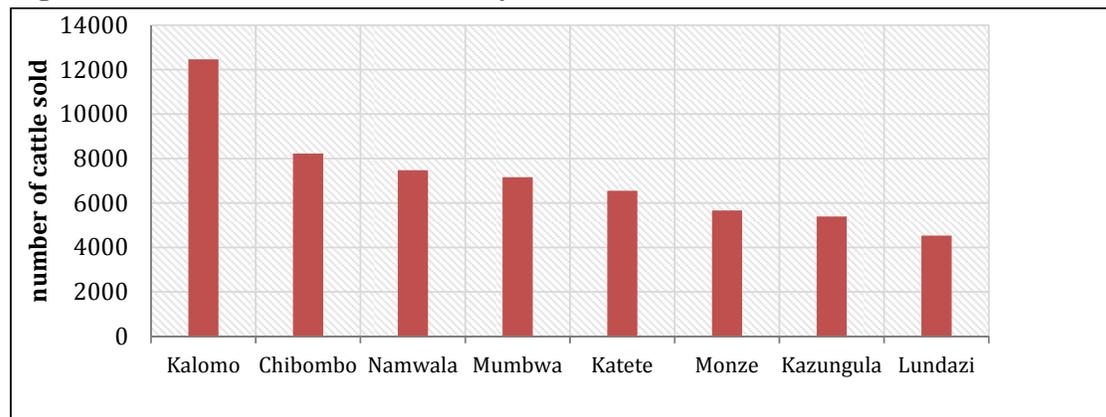
The lowest and highest prices of beef carcasses were ZMW14.00/kg and ZMW18.50/kg respectively. Similarly, the lowest and highest ox carcass weights were 150 kg and 250 kg respectively. Comparing the effect of price and carcass weight of the pessimistic case on the average returns, our model show a reduction of 88% and 161% in the percentage average return on costs when price and weight reduces to ZMW14.00/kg and 150 kg respectively. However, under the optimistic situation, the percentage increase in the average return between price and weight is marginal. Given that prices are determined by the buyer, it is less likely that prices might change. Therefore, the carcass weight improving interventions would have a great impact on the livelihood of livestock producers.

6.8. Limiting Factors Contributing to Underinvestment

The traders and abattoirs face cattle supply challenges. Supply of cattle is low between September and December for reasons described above. In addition, the traders operating in livestock movement restricted areas face regulatory and transportation challenges. None of the traders interviewed had their own refrigeration trucks. They claim that the cost of hiring refrigeration trucks is relatively high when the supply is low. In Monze for example, hiring a truck costed ZMW1,400 per trip. Second, they have to hire cold rooms at the point of sell. On the other hand, traders dealing in lives animals, as is a case of Chibombo (with no abattoir), face challenges of doing business when there is a livestock movement ban. As shown in Figure 24, Chibombo is the second leading district in terms of cattle traded after Kalomo. In case of an outbreak, over 8,000 cattle are at stake unless a disease procedure testing is undertaken. The whole process of testing cost ZMW30 per animal at the time of field visit. This adds to the traders’ costs and reduces the number of cattle purchased. In addition, the traders face some losses when cattle are condemned by health inspectors at the point of sale once they are slaughtered. Reduction in traded volumes affects the number of cattle filtering through the value chain, hence, the low supply pushes the retail prices up. This in part explains the seasonal price variations observed in the beef consumer prices.

The second limiting factor is lack of market segmentation. The Zambian beef market is currently segmented between standard beef produced by smallholder farmers, and choice beef produced primarily by commercial farmers and fattened in feedlots. In this market structure, all the beef from smallholder farmers is categorized as standard which is further categorized as standard and commercial based on the presence of fat, though this was not the case in some regions.

Figure 24. Number of Cattle Traded by District

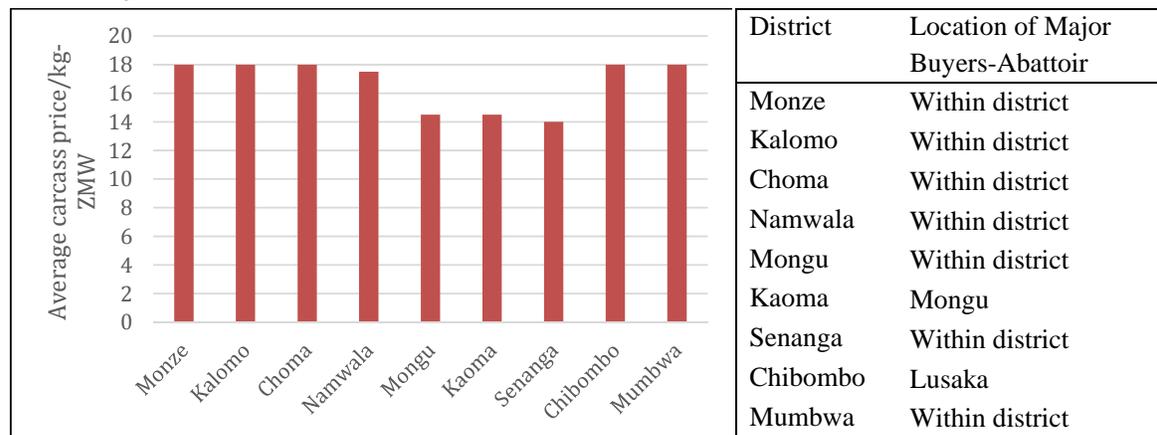


Source: IAPRI/CSO/MAL RALS 2012.

For example, all the meat in Western Province was considered commercial beef regardless of quality and weight. This could be attributed to little understanding of what constitutes quality. As discussed earlier under the gross margin estimation, the commercial meat fetches a lower price. At the time of the field visits, the price for commercial beef in all the visited districts in Western Province was ZMW14.00/kg. This is about 30% less than what farmers sold their cattle for in Southern Province (Figure 25). Another interesting finding is that there is no price variation for standard beef in Southern Province and Lusaka. One would expect higher prices in Lusaka, a *beef consuming area*, compared to Southern Province, a *producing area*. Farmers in Chibombo sell their cattle in Lusaka. Therefore, the lack of quality and price variations in the standard beef sector leads to substantial underinvestment in herd management and limits commercialization.

Other challenges affecting marketing of beef cattle include, multiplicity of intermediaries leading to increased charges and shades the transparency of the beef trading, adverse macroeconomic conditions, lack of institutional support, infrastructure constraints such as marketing centers, and lack of business skills on part of the famers.

Figure 25. Average Dressed Price/Kg Reported by Farmers (ZMW) and Location of Main Buyer



Source: Author's field notes.

7. RETAILING

The retail market is comprised of small butcheries, independent retail outlets including minimarts, and the rapidly growing sector of supermarkets. In our study districts, we found a range of three to seven butcheries within the rural districts. In addition, most of the feedlot/abattoir operators have integrated further down the value chain and sell beef directly to consumers through their own retail outlets, not only in urban areas but also in some rural districts. They also supply the supermarkets within and outside urban areas like Lusaka and Copperbelt. For example, at the time of field visits, Zambeef supplied ninety of its own retail shops and twenty-one Shoprite chain stores that exclusively sell Zambeef meat products.

8. CONCLUSION AND RECOMMENDATIONS

Production and commercialization of cattle have significant potential of generating income for smallholder farmers and contributing to rural poverty reduction. Our finding from gross margin analysis suggests that cattle commercialization yields a positive net income. However, smallholder cattle marketing still remains highly seasonal. In light of the foregoing discussion the following recommendations are proposed:

Cultural and economic motivations surrounding ownership and marketing decisions severely constrain the commercialization potential of cattle and contribute to the distinct seasonality of cattle marketing observed in Zambia. Cattle are often only sold to address specific types of family needs, which are highly seasonal, thus, cattle producers routinely sell at the bottom of the market. This is because cattle perform various non-market functions such as security and asset functions, which to some extent reflect weak or missing financial institutions. Therefore, investment in financial institutions in rural areas is one of the options to increase sales when prices are high.

Cattle management and herd composition limits the commercialization. The tendency of farmers selling old oxen, which have ceased to perform non-market functions, limits the number of cattle available for marketing and investment in improved management. Small herd size also limits the number of marketable surplus. Therefore, coping with factors that affect the herd size, such as low conception rates and disease management, will improve the willingness of farmers to sell cattle. Extension training on animal husbandry such as forage management should be emphasized. Investments in water stations that both animals and people can access will improve herd management by reducing the long distances that animals walk in search of water. Extension agents should also educate farmers on the importance of maintaining a targeted breeding stock from which offspring are selected for training as oxen, and replacement bulls and heifers with the remainder earmarked for sale when they have grown to an appropriate age/weight for income.

Disease outbreaks and regional quarantines impede investment in the cattle market. Disease outbreaks affect the number of cattle traded through formalized channels as farmers opt to sell through non-formal markets with limited health inspections. This reduces the number of cattle filtering through the value chain and, thus, limits the downstream investments. Regional quarantines also affects inter-provincial trade thus affecting the traders who sell live animals. The government and other stakeholders, therefore, should significantly expand investments in cattle health management to eradicate the diseases that affect cross provincial trade. This calls for strengthening of veterinary services, by improving the veterinary-extension-farmer ratio.

Lack of smallholder beef market segmentation limits smallholder commercialization. Uniform pricing for smallholder cattle in some regions, to some extent, inhibits commercialization within the smallholder cattle sector, as this discourages farmers from investing in herd improving practices. Lack of proper cattle management practices, in turn, limits the number and quality of marketable surplus cattle. In order for farmers to increase the investment in herd management, the beef traders should segment the smallholder beef cattle pricing and offer premium prices.

Overarching all of these recommendations is the need for increased and sustained public sector investment to support smallholder cattle production and marketing, including investments in physical infrastructure, knowledge creation through research and development, and knowledge dissemination through improve extension service delivery.

REFERENCES

- Ayalew, T., B. Duguma, and T. Tolemariam. 2013. Smallholder Cattle Production Systems in Three Districts of Ilu Aba Bora Zone of Oromia Regional State, South Western Ethiopia. *American-Eurasian Journal of Scientific Research* 8.1: 38–46.
- Central Statistical Office (CSO). Various Dates. Monthly Price Data. Lusaka: CSO. <http://www.zamstats.gov.zm/gen/monthly.php>.
- Central Statistical Office (CSO). 2005. Living Conditions Monitoring Survey 2004. Lusaka, Zambia: CSO.
- Central Statistical Office (CSO). 2011. Living Conditions Monitoring Survey Report, 2006 and 2010. Lusaka, Zambia: CSO.
- Central Statistical Office, Ministry of Agriculture and Cooperatives, and Food Security Research Project (CSO/MACO/FSRP). 2001. First Supplemental Survey to the 1999/2000 Post-Harvest Survey Data. Lusaka, Zambia: FSRP.
- Central Statistical Office, Ministry of Agriculture and Cooperatives, and Food Security Research Project (CSO/MACO/FSRP). 2008. Third Supplemental Survey to the 1999/2000 Post-Harvest Survey Data. Lusaka, Zambia: FSRP.
- Costales, A., C.L. Delgado, M.A. Catelo, M. Lapar, et al. 2006. *Scale and Access Issues Affecting Smallholder Hog Producers in an Expanding Peri-Urban Market: Southern Luzon, Philippines*. IFPRI Research Report No. 151. Washington, DC: International Food Policy Research Institute.
- Delgado, C.L. 2003. Rising Consumption of Meat and Milk in Developing Countries Has Created a New Food Revolution. *The Journal of Nutrition* 133.11: 3907S–3910S.
- Delgado, C., M. Rosegrant, H. Steinfeld, S. Ehui, and C. Courbois. 1999. *Livestock to 2020: The Next Food Revolution*. IFPRI Food, Agriculture, and the Environment Discussion Paper No. 28. Washington, DC: International Food Policy Research Institute.
- Gabre-Madhin, Eleni. 2009. *A Market for All Farmers: Market Institutions and Smallholder Participation*. CECA Working Paper Series No. AfD-0903. Berkeley, CA: University of California Center of Evaluation for Global Action.
- Hichaambwa, M. 2012. *Urban Consumption Patterns of Livestock Products in Zambia and Implication for Policy*. Indaba Agricultural Policy Research Institute Working Paper No. 65. Lusaka, Zambia: IAPRI.
- IAPRI/CSO/MAL. 2012. Rural Agricultural Livelihood Surveys of 2012. Lusaka: IAPRI and Government of Zambia.
- Kefenie, K.K. and A.V. Zarate. 2015. Importance of Livestock Production in Tropical Agriculture-Roles and Functions of Livestock. Semester 2015/2016 Lecture Notes, Institute of Animal Production in the Tropics and Subtropics, Animal Breeding and Husbandry in the Tropics and Subtropics (480a) Module 4801-450 Livestock Production Systems and Development. University of Hohenheim.
- Key, N., E. Sadoulet, and A. de Janvry. 2000. Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics* 82.2: 245–259.

- Lamy, E., S. van Harten, E. Sales-Baptista, M.M.M. Guerra, and A.M. de Almeida. 2012. Factors Influencing Livestock Productivity. In *Environmental Stress and Amelioration in Livestock Production*, ed. Veerasamy Sejian, S.M.K. Naqvi, Thaddeus Ezeji, Jeffrey Lakritz, and Rattan Lal. Berlin, Heidelberg: Springer-Verlag.
- Lapar, M.L, G. Holloway, and S. Ehui. 2003. Policy Options Promoting Market Participation among Smallholder Livestock Producers: A Case Study from the Philippines. *Food Policy* 28:187–211.
- Livestock Data Innovation in Africa. 2014. Business and Livelihoods in African Livestock Investments to Overcome Information Gaps. Washington, DC and Rome: The World Bank and the Food and Agriculture Organization of the United Nations. Accessed February 2015 at <http://www.fao.org/3/a-i3724e.pdf>.
- Lubungu, M. and R. Mofya-Mukuka. 2012. *The Status of the Smallholder Livestock Sector in Zambia*. Paper submitted to the Parliamentary Committee on Agriculture. IAPRI Technical Report No. 1. Lusaka, Zambia: IAPRI. <http://www.iapri.org.zm/templates/iapr/pdf/Final%20Report%20-%20Livestock%20Status%20in%20Zambia.pdf>
- MAL, IAPRI, World Bank, UNZA, et al. 2012. Livestock Sector in Zambia for Economic Growth and Poverty Reduction an Analysis. Ministry of Agriculture and Livestock Report. Lusaka, Zambia: Ministry of Agriculture and Livestock.
- McCullough, E.B., P.L. Pingali, and K.G. Stamoulis. 2008. Small Farms and the Transformation of Food Systems: An Overview. In *The Transformation of Agri-Food Systems: Globalization, Supply Chains, and Smallholder Farmers*, ed. E.B. McCullough, P.L. Pingali, and K.G. Stamoulis. UK: Taylor and Francis.
- Muhammad, A., J.L. Seale, B. Meade, and A. Regmi. 2011. *International Evidence on Food Consumption Patterns: An Update Using 2005 International Comparison Program Data*. USDA-ERS Technical Bulletin No. 1929. Washington, DC: USDA. Accessed April 2015 at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2114337.
- Nowers, C.B., L.M. Nobumba, and J. Welgemoed. 2013. Reproduction and Potential of Communal Cattle on Sourveld in the Eastern Cape Province, South Africa. *Applied Animal Husbandry and Rural Development* 6: 48–54.
- Otte, M.J., R. Nugent, and A. McLeod. 2004. *Transboundary Animal Diseases: Assessment of Socio-economic Impacts and Institutional Responses*. FAO Livestock Policy Discussion Paper No. 9. Rome, Italy: Food and Agriculture Organization.
- Rae, A. and R. Nayga. 2010. Trends in Consumption, Production, and Trade in Livestock and Livestock Products. In *Livestock in a Changing Landscape, Volume 1 – Drivers, Consequences, and Responses*, ed. H. Steinfeld, H.A. Mooney, F. Schneider, and L.E. Neville. Washington, DC: Island Press.
- Rahman, S.M.R., S. Hashan, M.D. Shahjahan, and S. Islam. 2001. The Ownership of Livestock in Relation to Land Holding in the Semi-arid Area of Bangladesh. *Journal of Biological Sciences* 1.10: 960–962.
- Reardon, T. and J.A. Berdegue. 2002. The Rapid Rise of Supermarkets in Latin America: Challenges and Opportunities for Development. *Development Policy Review* 20.4: 371–388.

- Reardon, T., D. Tschirley, M. Dolislager, J. Snyder, et al. 2014. Urbanization, Diet Change, and Transformation of Food Supply Chains in Asia. East Lansing, MI: Global Center for Food Systems Innovation.
- Reardon T. and C.P. Timmer. 2014. Five Inter-linked Transformations in the Asian Agrifood Economy: Food Security Implications. *Global Food Security* 3.2: 108–117.
- Regoverning Markets. 2008. *Farmer Innovation–Linking with Modern Agrifood Markets*. Conference Issue Paper No. 4. Paper prepared for the international conference Inclusive Business in Agrifood Markets: Evidence and Action, 5-6 March. Beijing, PR. Accessed December 2014 at <http://pubs.iied.org/pdfs/G03303.pdf>.
- Seale, James Jr., Anita Regmi, and Jason Berstein. 2003, *International Evidence on Food Consumption Patterns*. USDA Technical Bulletin No. 1904. Washington, DC: US Department of Agriculture. Accessed April 2015 at http://www.ers.usda.gov/media/285613/tb1904_1_.pdf.
- Sikhweni, N.P. and R. Hassan. 2014. Determinants of Herd Size among Small-scale Cattle Farmers: The Case of Selected Villages at the Mhinga Traditional Authority in Limpopo, South Africa. *Agrekon* 53.4: 106–122.
- Steinfeld, H., H.A. Mooney, F. Schneider, and L.E. Neville, editors. 2013. *Livestock in a Changing Landscape, Volume 1: Drivers, Consequences, and Responses, Executive Summary*. Washington, DC: Island Press.
- Tolera, A. and A. Abebe. 2007. Livestock Production in Pastoral and Agro-Pastoral Production Systems of Southern Ethiopia. *Livestock Research for Rural Development* 19.12: 4–7.
- Tschirley, D., T. Reardon, M. Dolislager, and J. Snyder. 2014. *The Rise of a Middle Class in East and Southern Africa: Implications for Food System Transformation*. World Institute for Development Economics Research Working Paper No. 2014/119. Helsinki, Finland: United Nations University. WIDER.
- Turner, Robin L. 2004. *Livestock Production and the Rural Poor in Andhra Pradesh and Orissa States, India*. Pro-poor Livestock Policy Initiative Working Paper No. 9. Rome: FAO, PPLPI.