

THE PERFORMANCE OF UDSML IN RELATION TO PORK VALUE CHAIN IN TAMALE METROPOLITAN AREA

A research project submitted to Van Hall Larenstein - University of Applied Sciences in partial fulfilment of the requirements for the Master's Degree in Agriculture Production Chain Management with specialization in Livestock Chains



By

ERIC DADE AFARI

SEPTEMBER 2012



Acknowledgement

My first thanks goes to the Almighty God for his divine protection, strength and guidance during this year of study.

I also wish to express my sincerest gratitude to the Royal Netherlands Government through the Netherlands Fellowship Program for awarding me this scholarship that enabled me to pursue this Course in Agricultural Production Chain Management specialising in Livestock Chains.

Also my appreciation goes to Resie Oude Luttikhuis, my supervisor. I am particularly grateful for her guidance and valuable feedback that helped to shape this report. To Robert Baars, co-ordinator of the master's program I say thank you. I also thank all the lecturers and staff of the University for the wealth of knowledge, skills, experience and support they deposited in me during this course.

To the Principal and staff of Damongo Agricultural College, I say I am most grateful for the wonderful support and encouragement they offered me during my study including the thesis. Finally to Miss Mavis Oppong for your unfailing support, I say thank you and God bless you.

Dedication

This work is dedicated to the Almighty God for successfully seeing me through this course; also to my Dad – Mr L. G. Afari, Mum – Aunty Addobea and siblings – Sam, Nyarkoa, Kofua and Mary who never ceased praying for me and the support, patience, sacrifices and resilience you demonstrated during my absence.

Table of Contents

Acknowledgement	ii
Dedication	iii
Lists of tables	vii
Lists of figures	vii
Acronyms	viii
Exchange rate	viii
Abstract	ix
CHAPTER 1: INTRODUCTION	1
1.1 Background.....	1
1.2 Problem statement.....	3
1.3 Research objective	3
1.4 Research questions	3
1.5 Research methods.....	3
CHAPTER 2 LITERATURE REVIEW ON PIG SECTOR	4
2.1 Review of chains from selected countries	4
2.1.1 Netherlands Pig Chain.....	4
2.1.2 Kenya Pig value chain	4
2.1.3 Ghana - Ejisu District Pig Farmers and Processors Association (EPFA).....	5
2.2 Meat legislation in Ghana.....	6
2.3 Microbial contamination of meat on markets in Tamale.....	7
2.4 Value chain	7
2.5 Chain coordination	8
2.5.1 Mechanisms for chain coordination	8
2.6 Porters Five Force	8
2.7 Sustainability concept	9
2.8 Quality control system.....	10
2.9 Marketing mix	10
2.9.1 Challenges in marketing	11
2.10 SWOT Analysis.....	12
CHAPTER 3 RESEARCH METHODOLOGY.....	13
3.1 The study area.....	13
3.1.1 Access to study area	14
3.1.2 Sample selection and size	14
3.2 Concepts used.....	15
3.3 Tools for analysis of value chains	16

3.3.1 Stakeholder analysis	16
3.3.1.1 Value Chain map	16
3.3.1.2 Value chain actors	16
3.3.1.3 Chain supporters	16
3.3.1.4 Chain influencers	16
3.3.1.5 Information, product and money flow	16
3.4 Research strategy	16
3.4.1 Survey	17
3.4.2 Interviews	17
3.5 Data analysis	18
3.6 Limitations of the study	18
CHAPTER 4: RESULTS	19
4.1 The role of actors in the value chain	19
4.1.1 Input Suppliers	19
4.1.2 Producers	19
4.1.8 Sources of information on production	20
4.1.3 Processors	21
4.1.4 Retailers	22
4.1.5 Consumers	22
4.2 Case study with stakeholders	23
4.3 Chain coordinator	26
4.4 Chain sustainability of UDSML	26
4.5 Farm hygiene	27
4.6 Quality control system	27
4.7 Situational analysis of UDSML and informal chain	28
4.8 SWOT analysis of the pork value chain of UDSML	30
CHAPTER 5: DISCUSSION	31
5.1 What are the reasons for farmer's choice in selling to a particular buyer?	31
5.2 In which ways is meat inspection carried out in the UDSML and the informal chain?	31
5.3 What quality control measures are applied in the pork value chain?	32
5.4 What factors have contributed to the low supply of pigs to the UDSML?	32
5.5 What motivates an actor to sell to a buyer?	32
5.6 Consumer perception on meat quality	32
CHAPTER 6: CONCLUSION	34
CHAPTER 7: RECOMMENDATIONS	35
REFERENCES	36

APPENDICES	40
Appendix 1: Survey questionnaire for small holder pig farmers.....	40
Appendix 2 Check list for transporter / middleman	42
Appendix 3 Check list for processor.....	42
Appendix 4 Check list for retailers.....	43
Appendix 5 Check list for Metropolitan Veterinary Director.....	43
Appendix 6 Data from the field (interview with stakeholders)	44

Lists of tables

Table 1.1 Livestock population.....	1
Table 1.2 Domestic pork production (metric tonne)	2
Table 4.1: Farming system practised.....	19
Table 4.2: Frequency distribution of respondents	20
Table 4.3: Sources of information.....	20
Table 4.4: Practises that enhance pork quality and food safety at the farm.....	21
Table 4.5: Number of pigs, buyer and farm processing.....	22
Table 4.6 Marketing strategy of UDS.....	23
Table 4.7 Supporters and influencers in the chain.....	26
Table 4.8 Quality control measures.....	27
Table 4.9 SWOT analysis.....	30

Lists of figures

Figure 2.1 Netherlands formal pig supply chain.....	4
Figure 2.2: Kenya pig value chain.....	5
Figure 2.3: Ejisu pig value chain.....	6
Figure 2.4 Porters 5 forces with determinants.....	9
Figure 3.1 Map of Tamale area and Ghana.....	13
Figure 3.2: Model chain map of pork value chains.....	15
Figure 3.2 Research framework.....	17
Figure 4.1: An informal pork chain processor	21
Figure 4.2: Processing at UDSML	21
Figure 4.3: Pork on display for consumers	22
Figure 4.4: Chain maps of UDSML and informal value chains.	25
Figure 4.5: Porters forces of UDSML.....	29
Figure 5.1 Processing on a slab.....	29

Acronyms

ASF	Africa Swine Fever
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GNA	Ghana News Agency
GSS	Ghana Statistical Service
HACCP	Hazard Analysis and Critical Control Point
IFAD	International Fund for Agricultural Development
IIRR	International Institute of Rural Reconstruction
KIT	Royal Tropical Institute
MOFA	Ministry of Food and Agriculture
MSVO	Metropolitan Senior Veterinary Officer
NGO	Non-Governmental Organisations
PTLBS	Pong Tamale Livestock breeding station
SRID	Statistical Research and Information Directorate
UDS	University for Development Studies
VSD	Veterinary Service Department

Exchange rate

€1 = GH¢2.5

Abstract

This study attempts to analyse the performance of the University for Development Studies Meats Limited (UDSML) which adapt formal value chain in such a way that it caters for public health, consumer demand and improves producer livelihood and to propose the opportunities available in the informal sector to enhance development of the pork value chain in the Tamale Metropolitan Area.

Tamale, the capital of the Northern region of Ghana is known to be the food basket in the country. The importance of food safety and quality of pork has brought about the establishment of the UDSML in the Tamale Metropolis. Unfortunately, pig producers and middlemen in the metropolis prefer selling pig through the informal chain; without regarding the measures of safety and quality of meat. It is against this background that this study was done to find the reasons why producers prefer selling through to a particular buyer in the pork value chain.

The study used desk study, survey and interview as research strategy for data collection. The desk study was based on literatures on countries with successful formal value chain. The interviews involved eight representatives in both formal and informal value chain, while the survey involved 40 farmers. The analytical tools used were Value Chain Map, Stakeholders Analysis, Porter's Five Forces, Sustainability Concept and SWOT.

The findings revealed why producers prefer informal value chain to the UDSML value chain which has contributed to low performance of the latter. The measures instituted for quality of pork not strictly followed and is a reason for most processors in the informal chain, which do not restrict on safety unlike the formal chain.

Another reason is that the formal chain system is bureaucratic, in terms of payment and other procedures. The study also found that there are no marketing associations to enhance the producers to sell in the formal chain.

The study found out that most of the success behind the other countries formal value chain was strict safety issues and marketing networks and alliances in the formal value chain. There is always a way to formalise the informal chain.

CHAPTER 1: INTRODUCTION

1.1 Background

Ghana is sandwiched between three Francophone countries on the western coast of Africa, sharing boundaries with Togo and Cote d'Ivoire on the east and west sides respectively. It also share boundary with Burkina Faso in the north. The total land area is 230,940 km² and has a population of 24,658,800 million with 50.88% and 49.12% living in urban and rural areas respectively (G.S.S., 2012). The climate is tropical but temperatures vary with season and elevation. The southern part of the country experience two rainy seasons, which is from April to July and from September to November. In the northern part, the rainy season is unimodal and begin from April and last until September. Annual rainfall ranges from 1,100mm in the north to 2100mm in the South West. The climate gives rise to five major agro ecological zones: forest, derived savannah, coastal savannah, guinea savannah and Sudan savannah.

Agriculture is the most important economic sector, employing 59% of the population on a formal and informal basis and the majority are subsistence farmers with low income (Al-Hassan and Diao, 2007; GSS, 2012). Similarly, the poor are mostly found in rural communities and agriculture forms the backbone of these people (MOFA, 2003). Agriculture remains an important means of alleviating poverty. The livestock sector contributes about 40% of the Gross Domestic Product (GDP) of the country and livestock production accounts for an estimated 7% of the agricultural GDP (SRID, 2007; Factbook, 2012).

Livestock rearing plays a major economic, social and cultural role in the livelihoods of small holder farmers, processors and traders. It is a source of protein hence contributes to balanced human nutrition. It acts as a bank and insurance in times of urgent financial needs, since it generates cash income (Holness et al, 2005). It also helps to maintain soil fertility and structure through manure. In addition, livestock provides draught power particularly which enables bullock-owning households to cultivate 60% more land than their neighbours without it (Amu, 2005).

The production of all major livestock types used for human consumption in Ghana increased from 1995 to 2006, except pigs whose population declined steadily due to the outbreak of Africa Swine Fever (ASF) disease in early 1995 and also in 2004 production years (Sarpong, 2009). Most of the pigs were destroyed including their parent stocks as a result. The population however started increasing in 2006 (VSD, 2007). The increase in the pig population may be attributed to re-stocking of affected farms through the assistance of Food and Agriculture Organisation (FAO) (Sarpong, 2009).

Table 1.1 Livestock population ('000)

Type of livestock	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cattle	1,315	1,330	1,344	1,359	1,373	1,392	1,407	1,422	1,438	1,454
Sheep	2,771	2,922	3,015	3,112	3,211	3,314	3,420	3,529	3,642	3,759
Goats	3,199	3,230	3,560	3,925	3,923	3,997	4,196	4,405	4,625	4,855
Pigs	312	310	303	297	290	477	491	506	521	536
Poultry	22,032	24,251	26,395	28,727	28,386	34,030	37,038	39,816	43,320	47,752

Source: MoFA, Facts and Figures, Accra. 2011

Statistics provided by MOFA (2011) suggested a total of 112,067 tons of domestic meat production which comprise cattle 18%, sheep 15%, goat 17%, pig and poultry 16% each. The total quantities of domestic pork production are given in the table 1.2 below.

Table 1.2: Domestic pork production (metric tons)

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
9,653	10,416	10,181	9,979	9,744	16,027	16,498	17,002	17,512	18,062

Source: MoFA, *Facts and Figures*, Accra. 2011

Private sales are the most common marketing methods among small-scale producers in the Tamale Metropolis. One or more pigs are sold to local consumers, other producers, butchers or middlemen. The pigs are sold live and the price is generally subject to negotiation. This system has the advantage of being the simplest, but in rural areas, individuals who are not aware of current prices can be taken advantage of by buyers (Holness et al., 2005).

Despite the role pig plays in the livelihood and the contribution to protein intake, pork can be a source of food-borne illnesses under unhygienic conditions in which they are handled, slaughtered, processed, transported and sold on the markets. According to Prescott et al (2002) food items especially meat, is not only of high nutritional value to the consumer but is also ideal culture media for microbial growth. It is one of the most perishables and its composition is ideal for the growth of a wide range of spoilage bacteria (Mayr, et al., 2003). Findings from Mukhopadhyay et al. (2009) states that fresh raw meat have been associated with a number of meat borne infections and intoxications. This is as a result of both pathogenic and non-pathogenic organisms living in the gastro-intestinal tract which can be transferred onto the meat under faulty and poor processing conditions.

In the developed countries, there exist strict legal regulations on the hygienic standards of handling and processing of meat. A number of abattoirs and meat processing units operate below the required standards without adequate quality control systems. Transportation of pork to market centres in taxis and motor cycles or bicycles and are sold in the open markets occasionally in sieves and on tables that are not kept clean after work, thus exposing it to a number of microbes some of which may be pathogenic (Adzitey, et al., 2011). Food safety is increasingly becoming an important public health issue and great concern to everybody (GNA, 2005). Consumers are currently putting more demands on the assurance of quality and safety of the food products and their production process (Luning and Marcelis, 2009).

In the rural communities, the standards and hygienic methods of handling and processing meats are given less attention even though they form part of the country's rules and regulations on animal and meat production. For instance, perhaps due to certain constraints such as inadequate education, unavailability of potable water and unreliable power supplier, meat processing is traditionally carried out in unhygienic conditions. Religious beliefs and local customs sometimes dictate slaughtering methods allowing animals to be slaughtered without inspection by qualified veterinary officers (Adzitey, et al, 2011). A lot of slaughtering take place on slabs and in homes and may even exceed officially recorded figures (Clottey, 1985). The public health implications of slaughter facilities and meat from these places are a public concern (Annan-Prah, et al. 2012).

The University for Development Studies Meats Limited (UDSML) was established in 2005 and commenced operations in 2006 with an overall strategy to become the major provider of meat and meat products in the northern part of Ghana. It is the only private abattoir with state-of-the-art facilities that processes and distributes meat and its products. As a result, it is virtually in competition only with itself and therefore taking advantage of the entire existing market to distribute pork of higher quality. The targeted consumers in particular to constitute the pivotal market segment for the products were the elite citizens, Non-Governmental Organisations (NGO), second and third cycle educational institutions. The daily capacity of the unit is 10 cattle, 20 pigs, and 50 sheep or goats. Processed pork meant for restaurants and fast food operators as well as individuals include sausages, bacon and ham.

1.2 Problem statement

Pork in Tamale Metropolitan area is characterized by unhygienic condition as these are done in individual farms with little inspection, if any, checks. The establishment of UDSML was a relief for people that appreciate the value of quality. Meat processing has always been questionable from the manner in which they are handled before it gets to the consumer. However, the supply of animals from producers to UDSML is low and this has led the project to near collapse.

1.3 Research objective

To investigate and analyse the performance of the University for Development Studies Meats Limited (UDSML) which adapts formal value chain in such a way that it caters for public health and propose opportunities available in the sector to enhance development of the pork value chain in the Tamale Metropolitan Area.

1.4 Research questions

Based on the research objective of this study, the following research questions have been formulated.

What are the characteristics of the pork value chain?

- In which ways is pork market value chain organised in Tamale Metropolitan Area?
- What are the reasons for farmer's choice in selling to a particular buyer?
- What are the roles of stakeholders in the chain?
- What factors have contributed to the supply of pigs to the UDSML?

What quality control measures are applied in the pork value chain?

- In which ways is meat inspection carried out in the UDSML and the informal chain?
- What are the different quality control measures in the formal pork chain compared to the informal chain?

1.5 Research methods

The work involved initial research from desk study. This was followed by field work to take data through survey and interviewing stakeholders in the pork value chain.

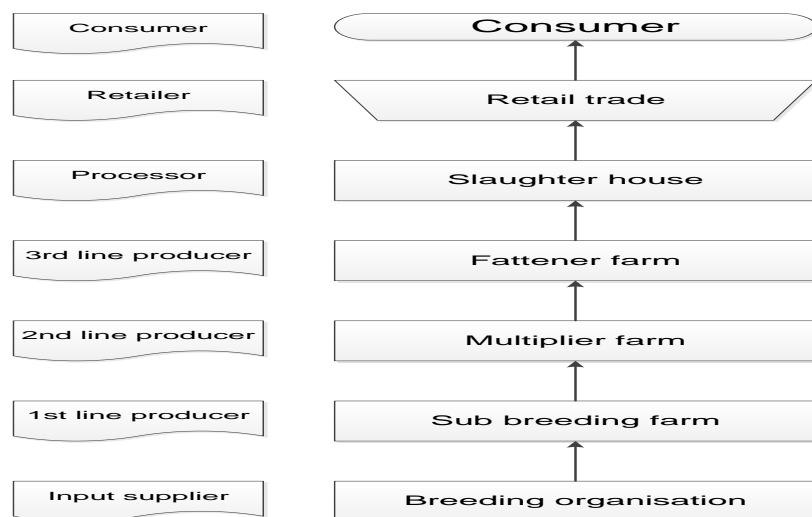
CHAPTER 2 LITERATURE REVIEW ON PIG SECTOR

2.1 Review of chains from selected countries

2.1.1 Netherlands Pig Chain

The Netherlands is among the six largest producers of pork in the EU (Eurostat, 2012) although the number of pigs and pig farms has reduced in recent years but the quality of the formal chain is not compromised (Dutch Pig Farmers, 2012). The pig farming in the Netherlands saw its greatest period of expansion in 1970s and 1980s. But pig farms started having small farms especially on sandy soils unsuitable for arable farming. Currently the Netherlands exports pork throughout Europe. Also there is local market for the pork produced. Here the Dutch pig producing sector earns its income by supplying the best possible quality pork just how consumers like and want it. This is because consumers demand more information about the origin and safety of their food including the production, hygiene, chemical application and environmental issues (Wever & Talamini, 2009). The pork industry is governed by combination of quality management systems and governance structures. In a place where consumer quality is paramount one cannot afford the impacts of failure to meet consumer demand and legislation (Wever & Talamini, 2009). The pork industry in the Netherlands has no informal line the value chain is solid and monitoring of the chain is the responsibility of the Dutch consumer, EU consumer, legislation in the country and the EU and also the mandatory and voluntary standards.

Figure 2.1: Netherlands formal pig value chain



Source: (Dutch Pig Farmers, 2012)

The Netherlands has a solid governance structure which ensures the transactions are coordinated with the chain. According to Martinez and Zering (2004) market types of the governance structure rely mainly on price and competition for the coordination of the transaction. Consumers everywhere have the tendency to switch to other suppliers in the chain where there is price change and much difference in prices. The Dutch pork industry in particular is more affected by greater cost rising because of the European legislation relating to environment and animal welfare. For the Dutch pork industry added value means new opportunities (Wever & Talamini, 2009). In all, food safety aspects are key in the pork industry.

2.1.2 Kenya Pig value chain

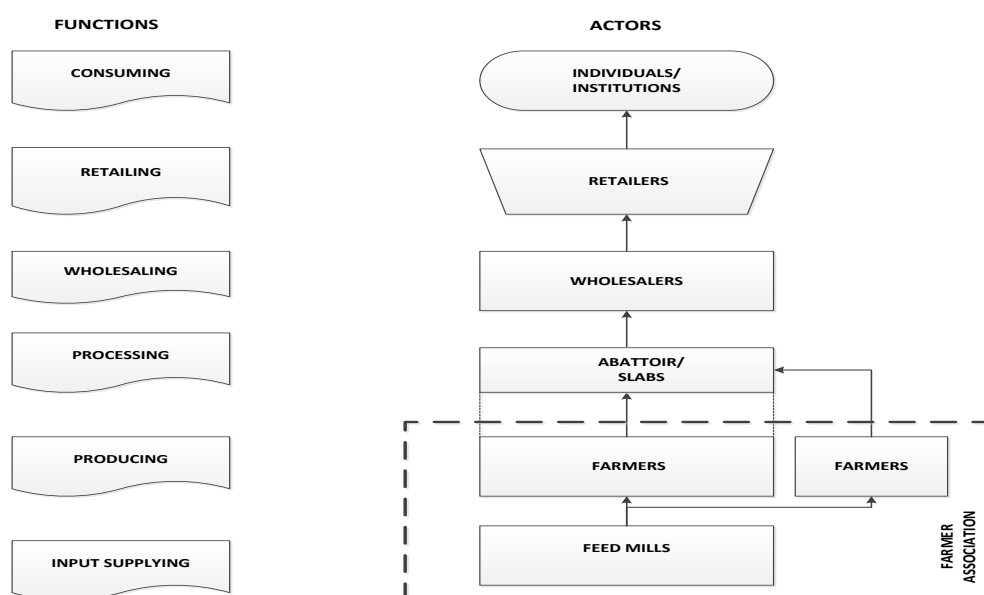
Kenya also a developing country as Ghana has its pig industry much more structured with the pork value chain ensuring quality and meeting government policy and consumer demand. Up to 70% of all pig farmers are engaged in small-scale production and farmers have formed

cooperative societies and opened feed mills. They characteristically supply pigs to local butcherries rather than to nearby urban areas.

Live pigs are traded on farmers' farm. However, large and medium pig commercial enterprises have their own licensed slaughter slabs which are inspected by the Department of Veterinary Services (DVS). They slaughter their own pigs and sometimes those of the neighbouring small-scale farmers. The informal pork chain which is mostly in the rural areas even have slaughter slabs with varying type and hygiene standards which are inspected by the DVS (Githigia, et al., 2012). Research by Gikonyo (2010) revealed that slaughtering at home for the purpose of selling to consumers has decreased to near zero.

The Government is encouraging the private sector and local authorities to establish small abattoirs and meat-processing facilities. In the meantime, there is a drive to organize pig farmers into groups and cooperatives able to organize and manage live pig trade markets. There are many players involved in the pork value chain where the issues of policy, bio-security and bio-safety are emphasized. The value chain is well-organized and value is added to every product along the value chain (Githigia, et al., 2012). Small butcherries in major towns are beginning to take off, and some enterprising producers looking for export markets.

Figure 2.2: Kenya pig value chain



Source: FAO, 2011

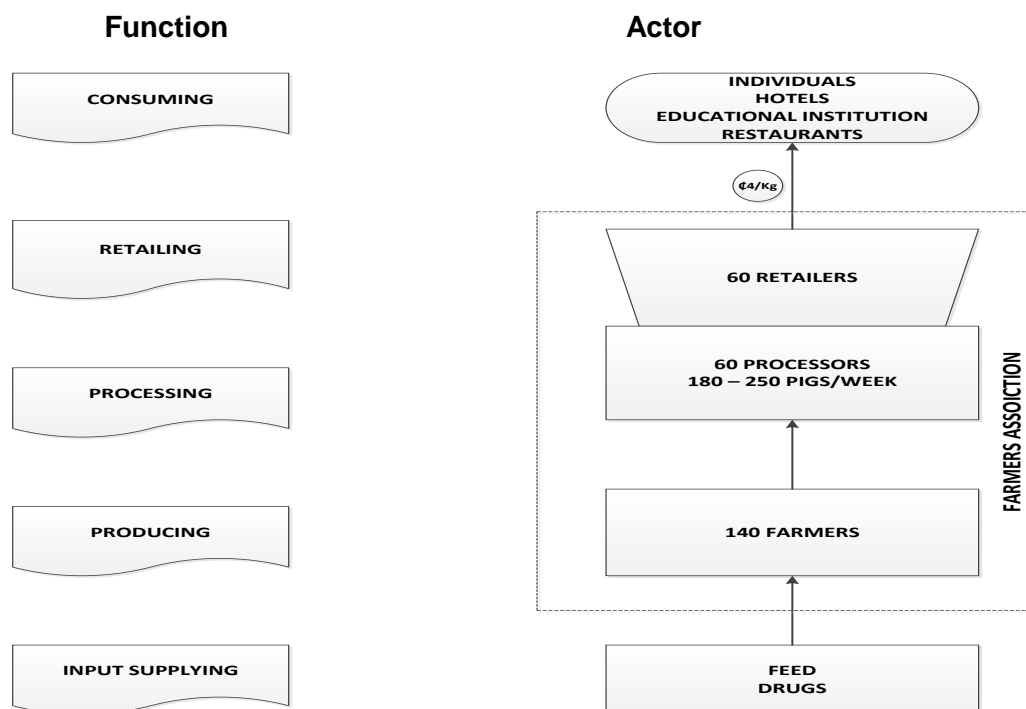
2.1.3 Ghana - Ejisu District Pig Farmers and Processors Association (EPFA).

The Ejisu District in the Ashanti Region is one of the highest pig producing areas in Ghana. Initial production and marketing were done without any formal activity. However, to maintain acceptable hygienic and quality standards in the industry, the association, EJPFA, was established in 2001 with 10 members and currently has a membership of 200 farmers and processors (producers 50%, processors 30% and producer/processor 20%). The aim and objective of this association is to produce; process and market quality pork and also improve upon existing technologies.

The association assist the farmers to procure farm inputs and other materials at cheaper prices. Membership benefits also include higher prices of pigs paid and credit support. Pigs are sourced from members without the need to buy from non-registered members to ensure safety and quality of pork. The members undertake slaughtering and processing in the

abattoir where there is a veterinary stationed. The value addition is the further processing of pork into products like ham, sausage and bacon for the consumers (Ofori, 2012).

Figure 2.3: Ejisu pig supply chain



Source: Ofori, 2012

2.2 Meat legislation in Ghana

Animal slaughter is guided by national and international regulations. Even though these laws do exist, sometimes, departments are in conflict with each other as to their responsibility. Moreover, there are inadequacies in some of the regulations. The Meat Inspection Act, for example, is not adequate in the enforcement of condemnation of diseased carcasses and is vague about the distribution of responsibilities of carcass inspection between Food and Drug Board (FDB) and Veterinary Services Department (VSD) (<http://siteresources.worldbank.org>). According to the Food and Drugs Act, 1992 P.N.D.C.L.3058 any persons wishing to put livestock products onto the market for sale will be expected to register with the Food and Drugs Board. In the case of local producers, the slaughter facility will be inspected before permission is granted (<http://www.epa.gov.gh/ghanalex/acts/Acts>).

Moreover, animals from which the carcass is derived shall be healthy and be slaughtered in a certified abattoir. Local producers will therefore need FDB authorization to operate an abattoir even if the facility is cited on their own premise. <http://www.fdbghana.gov.gh>

The Animal Health Law is outdated and does not take into account the new international rules for live animal trade and risk analysis. The subsidiary laws, such as the Veterinary Surgeons Act also doesn't provide for modern developments, such as the emergence of a private veterinary service. In determining whether food is injurious to health, regard should not only be on the immediate probable effect of that food on the health of a consumer, but also the cumulative effect.

2.3 Microbial contamination of meat on markets in Tamale

Healthy animals have muscle tissues that are free of microorganisms but are easily contaminated with both pathogenic and non-pathogenic microorganisms at the time of slaughter under poor processing conditions. A study conducted by Adzitey et al (2011) on microbial quality of meat sold in the markets of Tamale revealed high levels of bacterial. The mean viable count showed that the meats were not spoiled since counts were less, below $10^7 - 10^8$, for which spoilage of meat is apparent (Warriss 2001; Teye and Okutu 2009). However, meat traded on Sakasaka market is close to spoilage.

Table 2.1 Total aerobic bacteria counts obtained from the various meat shops in the Tamale

Meat shop	Mean bacterial count, cfu/cm ²	Mean log
Sakasaka	1.67×10^6	6.22
Aboabo	5.75×10^5	5.76
Central Market (internal)	4.325×10^5	5.64
Nyohini	3.875×10^5	5.59
Central Market (external)	3.725×10^5	5.57

Source: Adzitey et al. 2011

Advertisement by these butchers was by way of displaying meat on wooden tables which were not neat, the environment littered with bones and butchers appearing dirty. Some of the butchers were illegally slaughtering without any inspection by a qualified inspectors (Adzitey et al., 2011).

The meat displayed is contaminated with various genera of bacteria with *Salmonella* spp. and *Streptococcus* spp. being common probably due to the poor handling, storage and environmental conditions. The isolation of organisms like *Salmonella* is important food-borne pathogen for public health concern. Consumers are, therefore, at risk of consuming meat from around Tamale Metropolis although adequate cooking (cooking at 75°C for 15 minutes) will kill these pathogens (Adzitey et al., 2011).

The likely sources of contaminations may be the slaughter process, tables, knives and weighing scales occasionally wiped with the same dirty cloth, chopping boards, meat handling, containers, vehicle for carcass transportation and the selling environment. Sulley (2006) reported that there are inadequate vehicles and trucks for transporting carcasses and these have compelled others butchers to use motor-bikes and bicycles for transport. The few vehicles for transport are not properly cleaned and contained high microbial loads.

The bacteria count and diversity is an indication of low bacteriological quality, and is making meat on the market a potential source of food infection. General sanitary conditions and poor hygienic practices are some of the probable contributors to the contaminations.

2.4 Value chain

Kaplinsky and Morris (2001) defined value chain as the full range of activities which are needed to transport a product or service from conception, in the course of the different phases of production including a combination of physical transformation and the input of various producer or services, delivery to final consumers, as well as final disposal after use. Besides, there are various series of activities within each connection of the chain. This exists when all stakeholders in the chain work to maximise the generation of value along the chain.

The UDSML is used as the formal pork value chain and involve the channel through which the producer delivers pig to it for processing before the product reaches the final consumer. Informal pork value chain involves the delivery of pigs by the producer to local processors before it reaches the retailers and consumer as shown in typical traditional markets.

2.5 Chain coordination

According to KIT and IIRR (2008), a chain coordinator restructures all activities and takes care of it at the level of the value chain and see to it development. They serve as guardians and as a source of inspiration to make the value chain a success. Their services are needed to allow the flow of products without any obstacles.

Coordination can be in the form of:

- Chain leader: a situation where an actor assumes the role of a chain leader.
- Joint organization: two or more actors join forces in the chain coordination.
- Third-party facilitation: this happens when an external chain facilitator has the advantage of working for the value chain as a whole.

2.5.1 Mechanisms for chain coordination

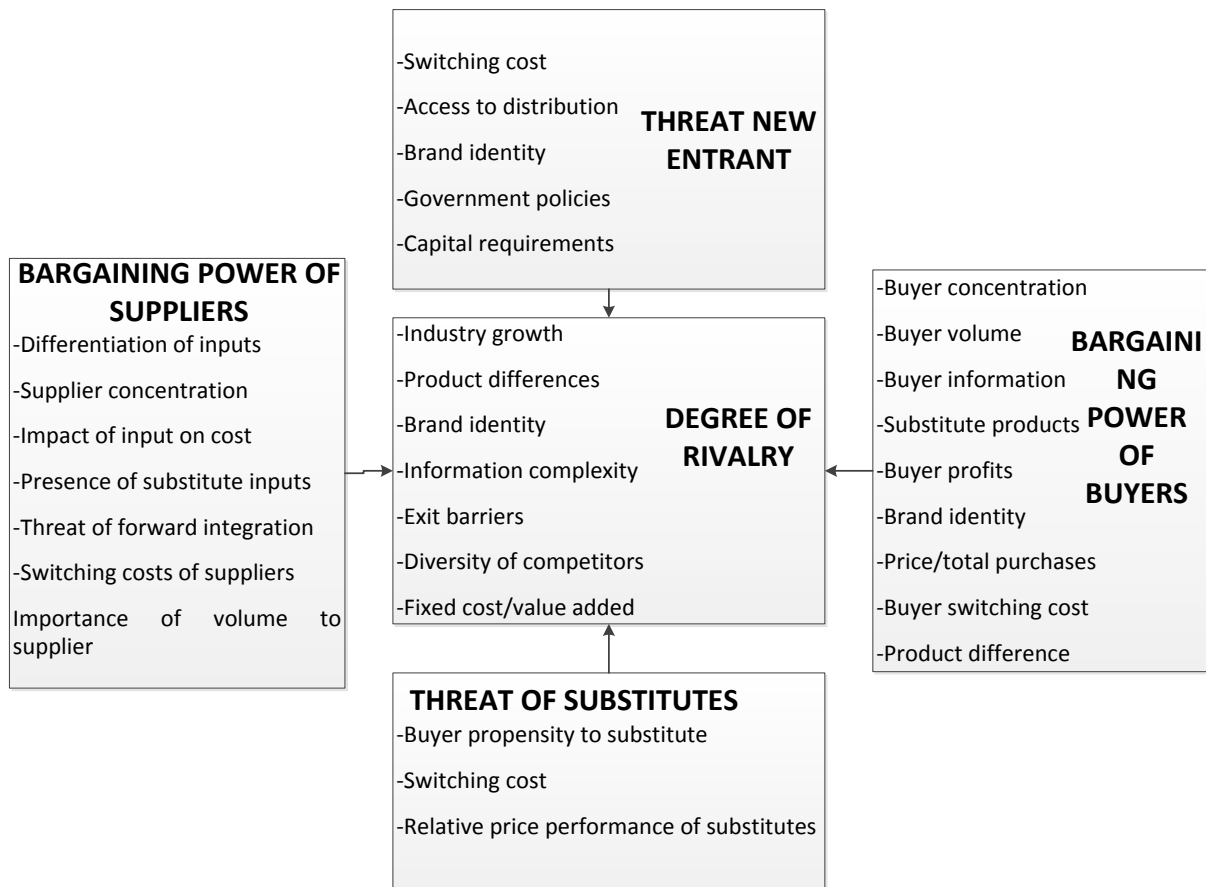
Inclusion of small holder farmers: It can be achieved with an agreement between a lead company and small holder producers. The producers use their own inputs and the lead company may use its facilities. In this way, there is a business relationship existing between them. The problem is that if market demand changes and the company is closed, the producers may be left without an outlet to supply their produce.

Subcontracting small holder producers: Contracts as a governance mechanism is used to supply standardised products with limited risks for quality degradation especially when it concerns production processes. Product quality, delivery conditions, price and information sharing are elements of a contract. It is important in guaranteeing quality and reduce transaction cost. Producers may be supplied with inputs and they become secure about market. The contractor becomes coordinator and the relationship is typical of employer employee model.

2.6 Porters Five Force

Since rivalry exists between the UDSML chain and the informal chains, the Porters 5 forces was used in analysing both chains to know the level of competitiveness and market attractiveness as it defines the rules of competition between the formal and informal chains. It was used in analysing the bargaining powers of supply and demand, threat of substitutes, threat of new entrants and rivalry within the formal and informal chains. Each of the forces has a number of determinants.

Figure 2.4: Porters 5 forces with determinants



SOURCE: Porter, M. 1985

2.7 Sustainability concept

Chain sustainability is a concept derived from the basis of people, planet and profit known to be as the 3Ps. According to Kleindorfer et al, (2005) a value chain is assessed by the way it functions and to what extent it realise the desires of the 3Ps. This concept of value chain sustainability was gained from sustainability definition thus, “development that meets the needs of the present without compromising the ability of future generations” Brundtland (1987). However, Tedo (2005) stated that sustainable chain endeavours to form equitable shareholding in the value chain, meets societal values with attempt to decrease environmental footprint. Therefore, integrating sustainability completely into the centre of the whole value chain functions is one way of preserving and ensuring the profitability of the actors.

Profit: A producer needs to know the economic viability of an enterprise before undertaking it. It takes into consideration the trade barriers and fair wages.

Planet: This refers to the production and distribution of a product and its impact on the environment. It takes into consideration if the activities in the chain are guided by existing laws and supervised by qualified inspectors - disposal of waste, use of chemical.

People: A producer has to know the end consumer or the target group and the distribution channel to get products to his customers before starting any enterprise. All actors, supporters and influencers within the chain must be considered.

2.8 Quality control system

Meat must be safe and suitable for human consumption and all interested parties including government, industry and consumers have a role in achieving this outcome. For this reason, Luning and Marcelis (2009) stated that consumers demand for food products that guaranteed the quality and safety along with their production process.

Recently, a research in India revealed that middle class consumers who are aware of food safety issues will pay more for a product that is certified and labeled as safe; with regards to this class of consumers, scaling-up and formalization of value chains is generally associated with greater food safety and diversity (Birol, Roy, and Torero, 2010). Also, a contemporary risk-based approach to meat hygiene entails that hygiene measures should be applied at the points in the food chain where it will be of greatest value in minimizing food-borne risks to consumers.

Trienekens and Zuurbier (2008) indicated that in order to establish a systematic approach to identifying, evaluating and controlling steps, HACCP in a food chain requires that the meat produced is within acceptable safety margin that address physical, chemical and biological hazards. Therefore, HACCP principles are the basis for the most part of food quality and assurance systems; it is aimed at preventing hazards. On the other hand, according to Luning and Marcelis (2009) the Good Manufacturing Practice (GMP) code are procedures aimed at assuring minimum acceptable standards and conditions for processing and storage as well as aiming on buildings and equipment, conditions of raw materials, production processes, knowledge, skills and experience of employees. However, in a pork chain it is designed to be applied in the whole chain.

In relation to value chain actors in pork, quality standards are achieved by establishing rules and regulations; for instance, the Integrated chain control quality management system (IKB) practiced in the pork chain in the Netherlands standardise feed quality and hygiene with the use of veterinary medicine as well as tracing and tracking of products (Wever and Wognum 2008). However, in countries without established quality control systems, measures are enforced by governmental institutions.

2.9 Marketing mix

Marketing Mix is a tool used to assess an existing or new market strategy; it involves the different forms of options an organisation has to make in the whole process of transporting a product or a service to the market. It is popularly called the 4P's thus: product, price, place and promotion.

Product, can be explained as the good or service provided for customers. It attributes may comprise; it's physical appearance, packaging, quality features, different ranges, brand name, warranty and customer service. The objective is to satisfy the needs of a particular target market; with this it is necessary to search for all vital information about the target market.

Price refers to the worth of the product, this take into account the cost of production as well as the profit margin thereby generating revenue for the business. The pricing method chosen should consider the position of the product in the market, which is based on the brand name, customer demand, substitute products and the external competitors.

Place refers to the distribution channel used to transport products to the final consumer. The channels could be in the form of direct sales (retail), distributor or an intermediary. The logistics in this mix involves transportation, warehousing and others to guarantee the availability of the product.

Promotion entails communication as well as selling activities that influence people to patronise the product on sale. Advertisement is one of the promotion methods, which enables customers to understand the type of product that are offered for sale.

2.9.1 Challenges in marketing

A research by KIT and IIRR (2008) explained the challenges in marketing in the following ways:

- Volatility: a phenomenon where market conditions change over time and place. It may be as a result of product quality and price fluctuations within and between seasons.
- Market integrations: poor infrastructure may lead to weaker linkages between village and city markets. This hinders operations of business services thereby affecting the efficiency of growth.
- Financial services: the acquisition of finance has always been a burden to small scale farmers and traders. Based on mutual trust they often give each other informal credit. The small scale agricultural production and trade, formal financial institutions have no significant roles.
- Limited purchasing power: a publication by Lyon (2003) and Okai and Boateng (2003) indicated that between 60% - 80% of income is used in buying food and this limits the ability to buy high value products. The set back is that, the process of value adding is limited in the value chain.

The development of markets is limited with little value addition, rudimentary business practices and low investment. To overcome this KIT and IIRR (2008) suggested two basic strategies.

Stronger chain relations: This involves the creation of a well-organised business relation of chain actors through strong, effective and exclusive organisations. It leads to the reduction of costs and risks that surface in a business. It can be achieved through:

- Organisation of actors into a team with common understanding through strengthening of skills and upgrading products and services.
- Creating mutual understanding through open dialogue and exchange visits and by respecting each other roles in the value chain.
- Role specialisation to improve the product and services to strengthen the value chain.
- Chain coordination through continual communication. It can be steered by farmer/trader organisations, chain facilitators or service providers.
- Development of chain partnerships through a shared vision and joint action plan to improve the performance of their businesses.

Stronger market institutions: these are set rules or policies regulating the interaction of farmers and traders. It can be formal or informal, written or unwritten and may change over time. It includes monitoring, contract enforcement and punishment for violations. Informal regular pattern of behaviour and social customs are also institutions. Some of the ways to achieve this are:

- Standardisation of quality and measures will help trade to become more efficient
- Ability to ensure that contracts are enforced
- Accurate information about whom, when, where and what to buy or sell are pivotal in decision making. It can be promoted through the mass media like internet, radio and television.
- A vital tool for trade is finance and also chain actors need capital for investment in other areas like staff and vehicle.

2.10 SWOT Analysis

It involves specifying the objective of a project and identifying the internal and external factors that are favourable and unfavourable to achieve that objective. SWOT analysis may be used in any decision-making condition when a desired objective is defined. Strengths are the internal competencies that an organisation needs to have and weaknesses are the competencies that it does not have. The opportunities are the potentials for growth while the threats hinder growth but there is no control over the opportunities and threats.

It is the foundation for evaluating the internal potential and limitations and the likely opportunities and threats from the external environment. It helps in uncovering opportunities that are well placed for exploitation and by understanding the weaknesses can help to manage and eliminate threats.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 The study area

Tamale Metropolitan area is in the Northern Region of Ghana with a population of 371,350. It has a total estimated land size of 790.5 km² and a growth rate of 2.9% (GSS, 2012). The geographical coordinates are 9° 24' 0" North, 0° 50' 0" West and lies in the Guinea-savannah belt. The dominant ethnic group is Dagomba with Dagbani is the widely spoken local language. Its location serves as a hub for all administrative and commercial activities in the region. The Metropolis is located in the centre of the northern region and shares boundaries with five other districts. There are a total of 197 communities of which 33 are urban communities. Livelihood in the city is largely dependent on agriculture despite its Metropolitan status. The temperature of the area can be described as hot and dry ranging between 23°C to 40°C. Majority of the population of the metropolis are Muslims (84%) and the rest are mostly Christians (13%) and traditionalists (3%). Tamale is also known for being the fastest growing city in West Africa.

It is one of the biggest marketing centres for agricultural goods due to the network of roads that facilitate easy marketing of products between rural and urban areas and other West African countries. Infrastructure and human development outcomes have greatly improved and a number of medium sized companies have established operations in the metropolis.

Figure 3.1: Map of Tamale Metropolitan area and Ghana



Source: Google map

****This is not part of the research but it has affected livestock production in several ways.***

Conflict situations and livestock production in northern Ghana.

According to Karbo and Bruce (2000) the northern region is usually described as the food basket of the nation; 70% of the land suitable for livestock production and farmers gaining 42.6% of their income from sales.

In Ghana, poverty and underdevelopment have been stressed as the major causes of conflicts. Unfortunately, the Northern Region is associated with conflicts and making the place prone to it. The link between conflicts and livestock production is complex; livestock production systems, especially ownership, cause conflicts and on the other hand, conflict depopulates livestock numbers. It has been argued that the low level of education in the northern region to a certain extent accounts for the vulnerability to violence and conflicts (Linde and Naylor, 1998; Jösön, 2007).

The region accounted for 22 conflicts that occurred between 1980 and 2002, due to disparity between prospective economic resources and rising poverty levels (Jösön, 2007). Through these conflicts the veterinary and agricultural extension staff of MoFA at all the districts engulfed in the conflict had to flee for safety. As a result, planned programmes on surveillance and preventing of livestock disease outbreaks were affected (Addah and Zezebi, 2008). This has resulted in a vicious cycle of poverty and under-development among the people of such regions. There are daily rumours and realities of killings, insecurities, ethno political tensions and horror signs of chaos in the region (<http://www.ghanaweb.com>).

Most conflicts in the region are usually caused by simple events but it end up with a lot of great consequences of human lives and properties and resources. It is documented that these wars were fought over such items like mangoes, local drinks (pito), guinea fowls and cattle. The conflict which was sparked off by a dispute over the price of a black guinea fowl at a livestock market in January, 1994 later engulfed 6 administrative districts resulting in 20,000 deaths (Addah and Zezebi, 2008).

Before the conflict, every household had livestock. However, after the conflict, 23%, 16%, 12% and 21% of families lost their cattle, sheep, goats and poultry respectively. Households having cattle of more than 100 declined from 12% before the conflict to 0% after the conflict and after a decade production only increased by 0.7% per annum (Addah and Zezebi, 2008). The devastating result is livestock production is affected negatively and investors are not willing to invest as there are frequent outbreaks of conflict in the region.

3.1.1 Access to study area

In carrying out this study, researcher discussed the research proposal and study design with the Metropolitan Director under the Ministry of Food and Agriculture (MOFA). Telephone contacts were made to two key resource persons – Metropolitan Senior Veterinary Officer (MSVO) and the Director of Pong-Tamale Animal breeding Station - explaining the purpose and permission to carry out the study. The researcher with the assistance of the MSVO met a pig farmer and trader who agreed to facilitate the meetings with other smallholder pig farmers. Together, we identified survey sites locations based on the concentration of pig farmers.

3.1.2 Sample selection and size

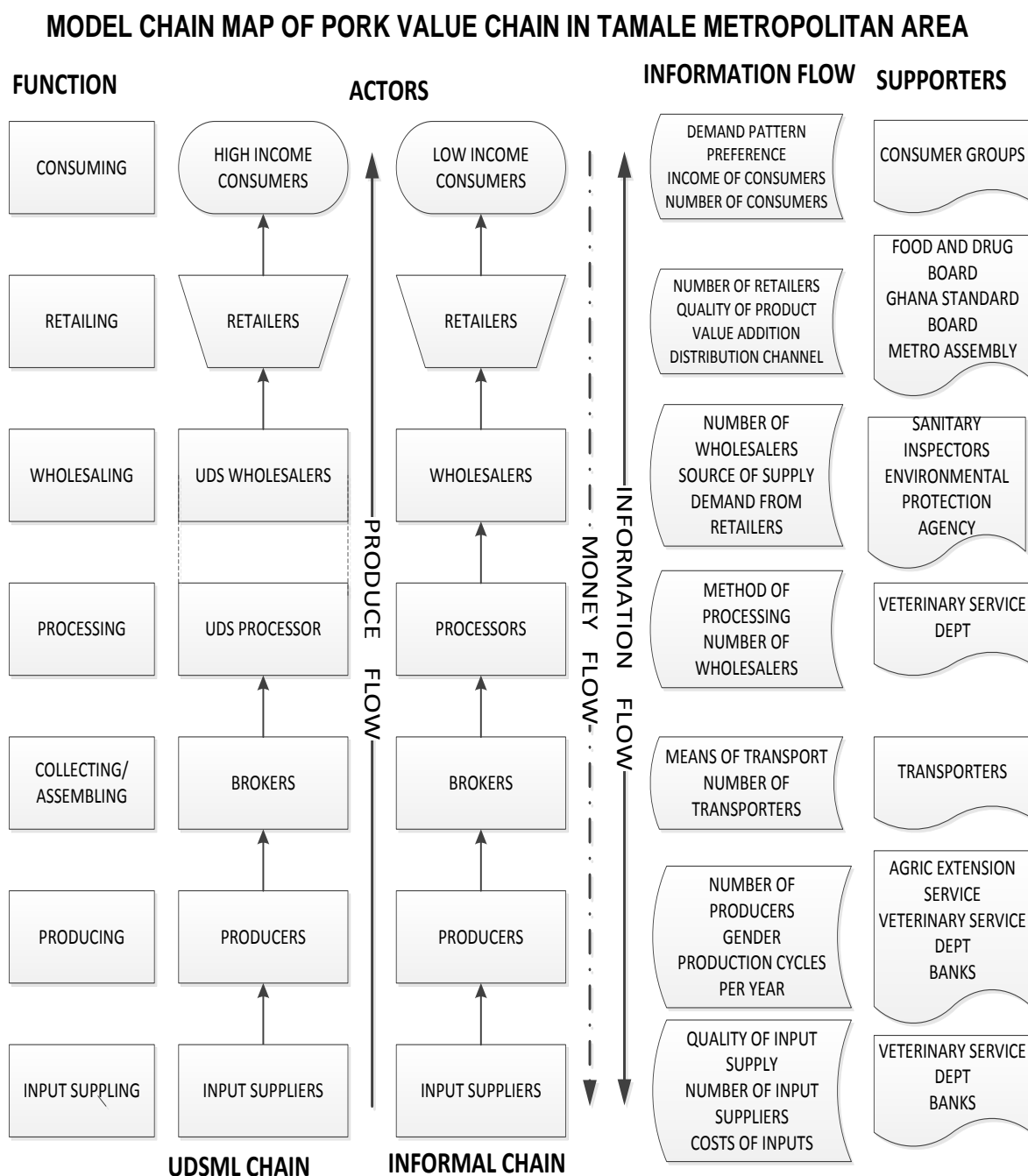
The research population used in this study was smallholder pig farmers, owning up to 50 pigs. Thus a sample size of 40 farmers was chosen by using the snowball sampling technique. The sample was appropriate for the study and was used to achieve the research objective. The findings of the study from the sample selected provided the generalisation of the research population. In order to reach a lot of producers in the study area, the

researcher limited the questionnaires administered to 5 producers as most in a particular town or area as answers were similar.

3.2 Concepts used

The value chain concept was used to analyse the situation of the UDSML pork value chain. This was done by analysing the stakeholders and representing it with chain maps. The framework entails analysing the pork value chain and assessing how it is marketed. The chain starts from input supplying to consumption and the study considered all chain functions. The criteria for assessment were information flow and quality system. Analysis was by the use of stakeholder analysis, porters' five forces, sustainability concept, marketing mix (4P'S) and SWOT analysis.

Figure 3.2: Model chain map of pork value chains



3.3 Tools for analysis of value chains

3.3.1 Stakeholder analysis

Stakeholders are those who need to be considered in realising project goals and whose involvement and support are important to its realisation. A stakeholder analysis is a process for providing insights into, and understanding of, the interactions between a project and its stakeholders (Grimble and Wellard 1996). It identifies all primary and secondary stakeholders who have an interest in the issues with which the project is concerned. The participation of stakeholders in a project is a key to – but not a guarantee of – success. This was adopted as an analytical tool to know all the stakeholders in the pork sector and their roles and level of influences they have within the value chain.

3.3.1.1 Value Chain map

The chain map was used in the analysis and understanding the functions of various actors and stakeholders to determine opportunities for value chain development. The quality and value addition for pork were developed through the chain perspective. Further, understanding on the information flow on prices of pigs and consumer's demand was developed.

3.3.1.2 Value chain actors

These are the individuals who produce, buy or sell the product. These actors owned the product at some stage in the chain. The basic structure of the Ghanaian pork industry qualifies as a value chain. This is because; it is made up of input suppliers, pig farmers, wholesalers, retailers and consumers with weak linkages existing in-between them.

3.3.1.3 Chain supporters

Besides the chain actors directly involved in the chain, there are stakeholders that support the functioning of the value chain. These are individuals or institutions that offer services to the chain actors (KIT and IIRR. 2010). They do not own the products, but are vital for the chain actors to produce and deliver to the consumers. Many of these services are provided for a fee.

3.3.1.4 Chain influencers

The organisations that provides regulatory framework, policies, infrastructure (at the local, national and international levels) to shape the way value chains operate. It includes Ministries, Departments, Metropolitan Assemblies and other Public agencies.

3.3.1.5 Information, product and money flow

The following four things exchange hands in the farmer- trader relationship: product, money, information and services. First of all, the product goes in one direction and the money goes in the other; this exchange is repeated at each stage in the chain forming two parallel flows of produce and money. In this exchange, each of the actors is likely to invest in the chain and also support the other actors to ensure that it works efficiently. This grants opportunity to increase further flows of finance between the different actors in the chain (KIT and IIRR, 2010).

The farmer and trader also exchange information on quantity of pigs. In relation to service in this chain, both the farmer and the trader provide services such as labour supply during transporting and marketing of the product.

3.4 Research strategy

The research process was produced from the research design developed by Verschuren and Doorewaard (2005). It is the combination of individual interviews together with participant observation and content analysis of textual materials known as triangulation of methods. It

gives the steps necessary for the completion of the research. The methods used in the data collection include desk study, survey and case study.

Figure 3.3: Research framework



3.4.1 Survey

A structured questionnaire was developed and pre-testing of the questionnaire was carried out to ensure that all the questions were understandable to the producers. The questions were discussed with the producers to inform them on the specific data which needed to be collected. The survey questionnaires used in this study were close ended questions. This covered the following main areas: income obtained from various sizes of pigs, chain of supply, choice of buyer and slaughtering processes.

3.4.2 Interviews

The researcher had semi structured interviews with informants. The selection of the interviewees was based on their role in the chain as well as contact with actors. They have been chosen as representatives in order to achieve the research objective. The interviews were done using a check lists (Appendix 2-5) on issues relating to marketing, slaughtering, processing and pork inspection. The interviews were characterized by probing and follow up questions based on the response given by the respondent. The questions for the check list were guided by the research objectives and provided answers to the sub questions. Below is a description of persons interviewed.

Director – Metropolitan Veterinary Service

The Metropolitan Director of Veterinary Service was out on official duty so the MSVO was chosen and interviewed. He gave insight on the production systems, meat inspection procedures, constraints to pork marketing, potential for chain development, quality control measures, food safety and meat quality in the informal sector. He briefed the researcher on ways some processors smuggle unwholesome meat unto the market and the punishment given to such people.

Director-in-charge of the UDSML

The interview with the director focused on price, the quality control systems, the method of payment, number of pigs slaughtered at a given time, the demand and supply of pork. Equally important were issues on environmental sustainability relating to disposal of effluents from the unit. Being the first of its kind in the Northern region of Ghana, he spoke on challenges the unit is facing.

Two processors in the informal chain

The research interview focused on hygienic standards of processing, meat inspection procedure, agency in charge of inspection, the adherence to hygienic standards, the challenges encountered, waste disposal method, the sources of supply of pigs and the demand of pork. It provided in depth insights on success and limiting factors within the chain.

Manager – Pong Tamale Livestock Breeding Station

As one of the six nucleus breeding stations in Ghana it keep large white pigs as one of the livestock's. The interview focused on the role of the sector in facilitating chain governance as well as policies and programs being undertaken by government to develop the pig sector. His opinion on strategies that can be adopted to improve pork value chain was also sought.

Two transporters

Two transporters were interviewed to give insights on pig transportation as well as constraints. The interview centred on transportation of both live pigs and pork from the farms or slabs. The means of transport, the choice of market to supply and number of pigs or quantity of pork supplied per week.

Two retailers in the informal chain

The interviews involving two retailers focused on sources of pork supply, consumer prices and the quality control measures. Observation was also be made on product attributes. The information on pork trading in the informal chain was important as it helped in drawing a comparison between the more organized UDSML channel and the spot selling channel of the informal chain.

3.5 Data analysis

Descriptive statistics was used to visualise the demographic composition of the smallholder pig farmers in the survey such as age, education and number of pigs. Presentation of survey findings was by using charts and tables. Analysis on the existing chain and assessing pork value chain was done by use of value chain map, stakeholder matrix, sustainability concept Porter's five forces and SWOT analysis.

3.6 Limitations of the study

Farmers were very sensitive when giving out prices of pigs sold and it was difficult to get these figures. Few also gave prices that were doubtful. This comes from the belief that their financial situation will be made known despite assurances of confidentiality.

However, there is dearth of data on the livestock sector, and the narrow scope and coverage of most of the available data render them unsuitable for application, planning and development of the sector. No proper records kept on pig production therefore the findings are as a result of field work. Also due to inadequate record keeping as was observed during the survey, it was difficult to get the exact number of pig farmers within the metropolitan area.

Even though, conflict issues were not part of the focus of this research, the researcher believes it has contributed to consumer influence. The northern part of Ghana is noted to be volatile and prone to sporadic conflict during which time enforcing laws become impossible.

CHAPTER 4: RESULTS

These are the findings from the case study involving interviews with various stakeholders in the chain and the survey with farmers in the metropolis under consideration. It outlines the respondents' demographic characteristics, chain of supply, factors determining the choice for a chain to supply, processes that enhance pork quality and information sources in raising pigs. They are important considerations in small holder pig farming because they assist in tailoring interventions in regard with the value chain.

4.1 The role of actors in the value chain

4.1.1 Input Suppliers

These are the suppliers of piglets, drugs and feed. PTLBS mostly supply weaners to farmers who want to start or want to change their production stock. The interviewed farmers prefer to buy from other producers with the basic reason of price. None of the survey farmers started with piglets/gilts from the PTLBS. Feed and drug stores and grinding mills are located with the metropolis. Factory prepared concentrates are not purchased from the shop but instead prefer to buy corn chaff from the grinding mill. However, other sources of feed are kitchen waste from hotels and restaurants.

4.1.2 Producers

These are the farmers that fatten pigs to marketable size. Generally, piglets are sourced from own breeding sows. The only exceptions are farmers who are venturing into pig keeping for the first time. The predominant farming system practised is the semi intensive. At the time of this research all farmers were keeping their pigs intensive since it was a period for crop farming. However, some farmers allowed the piglets to be moving around as they do not cause destruction to crops.

Table 4.1: Farming system practised

FARMING SYSTEM	NUMBER	PERCENTAGE
Extensive	0	0%
Semi-intensive	23	57.5%
Intensive	17	42.5%

The producer who owned the least number of pigs had 1 and the highest was 120 pigs. Producers having more than 50 pigs were discovered to be brokers who buy and send them to markets outside the metropolitan area. Majority of the farmers (82.5%) had less than 30 pigs with average farmer keeping 23.5 pigs.

In terms of sales only 20% of the sampled producers prefer selling through the UDSML despite paying a higher purchasing price than the traders in the informal chain. These producers supplying pigs to UDSML kept an average of 12.75 pigs which is lower than the average of pigs kept by the producers.

Between the months of September and December, supply of pigs is low. The producers who supply pigs to the UDSML live within 10km radius. That makes it easier to reach the meat limited during time of supply.

Table 4.2: Frequency distribution of producers

Variable	Frequency	Percentage
Age (years)		
20 – 30	8	20%
31 – 40	9	22%
41 – 50	12	30%
51 – 60	7	18%
61 – 70	4	10%
Sex		
Male	37	92.5%
Female	3	7.5%
Education		
Illiterate	27	67%
Primary	2	5%
Secondary	7	18%
Diploma and above	4	10%

The youngest producer was 20 years and the oldest being 68 years with a mean age of 43.5 years. The farmers above 60 years were the least constituting 10%. It could be inferred from this result that there is high percentage of active work force (under 60 years) among the pig farmers. The survey results also revealed an extremely low participation of female pig farmers, 7.5%. With regards to education, there is high level of illiteracy among the respondents as majority (67%) had no formal educational background and those above secondary level formed 10%.

4.1.8 Sources of information on production

The findings of this study revealed that producers obtained information on production and husbandry practises from various sources. About half (52.3%) indicated Extension/Veterinary officers as their major source of information on pig which is followed colleague pig farmers (20.4%) and traders. None of the surveyed farmers sought advice from PTLBS

Table 4.3: Sources of information

SOURCES OF INFORMATION ON PIGS KEEPING	RESPONSES (Multiple)	
	NUMBER	PERCENT
Livestock extension/veterinary	23	52.3%
Traders	5	11.4%
Pig farmers	9	20.4%
Combination of the above	2	4.5%
Others -	5	11.4%
TOTAL	44	100.0%

The practises that will enhance the quality of pork, majority agreed to keep a hygienic environment by cleaning the sty daily and proper disposal of manure which is incorporated into their farm lands.

Table 4.4: Practises that enhance pork quality and food safety at the farm

FARM PRACTISES	RESPONSES (Multiple)	
	NUMBER	PERCENT
Good body conditions of pigs before transport	2	2.4%
Daily cleaning of pig unit	33	40.2%
Observing withdrawal period	7	8.5%
Disposal of dead animals	11	13.4%
Disposal of manure	26	31.7%
Quick response to health issues/ good feeding practise	3	3.8%
TOTAL	82	100.0%

4.1.3 Processors

They play multiple roles and double as wholesalers as well.

A total of 13 slabs were used for processing by 6 local processors. Some of the farmers undertake slaughtering when a processor request for it to be done. The quality management practice which is carried out by the processors in the informal value chain was low because some farmers were not even having slabs or veterinary officers going to inspect the pork for wholesomeness or the premises for hygienic practices. In this chain, processors play the role of transporting pork for distribution. Some supply directly to hotels and individuals consumers. Over 30% of the interviewed farmers undertake processing in their farms on improvised slabs. Veterinary inspection and approval of pork for public consumption is either at the farm or when pork is delivered to the retailer.



Figure 4.1: An informal pork chain processor

In the UDSML processing, safety is of priority so all the pigs undergo both ante and post mortem checks. After processing, provision is made for special cuts like pork chops, spare ribs and fillets. There is a second processing of the pork into ham, bacon and sausage. The pork is not distributed to retailers but sold directly from the retail shop which is part of the processing building.

None of the producers who supply pigs to UDSML undertake processing on their farms.



Figure 4.2: Processing at UDSML

Table 4.5: Number of pigs, buyer and farm processing

Variable	Frequency	Percentage
Number of pigs		
1 – 10	10	25%
11 – 20	11	27.5%
21 – 30	12	30%
31 – 40	3	7.5%
41 – 50	2	5%
>50	2	5%
Buyer		
UDS	8	20%
Other buyers	32	80%
Farm Processing		
Yes	13	32.5%
No	27	67.5%

4.1.4 Retailers

They link processors and consumers by selling in preferred quantities and communicate consumer preferences to processors. The retailers from the informal chain add value to the pork by preparing pepper soup with pork, fried or grilling pork into barbecue in addition to the fresh pork. Pork sale is in pounds and sales volume ranges between 300 – 500 pounds per week. The price for a pound of pork is GH¢ 2.2 – 2.5. From an initial number of two retailers, the number has increased to over twenty in the metropolis. Higher sales are recorded in the first and last weeks of every month. As demand is higher than the supply, there is little feedback from the consumers concerning the quality of produce and safety.

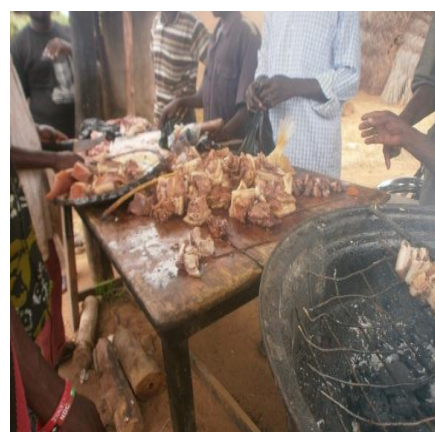


Figure 4.3 Pork on display for consumers

The UDSML is not, currently, operating a retail outlet aside the main building where slaughtering and processing take place. The pork products come in different forms and prices are based on the level of processing undertaken to get the final product. Prices are quoted with equivalent to the kilogram weight which is different from the informal sector that uses the pound as the unit for sale. The price range of pork products is between GH¢6 – 12/kg.

4.1.5 Consumers

The final chain actor is the consumer. The retailers explained having two groups of consumers. They are;

- Individuals: they buy the pork in small quantities for home consumption or prefer the already cooked pork. Majority are the middle and low income earners or students. The consumption pattern and purchasing power of these consumers have no influence on quality. They buy based on availability and proximity. Because the consumers in the informal sector have limited purchasing power, they prefer buying in smaller quantities. However, the elite and the university community prefer buying from the UDSML with more quality assured.

- Institutional buyers are the hotels and restaurants. They prefer buying whole carcasses (60-100kg) or special cuts. Prefer the informal chain as supply is regular with lower prices.

4.2 Case study with stakeholders

Interview with the Director: Pong Tamale Livestock Breeding Station (PTLBS)

The station undertakes consultations on pigs for farmers. All pigs that are sold goes through performance test to expose any hidden disease to make sure they are ready for the keeping. There is a higher demand for gilts from the station but most comes from farmers outside the metropolis. In the first six months of 2012, two farmers from the metropolis have contacted the breeding station for advice. The director further elaborated that religion does not hinder the production and sale of pigs or pork. The selling price of a kilogram of live weight of gilt is GH¢4.00 which is high for the local farmers to buy, but quality is also guaranteed. For the purpose of records, pigs are intensively kept at the station for proper record keeping. He was of the opinion that livestock extension is still undeveloped whilst the veterinary service is more interested in animal health than production.

Interview with the Director in charge of the UDSML

The Unit is a private slaughter and processing facility with the capacity to process 20 pigs a day aside other livestock. It was constructed to provide wholesome and hygienically packaged meat to the university community. Current production and utilisation is far below the installed capacity as the facility processes two pigs per week which is not even consistent.

For assurance of quality and food safety, there was microbial quality examination conducted with meat from the UDSML and that of meat from the markets in Tamale from the local butchers. The results showed high levels of bacterial contamination in the meat from the local processors.

The method of payment has not been favourable to the producers. Payment delays, even up to two weeks, have led to farmers feeling reluctant in supplying pigs to the UDSML. The location of the meat unit where retail takes place is not within the city and consumers have to bear extra cost to buy the pork. Pork is measured in pounds by the local retailer as against the kilogram used by the unit and this gives the impression, especially to the lowly educated, that pork sold by the unit is expensive.

He was of the opinion that a lot of consumers are not looking at quality standards. Their main preference is quantity and price. They see all meat to be the same and tend to overrule standards for meat. Looking at the usage of the place being underutilised, he was of the view that it can be leased to another user with strict conditions so that will continue to be used for student practicals.

Table 4.6: Marketing strategy of UDS

Product	Different brands of pork products measured in kilograms
Price	Price range between GH¢6 – 12/kg which depend on the part of the pig and value addition.
Place	Selling takes place at the meat shop located within the meat unit.
Promotion	Advertisement on local radio station. All prices are displayed on a notice board.

Interview with veterinary officer

The common farming system is semi intensive with few farmers keeping their pigs intensively. The metropolis is Muslim dominated but does not forbid the keeping of pigs. On pork hygiene and quality, the veterinary services have the mandate to inspect every meat sold on the market. The animals slaughtered from the abattoirs in the city centre have the veterinary and sanitation officers inspecting before been sent to the market. He acknowledge that unwholesome meat does get to the market for consumption as producers and processors conceal them to avoid it been inspected. They cut the carcass into pieces making it difficult to do a complete inspection on the animal. Those that have been exposed have spent some jail terms.

Concerning his opinion on limiting factors to production he explained that:

- The pig farmers sell early when pigs are not fully grown.
- Farmers try to keep a particular number of pigs without need for expanding.
- Housing also poses a challenge as some pens are badly constructed leading to the escape of pigs which get killed or stolen.
- Some farmers are not willing to spend money on feeding and rely on only left over.
- Other reason farmers hardly treat their pigs and call the veterinary technician when the sickness is at an advance stage.

The strategy, according to the veterinary officer, for improvement is that producers do not approach pig farming as a business and, therefore, do not give the needed care it requires. However, there are high prospects for the development for pig production as the number of farms is increasing in relation to number of pigs produced. Some of the farmers are Muslims (practising the religion) but are involved in keeping pigs.

A Muslim pig farmer confirmed the information from the veterinary officer.

Haruna – a Muslim pig farmer

"I raise pigs to take care of my family and send my children to school as the returns far exceed that of the ruminants. They are easier to keep with few problems of diseases. With that am able to buy farm inputs during the cropping season. I also slaughter pigs from my farm when a local processor requests I do it for him."

Interview with other informal processors

It was revealed that slaughter and processing take place in the farms with or without slabs. Pork is either inspected on the farm by veterinary or inspection done at the retailer point. The supply can range between 4 - 20 pigs per week for one local processor. Price ranges between GH¢3.5 - GH¢3.8 per kilogram depending on the retailer's influence on the market. Transportation of pork to retailers is by the use of taxi and motor bikes. Major challenge is the inability of bulk storage of pork.

Interview with retailers

The main source of the supply is from the local processors who deliver the required quantity upon request. Due to inadequate storage facilities, bulk buying is limited. The customers are mainly government employees, students and low income earners. Higher demand of pork is during the first and last weeks of the month. In the informal chain the retail price is GH¢5.0 – 5.5/kg.

Figure 4.4: Chain maps of UDSML and informal value chains

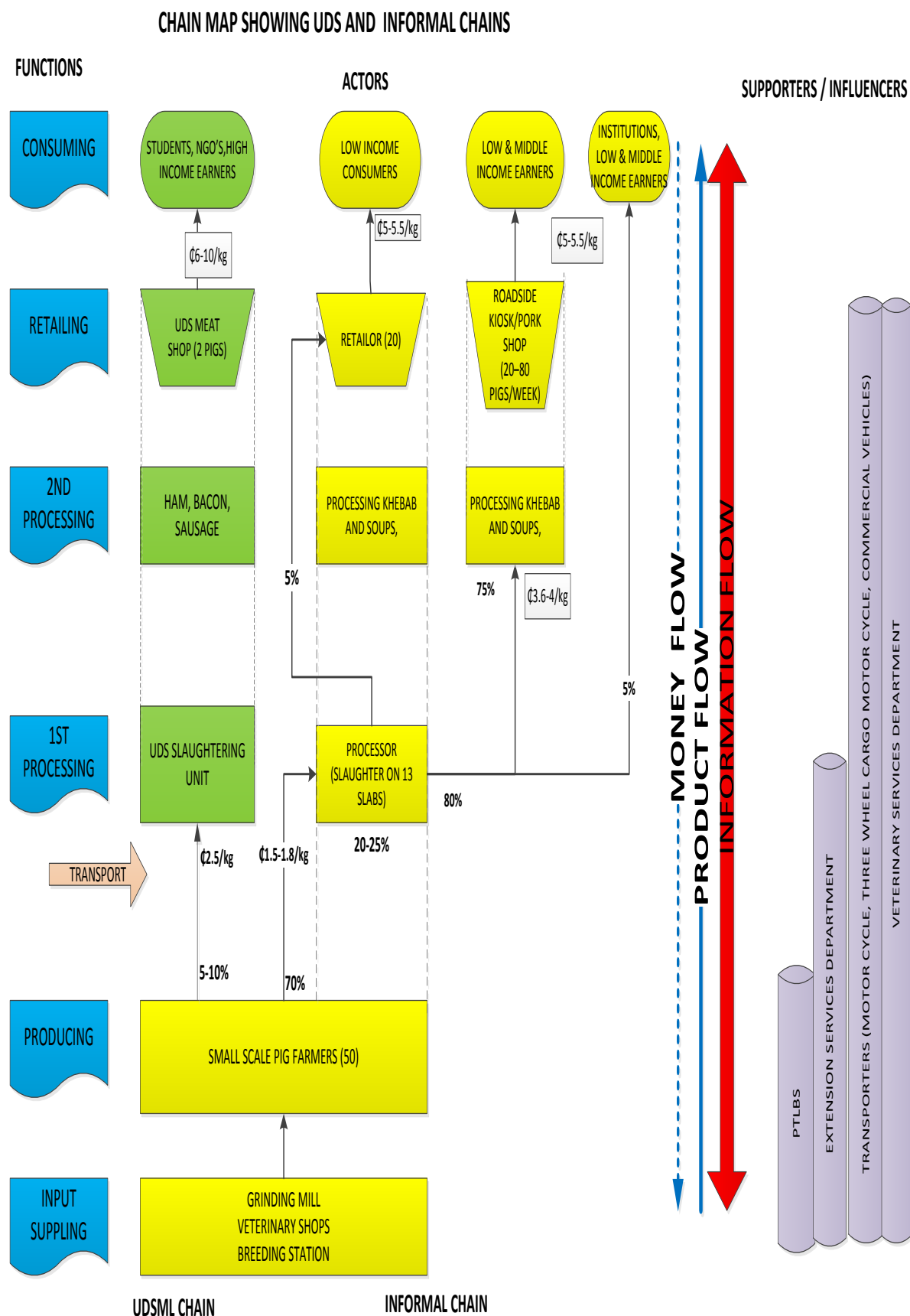


Table 4.7: Supporters and influencers in the chain

SUPPORTERS/ INFLUENCER	ROLE	LEVEL OF INFLUENCE
PTLBS	Maintaining the gene of pure breed large white pigs Dissemination of knowledge on pig keeping to farmers Supply of improved weaner gilts and young boars to farmers	Medium
Veterinary Services Department	Issuance of movement permits prior to transportation of pigs. Carry out disease surveillance and vaccination schedules on pigs Diagnosis of pig disease and prescription of drugs. Perform ante mortem and post mortem inspection and certify pork as safe for consumption. Regulate the importation of vaccines and drugs.	Medium
Extension Services Department	Training of farmers in modern production technologies through field demonstrations. Provision of technical advisory services through the organisation of fora and seminars.	Low
Transporters	Individuals who operate three wheeled cargo motorcycle. It is mostly used to transport live pigs and is preferred due to it lower charger as compared to vehicles. Cost ranges between GH¢5 – GH¢10 per animal and depends on distance. However, trucks are used for transportation outside the metropolis and longer distances.	Medium

4.3 Chain coordinator

The actors playing influential roles in both chains are the processors because they have direct link with all the other actors in the chain. This is as a result of the multiple functions they play in the chain. From the interviews the processors play leading roles in other chain functions as well. The chain is supplier driven and not production oriented because producers sell when they want.

4.4 Chain sustainability of UDSML

People: To be able to sustain the chain and have a constant supply of pigs, the farmer's plight is addressed by offering the highest price for pigs in the metropolis that goes with guaranteed minimum prices. But long term relationship is still not established with these farmers. The safety of workers is of priority so they are provided with all the tools and equipment for their protection. There was no observation of child or forced labour with workers placed on a salary scale. Gender issues are not addressed equally since out of nine workers only one is a female.

Planet: Necessary steps are taken to ensure the safety of the environment. There is little pollution as effluent is well managed by channelling it through drainages. In addressing animal welfare issues all pigs are stunned before slaughter

Profit: It is a place that can generate a higher turnover if used to capacity judging from the value addition to products it supplies to the customers. However, the current state of its utilisation and output is a clear indication that it is not economically viable to continue unless pragmatic efforts are taken. The UDSML has little power over the market with its products going for higher prices than informal sector. It has all the machines to process pork into

different products. Currently, there are no contract/agreements made with the suppliers so they have the choice to supply to other buyers. Long-term trading relationships have not been established so the suppliers are not static and tend to sell through other routes.

4.5 Farm hygiene

These measures were undertaken by farmers to ensure the production of good quality pork.

Feed: leftover from the kitchen, corn chaff and rice bran constitute the main ingredients. Specific plants are harvested and fed to the pigs as well.

Housing: local building materials are used in constructing sty. These are cleaned every morning before feeding.

Waste management: the disposal of dung was not a challenge as this is used on the farms as manure. The farmers have crops grown around their pens and these are fertilised from the waste generated.

Disposal of dead animal: whenever unknown cause of death occurs the farmers bury the pig. For some farmers living in rural parts of the metropolitan area, a known cause of death, for instance the deliberate killing by neighbours – does not end in burial but sold for consumption.

4.6 Quality control system

The study revealed through interviews with the MSVO, and director-in-charge at UDSML that there is a quality control system in place under the oversight of the veterinary office.

Table 4.8: Quality control measures

Level	Control measures	Observation
Farm	Treatment of pigs against diseases Disposal of dead animal Disposal of manure	Undertaken by veterinary but hardly done Bury Use on farm land
Transport	Movement of pigs outside the metropolis requires permit issued by the veterinary service. Transport of pork in meat van.	Permit issued by veterinary Never
UDSML	Holding pens for ante-mortem inspection Efficient waste disposal Use of appropriate outfit for processing Standard processing equipment A certified cold storage facility Routine facility inspection by authorised officers.	Veterinary inspection. Always done Available Available
Retail joint (market)	Inspection of pork by the veterinary officers	Undertaken by veterinary

Home slaughter for purpose of selling to consumers dominates as revealed from the interview with the MSVO and processors. It was made known that some local processors, sometimes, accept stray pigs killed by neighbours and are of the belief that since the cause of death is known, the pork is considered as hygienic for human consumption. The meat may not be wholesome looking at the situation in which the animal was killed.

Case 1. Mr Stephen Adams – a pig farmer

“One of the biggest problems we do encounter is deliberate killing of our pigs. Some of our brothers who practise the Muslim religion don’t want to see the pigs near their farmers. Even in the dry season when no crop farming activity is taking place which may lead to the destruction of crops when pigs are allowed to scavenge, our pigs are at the mercy of these people. They kill the pigs and, sometimes have the courage to, inform us. Since the cause of death is known, it is always better to get some money, no matter how small it will be, from the pig instead of throwing it away entirely. We do sell to the local processors.”

Confirming the farmer’s information a local processor was asked about his opinion on the subject.

Mr Charles Wumea – a local processor

“I will not buy dead or sick pig and process but in a situation where the pig is deliberately killed by a neighbour, the meat is wholesome for consumption. In such a situation, I buy, process and distribute to retailers. Such pork does not pose any health hazard and it is safe to consume.”

4.7 Situational analysis of UDSML and informal chain

Porter’s five forces is a tool used to analyse the task/specific environment. It is going to be used for the UDSML operational environment and the informal chain.

Bargaining power of suppliers: In all situations, farmers sell when there is the need for money and will even sell to a buyer offering a cheap price. The UDSML requires pigs from producers which have led to buyer-supplier relationship. There is a weaker chain relationship as the producers are not under any obligation to supply their pigs to the processing centre and as a result only sell when they want to or choose their buyer. They have a choice and switch buyers at no cost. The few producers (20% from the survey) who sell to the meat centre were discovered to have their farms within a shorter proximity.

In the informal sector, there exists some level of informal contracts between producers and processors. The form of contract has led to a stronger chain relation between them. Those without contracts are limited as buyers are few so the suppliers have little option to choose their buyers. Farmers without any form of contracts have a choice and can switch buyers at no cost, but a high switching cost for those who have an agreement with the processors. Producers are less powerful as they have limited market information or choose their buyers.

Threat of new entrant: The possibilities of new pork processors entering into the industry will create competition. However, there is policy supporting the establishment of private meat processing factories as government encourages the private sector participation in the development of the nation economy. Pig processors can enter and exit market at will and there is no regulation that can stop additional competitors from entering. But there is a higher cost if processors want to switch to the formal chain since that requires a higher capital.

The informal sector has lower switching cost, low capital requirement and no policies preventing them from operating. In addition to these it has access to the market with more retailers (20) to distribute the pork.

Threat of substitutes: Due to quality, in the UDSML chain, the products are designed for the elite and the university community. Customers have a lot of alternatives to choose from since prices of substitute products are cheaper and are measured in pounds so a low income consumer can easily afford. The majority of buyers are inclined to the substitute products.

Retailers from the informal sector are having little competition from the UDSML as their products are the cheapest on the market and are most preferred as the majority of the consumers are low and middle income earners. The substitute products from UDSML and beef, chicken, chevon or mutton have higher prices and are available on the local market.

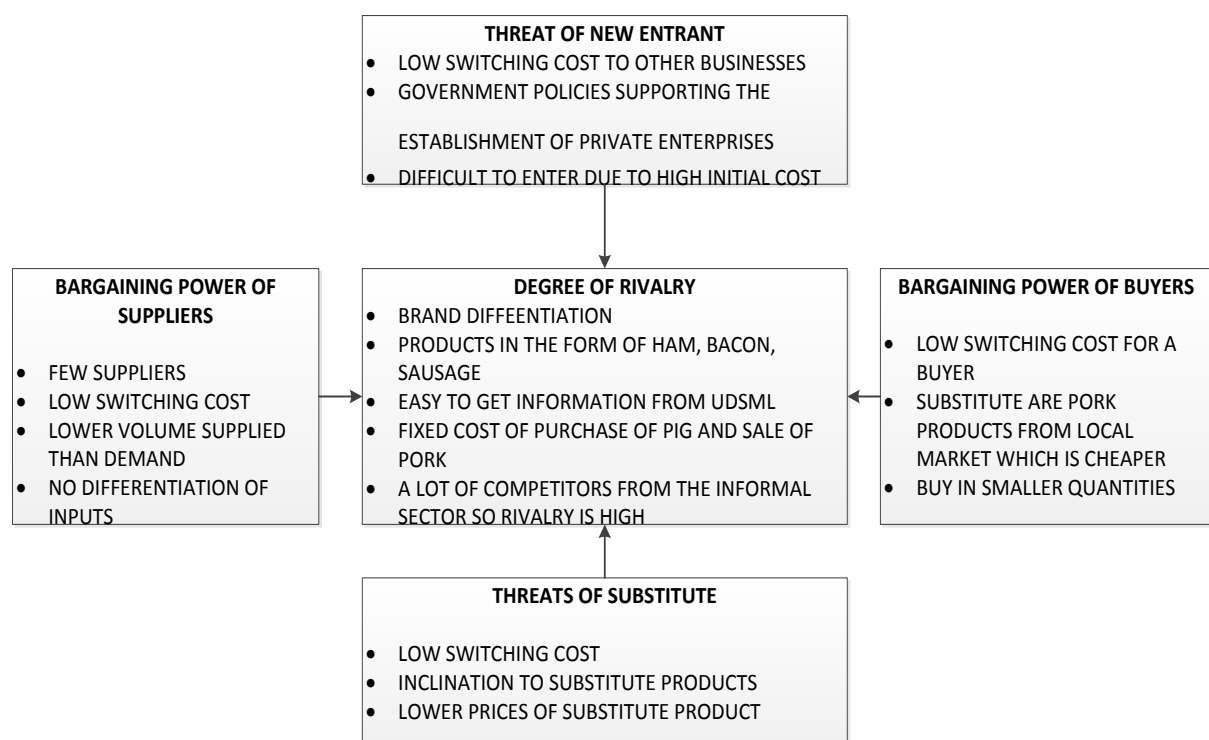
Bargaining power of buyers: Buying of pigs is relatively transparent from the UDSML as they have a fixed price paid for all purchases. It has made UDSML less powerful in bargaining though it will not accept any pig at all to buy and process. The pig for slaughtering must attain a certain minimum weight before it will be accepted for processing.

The informal sector has few buyers but control the pricing. Even though the producers determine when to supply, the processors determine the price by having a stronger bargaining power. Currently the switching cost is high for producers as some of them have contracts to fulfil.

Degree of Rivalry: The UDSML is facing a stiff challenge from the informal sector and, therefore, not making the needed impact as per the establishment objective. It supplies difference products that suit the taste of the consumers at a higher cost. The advantage over the informal is the information they share with the suppliers. Information exchange between is paramount for the value chain. The main competitors are the processors in the informal chain.

In the informal sector, there is growth as evidenced by the number of retailers over the years. The retailers add value to the products they sell through boiling and roasting. Information sharing on pricing is limited, especially to the producers. Entering and exiting is at no cost to the chain actor. Prices between processors and retailers are fixed but not between producers and processors.

Figure 4.5: Porters forces of UDSML



4.8 SWOT analysis of the pork value chain of UDSML

The table looks at the internal and external factors of UDSML pork value chain. It should capitalise on its strengths and opportunities and develop strategies to eliminate or minimise the weaknesses and threats

Table 4.9: SWOT analysis of UDSML

STRENGTHS	WEAKNESS
Transparency in buying. Product differentiation through branding. Value addition of pork through second processing. Quality assurance through inspection, processing and preservation methods. Standardise bulk storage facility for pork. Modern processing facility.	Lower price of competitive products Delay payment leading to mistrust from producers No external market outlets Longer distance between city centre and processing plant/retail centre.
OPPORTUNITIES	THREATS
Awareness creation on hygienic and food safety. Industry with tremendous growth potential	Outbreak of pig diseases Low income consumers prefer buying from the informal sector. Importation of cheap pork products into the country. Production area prone to conflicts

CHAPTER 5: DISCUSSION

5.1 What are the reasons for farmer's choice in selling to a particular buyer?

Despite the concern for hygienic and food safety campaign, producers prefer to sell in the informal chain. The informal market is easily accessible and all producers can easily access the market. There are minimal pre slaughter checks on pigs and as a result the producers sell their pigs with the intention that it will not be seen and rejected by the veterinary if found to be unwholesome. Through repeated transactions over time with local processors, they have built personal relationships and trust (a form of informal certification) between themselves leading to the selling and slaughtering of, sometimes, unwholesome pigs.

Payment is instant upon delivery of a pig in the informal value chain and when there is a delay, the producers are assured of time period to receive their money as they sell in relation to their need for cash. The producers explained that the UDSML sector delay in the payment of pigs delivered and they supply to others that pay early. The delay reduces their profit and thus their surplus. Therefore, they received less than the guaranteed producer prices in the period that payment delays were experienced. This confirms the findings of Nyamadi (1998) that farmer's sell their livestock's in the period of immediate need for money.

Another reason is some farmers have no other option than to sell to a particular buyer because they have no knowledge where to sell since the buyers are few in number. Some of the farmers do have mutual contract with the buyers and could not retract it for any reason. Some local processors were willing to buy any pig no matter the condition, even if it is killed by a neighbour. It is easier selling through the informal chain at a lower cost than being rejected and discarded through the formal chain.

The informal processors who double as producers are not in a position to trade their pigs to another buyer. They increase their profit margin by adding value to products which is the goal of many producers and processors. The processors prefer to take charge of their pork with some added value before selling. This confirms the findings of Fleming (2004) that value addition increases revenue. Adding value has a certain importance in that it offers a strategy for transforming an unprofitable enterprise into a profitable one.

5.2 In which ways is meat inspection carried out in the UDSML and the informal chain?

In the informal pork chain, inspection is either on the farm by veterinary officer or inspection is done when pork is supplied to the retailer at the market or supply outlets. The commonest is the inspection at the various outlets scattered in the metropolis. As a result of this, veterinary do daily checks at the processing or the retail outlets. Any person who refuses to let his pork inspected before selling to the public commit an offence punishable by law.

However, the pork can still be contaminated because of the use of unapproved means of transportation. Pork is transported on motor bikes and in taxis since no meat van is procured for such use. In the case of pork rejection, the farmers are informed on the reasons why their pork is not safe for public consumption.

In the UDSML sector, every step is under the surveillance of the veterinary doctor who certifies the wholesomeness of pork before it is sold. Even though quality of a product begins at the farm, it is difficult to monitor this. The pork is either accepted or rejected through ante or post mortem examinations carried out on every pig slaughtered.



Figure 5.1 Processing on a slab

5.3 What quality control measures are applied in the pork value chain?

Processors in the informal sector do not observe adequate hygiene. Moreover, the quality of pork produced is questionable due to the use of dirty clothing/aprons, unclean hands and some dirty slaughtering equipment. From observations, the slaughtering and processing takes place without due regard to basic hygienic practices like wear clean aprons, boots, mesh gloves and hair cap during pork processing in the informal chain. Such poor practise might result in the isolation of various pathogens sold in the Tamale Metropolis (Adzitey et al., 2011).

Processors does not use approved meat vans to transport the pork to the retail centres. The common means of transporting pork from the slaughter places is by the use of taxis and motor bikes. This means there is a serious public health concern since pork is transported sometimes in unsanitary vehicles. The use of polythene sheets as covering material to preventing meat contamination is the most popular method (Adzitey et al., 2011). In accordance to literature, in Northern part of Ghana carcass are manually carried or transported on trucks or on bicycles directly from the slaughter slab to the retail table (Ihekoronye and Ngoddy, 1995). Research by Addah, et al. (2007) stated that farmers in rural areas of Northern Ghana are often constrained with efficient and reliable transport facilities due to poor conditions of road networks. In the metropolis, vehicles and motorcycles are the commonest and most affordable means of transporting pork.

5.4 What factors have contributed to the low supply of pigs to the UDSML?

The informal sector continues to thrive as the farmers do get some form of assistance from other actors in the chain. KIT and IIRR (2010) explained that most smallholder farmers rely on actors in the chain for financial support and market access. This gives the knowledge of an existing business relationship that both enjoys and may not like to join an association. Informal financial dealings do not involve legal certification and are built primarily on a personal or business relationship making them simple and attractive to rural people.

In order to ensure uninterrupted supply of pork, the processors in the informal sector have assisted other producers to establish farms by giving them gilts to start. In return for the payment, the producers sell pigs to the processor. This has helped in sustaining their market and to have control over pricing. UDSML is not in such an agreement and farmers determine when to supply or who to supply to without difficulty.

5.5 What motivates an actor to sell to a buyer?

From the interviews conducted, it was made known that there is an extrinsic form of motivation for the retailers who continuously put in orders from the informal value chain processors (who are their suppliers). The processors give out the trotters free of charge, as a form of reward to the retailers. This practise has strengthened relationship as retailers get extra income from the sale of the trotters in addition to pork sold on the market.

5.6 Consumer perception on meat quality

In the northern region the high level of illiteracy (54.9%) (GSS, 2012) has contributed immensely to the acceptance of low quality of pork. The influencing factor in terms of purchasing is price and quantity. The consumer incorporates several influences when buying pork of which budget constraint are the most important.

Meat is bought by low income consumer without attachment of quality to the product. Purchasing of a low quality product at cheaper price is acceptable. The national average of poverty is estimated at 39% while in the northern region it is 69% (<http://www.modernghana.com/news/111564/1/>). So the majority of consumer perceptions of product, meat quality and safety as well as some personal characteristics are likely to affect

purchase decisions. Consumers may see a product to be of high quality, and will like it, but they may simply not be able to afford it.

CHAPTER 6: CONCLUSION

From the analysis it is clear that the informal chain is accepted and still thriving at the expense of the UDSML chain which is making little impact, in the metropolis even with the assurance of quality. A large amount of pork is sold through the informal chain from the smallholder pig farmers to which they have access and is most preferred, resulting in the underutilisation of the processing facility at UDSML. There have been campaigns on food safety and quality but the procedure to achieve this has not been followed, at least, for the pork processors in the Tamale Metropolis. The slaughtering, processing and handling methods have always been left with more questions than answers in terms of quality.

The objective of UDSML in providing consumers with quality pork is not been achieved. In northern Ghana, pork production is confronted with problems of unhygienic handling. Transportation using unapproved vehicles reduces the quality of pork. Some of the producers had no slabs where they prepare the pork and that implies that the observance of adequate hygiene and quality of pork is questionable. The few veterinary inspectors, and without a centralised abattoir for pigs, are not able to visit all slabs in the farms to inspect pork. In overcoming this, the veterinary officers visit the retailing centres where they do the inspection. The danger is the retailers cannot wait for veterinary approval when their customers are waiting to take the pork home.

The increase in demands for pork can lead to processing of unwholesome meat since pigs slaughtered through the informal chain are not all inspected by qualified personnel. The pork that will be inspected and seen to be unwholesome will be rejected so it will be concealed and find its way onto the market. Veterinary authorities should intensify efforts to monitor the supply of pork and conditions of sanitation and hygiene in places where pork is processed for the public in the informal sector.

Clear roles by food inspection bodies must be defined so that it will limit the conflict between them. The public, and consumer organizations, could play key roles in the food control system by drawing attention to inefficiencies and supporting quality control systems. Wherever, there is consumer pressure, there is keen awareness of food quality issues.

CHAPTER 7: RECOMMENDATIONS

From this research considering both desk study and field studies of the formal value chains through the UDSML and informal chain it could be said that formalising the informal chain will have enormous benefit for all actors and food safety can be regularised. This will help to erase the perception concerning the hygienic standards of pork produced in the northern region of Ghana. Upon these findings the objective of this research which is to investigate and analyse the performance of UDSML that caters for public health while exploring the opportunities available in the sector to enhance development of the pork value chain, the following recommendations are made

- Even though, the number of farmers is few in the metropolis, some are also not aware of UDSML. The fact that the main suppliers are producers near-by attests to the need to intensify the supply base to keep the project in operation by reaching to more farmers in other parts of the metropolis. A lot needs to be done to reach more farmers who are not aware of the existence of the unit or the higher prices offered per kilogram of live weight.
- The bureaucratic system of payment that takes days for a farmer to get his money has to be avoided to eliminate the mistrust as producers seek for prompt payment. However, if they can be paid within a shorter period, after the delivery of pigs, it will serve as a morale booster and will encourage them to sell more.
- The UDSML can have contractual agreement with producers and introduce incentive schemes through paying of bonuses or introduce low interest loan for the producers to increase production and channel sales through the UDSML.
- The organisation of fora for producers on hygiene improvement at the farm level to improve pork quality will be an added advantage since the production system is a factor in exposing the pigs to diseases and parasites. Good housing structure that will meet the basic hygiene requirements to be designed by livestock production specialist with the collaboration from the farmers.
- To get pork closer to the consumer, there should be an outlet where one can easily walk in or locate an agent who will be given supply constantly to sell. This will help in maintaining a good customer retailer relationship as frequent shortages lead to consumers switching to other sources of supply.
- The UDSML can put forward a proposal to the VSD to make it a mandatory slaughtering centre for pigs since such a facility is the only one in the northern region of Ghana. In that regard it will continue to deliver quality pork to the public and help erase misconceptions about the safety of pork sold on the market.
- Leasing the place out to another processor with a memorandum of understanding on its usage will save the UDSML on overhead cost in running the place as staff are being paid and yet little, if any, income/profit is generated.
- The formation of farmers association by the UDSML as it has worked for other producer groups in Ghana and Kenya, is possible. Lessons from these chains can be learnt to enhance the chain in the Tamale Metropolitan area.

REFERENCES

- Addah, W., Oppong, M. A. and Oppong-Anane, K., 2007. Effects of pre-slaughter transportation stress on some haematological parameters of small ruminants. *Journal of the Ghana society of animal production* vol. 2 and 3 No. 1. Pp 189-194
- Addah, W. and Zezebi, N., 2008. Impact of Ethnic Conflicts on Livestock Production In Africa: The Case of the Northern Region of Ghana. *Journal of Agriculture and Social Research (JASR)* Vol. 8, No.1
- Adzitey, F., Teye, G. A., and Dinko, M. M., 2011. Pre and post-slaughter animal handling by butchers in the Bawku Municipality of the Upper East Region of Ghana. *Livestock Research for Rural Development*. Volume 23, Article #2. Retrieved July 11, 2012, from <http://www.lrrd.org/lrrd23/2/adzi23039.htm>
- Adzitey F., Teye G. A., Kutah, W. N., and Adday S., 2011. Microbial quality of beef sold on selected markets in the Tamale Metropolis in the Northern Region of Ghana. *Livestock Research for Rural Development*. Volume 23, Article #1. Retrieved August 24, 2012, from <http://www.lrrd.org/lrrd23/1/kuta23005.htm>
- Al-Hassan R., Diao X., 2007. Regional Disparities in Ghana: Policy Options and Public Investment Implications. International Food Policy Research Institute, Sustainable Solutions for ending hunger and poverty IFPRI Discussion paper February 2007 Washington D.C, USA.
- Amu, N. J., 2005. The role of women in Ghana's agriculture. Available at < <http://www.library.fes.de/pdf-files/bueros/ghana/02990.pdf> > [Date accesses 10/09/2012]
- Annan-Prah A., Mensah A. A., Akorli S. Y., Asare P. T. and Kumi-Dei I. D., 2012. Slaughterhouses, Animal slaughter and Slaughter Hygiene in Ghana. *Journal of Veterinary Advances*, 2(4): 189-198.
- Birol, E., Roy, D. & Torero, M. 2010. How Safe Is My Food? Assessing the Effect of Information and Credible Certification on Consumer Demand for Food Safety in Developing Countries. IFPRI Discussion Paper 01029, October 2010, Washington D.C.
- Brundtland, G. (ed.).1987. "Our common future: The World Commission on Environment and Development", Oxford University Press. Oxford, UK.
- Clotey S. J. A., 1985. Manual for slaughter of small animals. FAO. Rome.
- Dutch Pig Farmers, 2012. *Vekensenzo.nl - Everything about pigs*. [Online] Available at: http://www.varkensenzo.nl/EN/index.php?file_id=4 [Accessed 15 September 2012].
- Eusebio, J.A. 1980. Pigs Production in the Tropics. Longman Inc. New York.
- Factbook, 2012. *Central Intelligence Agency*. [Online] Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html> [Accessed 16 May 2012].
- FAO, 2003. Trade Reforms and Food Security Project: Ghana.
- Fleming, K., 2004. Value-Added Strategies: Taking Agricultural Products to the Next Level. Available at < <http://pacificmediapub.com> > [Accessed 15/09/2012]

- Ghana Statistical Service, 2012. 2010 Population and Housing Census. Summary report of final results. Accra, Ghana.
- Githigia, S., Okuthe, S. & Diop, B., 2012. *Pig Sector - Kenya; FAO Animal Production and Health - livestock country reviews*. 1st ed. Rome: FAO.
- Ghanaweb, 2009. Northern Ghana: Ethnic conflicts and politics. [Online] Available at <<http://www.ghanaweb.com/GhanaHomePage/NewsArchive/artikel.php?ID=172737>> [Date accessed 2 October 2012].
- GNA, 2005. Food Safety, an Increasing Public Health Issue [Online] Available at <<http://www.modernghana.com/news/118107/1/food-safety-an-increasing-public-health-issue.html>> [Date accessed 9 July 2012].
- Gracey, J.F., Collins D.S., Huey, R.J., 1999. Meat Hygiene 10th ed. W. B. Sanders Company Ltd. London, Edinburg, New York, Philadelphia, Sydney, Toronto pp77-99.
- Grimble, R. and Wellard, K., 1996, 'Stakeholder methodologies in natural resource management: A review of principles, contexts, experiences and opportunities', *Agricultural Systems*, 55(2): 173-193.
- <http://www.epa.gov.gh/ghanalex/acts/Acts>. [Date accessed 03 October 2012].
- <http://www.fdbghana.gov.gh> [Date accessed 03 October 2012].
- <http://www.siteresources.worldbank.org> [Date accessed 04 October 2012].
- Holness, D.H., 2005. The Tropical Agriculturist. Pigs; Macmillan Education Ltd, London. Pp 1-120
- Ihekoronye, A. I. and Ngoddy, P. O., 1985. Meat, Poultry and Fish. In: *Integrated Food Science and Technology for the tropics*. Macmillan Ltd., UK. Pp. 326 – 338
- Jösön, J., 2007. The overwhelming Minority: Traditional Leadership and ethnic conflicts in Ghana's Northern region. Centre for Research on Inequality, human Security and Ethnicity (CRISE). Department of International Development, University of Oxford. Working paper No. 30. Retrieved from <http://www.crise.ox.ac.uk/pubs/workingpaper30.pdf> 8 September 2007.
- Kaplinsky, R. and Morris, M., 2001. A Handbook for Value Chain Research. Brighton, UK, Institute of Development Studies, University of Sussex.
- Karbo, N. and Bruce, J., 2000. The contribution of livestock production to food security in Northern Ghana. CIDA (Canadian International Development Agency) food security programme. A report submitted to CIDA by the Animal Research Institute of the Council for Scientific and Industrial Research, Tamale, Ghana, Pp. 3-11.
- KIT and IIRR. 2008. Trading up: Building cooperation between farmers and traders in Africa. Royal Tropical institute, Amsterdam; and International Institute of Rural Reconstruction, Nairobi.
- KIT and IIRR. 2010. *Value chain finance: Beyond microfinance for rural entrepreneurs*. Royal Tropical Institute, Amsterdam; and International Institute of Rural Reconstruction, Nairobi
- Kleindorfer, P. R., Singhal, K., and Van Wassenhove, L. N. 2005. Sustainable Operations Management. *Production & Operations Management*, 14(4) 482-492.

- Linde, V. A. and Naylor, R., 1998. From conflict to conciliation: NGOs consortium for peace in Northern Ghana. A report for the Northern Ghana Inter-NGO consortium and Oxfam, Great Britain. 99 pp.
- Luning P.A. and Marcelis W.J. 2009. Food Quality Management. Wageningen Academic Publishers Wageningen, the Netherlands.
- Lyon, F. 2003. Trader associations and urban food systems in Ghana: Institutional approaches to understanding urban collective action. *International Journal of Urban and Regional Research* 27(1): 11–23.
- Mayr, D., Margesin, R., Klingsbichel, E., Hartungen, E. D., Jenewein, D., Schinner, F. and Mark T. D., 2003. Rapid Detection of Meat Spoilage by Measuring Volatile Organic Compounds by Using Proton Transfer Reaction Mass Spectrometry. *Applied and Environmental Microbiology* 69:4697–4705.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC169070/>
- McDermott, J.J., Staal, S.J., Freeman, H.A., Herrero, M., and van de Steeg, J.A. 2010. Sustaining intensification of smallholder livestock systems in the tropics. *Livestock Science* (in press).
- MOFA, 2011. Agriculture in Ghana. Facts and Figures. Statistics Research and Information Directorate (SRID), Accra. Ghana
- MOFA, 2012. [Online] Available at:
<<http://www.ghana.gov.gh/index.php/governance/ministries/320-ministry-of-food-a-agriculture>> [Date accessed 10 July 2012].
- Modern Ghana, 2002. Eliminating poverty in Ghana [Online] Available at
<<http://www.modernghana.com/news/111564/1/eliminating-poverty-in-northern-ghana.html>>
[Date accessed 3 October 2012]
- Mukhopadhyay H K, Pillai R. M., Pal U. K. and Ajay V. J., 2009. Microbial quality of fresh chevon and beef in retail outlets of Pondicherry Tamilnadu. *Journal of Veterinary and Animal Sciences* 5 (1): 33-36.
- Nyamadi, A. A. A., 1998. Seasonal food availability in the rural household: a gender analysis of food security in the Tolon-Kumbungu District. BSc Dissertation, Department of Agricultural Economics and Extension, Faculty of Agriculture, University for Development Studies. Nyankpala - Tamale, Ghana
- Ofori, K. K. 2012. Discussion on pig value chain in Ejisu (Personal communication, 18 September 2012).
- Okai, D.B., 2007. Prodiving Solutions to the Problems of the Swine Industry in Ghana and Nigeria: The Perspective of a Ghanaian Scientist. Department of Animal Science, College of Agriculture and Natural Resources, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi-Ghana. "Pigs Assets under threats" Spore No. 132, December, 2007.
- Okai, D. B., 1998. Alternative feed resources for pigs in Ghana. Degraft graphics and pub. Kumasi, Ghana. Pp 31-41.

- Okai, D. B., Olympio, O. S., Bonsi, M.K. L. and Sam, E. 1994. Poultry and Pig Production Handbook for the Ghanaian Farmer. Degraft graphics and pub. Kumasi, Ghana. Pp 31-41.
- Pickering, T. E., Impey, C. D., van Gorkom, J. H., & Bothun, G. D. 1996, AJ, 114, 1858 First citation in article | CrossRef | ADS
- Prescott, L. M., Harley, J. P. and Klein D. A., 2002. Food and Industrial Microbiology. In: Microbiology 5th Edition pp 125 – 964. The WCB McGraw-Hill companies, Boston, USA.
- Sarpong, P. K., 2009. Post-weaning growth performance of the Ashanti black pig under intensive management system. MSc Dissertation, University of Cape Coast, Cape Coast, Ghana. Pp 50.
- SRID. 2007. Agriculture in Ghana. Facts and Figures. Statistical Research and Information Directorate, Ministry of Food and Agriculture, Accra, Ghana
- Sulley, M. S., 2006. The Hygienic Standard of meat handling in the Tamale metropolis. B.Sc. Dissertation, University for Development Studies, Tamale pp 23-29. Tamale, Ghana.
- Tedo, P. V., 2005. Building Business Value through Sustainable Growth. *Research Technology Management*, 48(5) 28-32.
- Teye, G. A. and Okutu, I., 2009. Effect of Ageing under Tropical Conditions on the Eating Qualities of Beef. *African Journal of Food Agriculture Nutrition and Development* 9: 1903-1904. <http://www.ajfand.net/Issue30/PDFs/Teye3545.pdf>
- Trienekens, J. and Zuurbier, P. 2008. 'Quality and safety standards in the food industry, Developments and challenges', *International Journal Production Economics*, 113, pp.107-122.
- UDS, 2005. UDS MEATS BUSINESS PLAN. Tamale: University for Development Studies (UDS)
- Verschuren, P and Doorewaard, H., 2005. Designing a Research Project. Second Edition. LEMMA. Utrecht, The Netherlands.
- Veterinary Services Directorate (VSD, MoFA) 2007. Ghana at 50: Progress and Challenges of Sustainable Agricultural Development. Twenty-third National Farmers' Day Brochure. Wa, Upper West Region. Ghana.
- Warriss, P. W., 2001. Postmortem changes in muscles and its convection into meat. *Meat Science*, an introductory text, pp. 100 – 161. CABI Publishing, Wallingford, UK.
- Wever, M. & Talamini, E., 2009. The Supply Chain Quality Coordination in the Pork Sector: A Comparison Between Brazil and the Netherlands. Sao Paulo, PENSA.
- Wever, M. And Wognum, P.M., 2008. Fresh pork meat chains- The Netherlands, Q-Porkchains Project FP6-036245-2.

APPENDICES

Appendix 1: Survey questionnaire for small holder pig farmers

1. Name of farmer.....

2. Age

3. Sex

4. Educational background

- a) Never been to school
- b) Primary level
- c) Secondary level
- d) Certificate level
- e) Diploma & above

5. What are the reasons for producing pigs?

- a) Demand of pork
- b) Profit margin
- c) Family business
- d) Feeding on a variety of feed
- e) Others (specify)

6. What is the intensity of production?

- a) Extensive
- b) Semi-intensive
- c) Intensive

7. What is current pig herd size?

Herd size per category

Age category	Males	Females	Total
a) Piglets (Less 8 weeks)			
b) Weaners (8 weeks-14 weeks)			
c) Fatteners			
d) Sows /gilts			
e) Boars			

8. Which do you sell your pigs?

- a) At farm gate
- b) Local livestock market
- c) UDSML
- d) Others (specify)

9. Who is the main buyer of your pigs?

- a) Pig traders (middlemen)

- b) Local processors
- c) Other pig farmers
- d) UDSML
- e) Others (specify)

10. What is your reason for your choice of buyer above? (can choose more than 1)

- a) Provides transport
- b) Transparent payment mode
- c) Offers better price
- d) Buy all categories of pigs
- e) Pigs collected when you want (assured market)
- f) I sell to any buyer that is available
- g) Others

11. At what stage of growth do you sell your animals?

- a) Piglet
- b) Fatteners/growers
- c) Mature
- d) Spent pig
- e) Any growth stage

12. What revenue do you get per each category of pig?

Particular	Amount
Fatteners	
Piglets	
Sows/gilts	
Boars	

13. How often do you sell your pigs?

- a) Monthly
- b) Every three months
- c) Twice in a year
- d) Yearly
- e) No clear pattern

14. Who provides you with information about pig business? (can choose more than 1)

- a) Livestock extension staff
- b) Pig traders
- c) Radio/television/ newspapers
- d) farmer to farmers
- e) Combination of the above
- f) None/other

17. What kind of information do you get from the answer above?

- a) Quality of pork
- b) Price
- c) Husbandry practices
- d) Market outlets
- e) A combination of the above
- f) None

18. How will you like to see the supply chain for it sustainability?

- a) Improving quality of products
- b) Engaging in contract with traders
- c) Marketing as a group
- d) Bulk input supply acquisition
- e) Others

19. Quality and food safety: which of them is more important to you?

- a) Quality is more important than food safety
- b) Food safety is more important than quality
- c) Safety and quality are equally important
- d) Others perception (specify)

20. What farm practices do you carry out that enhance pork quality and food safety? (can choose more than 1)

- a) Transport conditions of pigs
- b) Clean pig units (cleaning procedures)
- c) Observing withdrawal periods of vet drugs
- d) Disposal of dead pigs
- e) Disposal of manure
- f) Slaughter age
- g) Others.....

21. Do you process pork on your farm for sale?

- a) Yes
- b) No

22. If YES who does the meat inspection before sale?

CASE STUDY CHECK LIST

Appendix 2 Check list for transporter / middleman

1. Where do you sell your pigs?
2. How long have you been in the business of livestock transport?
3. Do you transport other livestock apart from pigs?
4. How many animals do you sell in a week?
5. What are the reasons for choosing to sell your animals in the formal/informal chain?
6. What extra benefit do you receive from the processor?
7. What is your means of transportation?
8. Is the transport facility specifically adapted for the business?
9. How much do you receive per kg carcass weight upon delivery to the processor?
10. What are the constraints that you face in transportation to the formal/informal chain?

Appendix 3 Check list for processor

1. Ownership of the abattoir/ concrete slab
2. How long has it been in operation?
3. Numbers of pigs slaughtered per day.
4. What is the current demand of pork?
5. What challenges do you encounter in your activities?
6. What are the disposal methods of effluent from the slaughter unit?

7. Who does the inspection of meat before been sold?
8. What activities are carried out to ensure public health safety?
9. What is the system of payment to suppliers?
10. What is the price offered per kg of carcass weight?
11. What incentives do you give to the supplier?

Appendix 4 Check list for retailers

1. Where do you get your supply from?
2. What other supply sources available?
3. What motivates your preference of buying from this processor/wholesaler?
4. How consistent is the supply from the processor/wholesale?
5. What feedback do you get from consumers concerning the quality of the product?

Appendix 5 Check list for Metropolitan Veterinary Director

1. Describe the predominant pig production systems in the metropolis?
2. What constraints are faced by small scale pig farmers in the metropolis?
3. What do you think is the reason for pig farmers participating in informal marketing arrangements?
4. What are your present plan and strategies in pig husbandry development?
5. What are the main limiting factors in pig development, and what can be done to increase production?
6. What can you say about the slaughtering of pigs in the informal chain and its impact on public health?
7. What measures do you take to inspect/check
8. What is the punishment for offenders who processes or retail pork without approval from your department.
9. What are the reactions for farmers/middlemen when their pork is rejected for public consumption?
10. What steps are you taking to discourage individual slaughtering at home for public consumption.



Appendix 6 Data from the field (interview with stakeholders)

Interview with Metropolitan senior veterinary officer (Baba Issah)

Production system of pigs: Semi intensive

Constraints: Muslim community (pig farmers move away from town)

- Housing size
- Difficult to treat when animal is sick.
- farmers selling early (not grown)
 - refuse to expand
 - late treatment of disease

UDS (Collapse) –cumbersome

Inspection by veterinary and sanitation officers of every meat on the market

Sick animals find their way to the market even in sacks.

Punishment for offenders –jail term (sentence)

Pork demand –Institutions demand

Road side sales

Interview with transporter/broker - Mr Mumuni

Does not supply to one person (about 10 people)

Markets – Kumasi, Accra, Takoradi experience 19yrs

Number per week 30 - 40 pigs (Dec, Jan, Feb, March – high supplies)

Other months sells 50 - 60 pigs at 2 weeks intervals.

Incentive provides meal (breakfast) or lunch

Means of transport: truck (between GH¢10-20 per pig)

The more you take the less the payment

Sale at abattoir “local name -mayanka” in Kumasi

4 ways/types of sales in mayanka;

- weigh live animal
- Kill and sell pork,
- bargain and add profits
- sell without head,

Prefer the weigh alive

Price of 1kg live weight = 3.90 (company take 0.20)

Final payment =GH¢3.70

Buy at farm gate only males

Transport constraints police demand cash before opening barrier for passage.

Results: threat of new entrant (police bribes)

Interview with manager - PTLBS - Pong Tamale – Mr Shahadu

Purpose- serves farmers with good quality animals

Have structures

National model breeding station

-main interest: maintain pure gene of WASH cattle

-Livestock extension is very rudimentary,

-Veterinary service is more interested in health of animals

Purpose –serve famers with good animals and achieves this through open breeding nucleus scheme.

Give knowledge to farmers.

Pigs are intensively kept

Sells after 20kg weight of live animal

Pay money into consolidated fund

Prize: 1kg=GH¢4.00 live weight

Pre-arrangement by phone calls

Sell to all interested farmers

A complete station with all personals or sectors in place

Supply to all parts of the country to individuals & groups

Mortality ratio - 4 pigs in a year

Demand is quite low from Tamale Township.

Foreigners patronize the processed pork.

Religion does not affect the production as people do not prevent others from rearing.

Structures for pig, sheep, cattle, rabbit.

Breeding chart as at 30/06/2012

CATEGORY	NUMBER
Breeding males	3
Young males	49
Castrates	9
Breeding sows	14

Gilt	60
Piglet boar	11
Piglet gilt	12

Interview with Mr Alenyorege in-charge of UDSML

Payment method: Request sent to dean and then to the Account officer

-lease the place out for a short term

Lease the place out with strict conditions as it will be used for students practical

In northern Ghana livestock rearing

- Farmers sell when in need of money –funeral , school fees, building
- Only about 20% sell when animal is fattened

Slaughtering: Auditors inspects animal before slaughtering

Facilities-sealing

Smoking

Marketing system

- Informer chain is cheaper
- Unit of sale: sells in kg while informal sells in lb.
- Processing unit is 16km from town.
- No outlet in town so people drive too long to buy.
- Consumers are not looking at standards. Prefer quantity & price
- People overrule standards so they see all meat to be the same.

Respect suppliers -delay in payments (up to 2 weeks)

Privatise (rent) the place with a memorandum of understanding.

Disciplined chain of command

Position of university on investments should be made clear.

Bulk buying (stop buying input in small quantities)

-seed money to run the meat unit

Mr Simon – processor/retailer at Sagnarigu

Processing at home on his slab

21yrs in the business

Process about 4-6 pigs per week.

Demand increasing dd

Increase population

Different tribes

Challenge; electricity/power ss

Storage facilities to store

Disposal of effluent; burial

Meat inspection; by the veterinary at the farm level.

Payment method: instant payment for full/whole animal. Those that take parts pay after some days

Initial processors were 2 current over 20 retailers.

Incentive given: feet intensive & liver

Price determination: by scale (weight)

Wholesale price=1.80/lb. retail price =2.20/lb. singeing method fire (grass) or hot water

Alhaji processor at Teshie

Processing about 8yrs ago

4 pigs to the market in a week/can be up to 20 in a week

Transportation; use of motorbike

Price; range 1.6/lb. -1.8/lb. wholesale price

Use of slabs at farm for slaughtering

Fire for singeing

Selling price of pig compare to goat/sheep /cattle is lower

Price = 1.8/lb.

Farmers are complaining of getting lower price

Mr Peter – processor/retailer in Tamale

Get supplies from outside the district

Sells other animals like goat to maintain customers

kill at the farm & transport pork in containers on motor bike

Slaughtering: number depends on sizes (smaller 3 in a week and bigger 1 in a week)

Demand of pork: more at beginning of each month

Buying: bargaining at the farmers level

Price =GH¢2.50 /retail price

=GH¢1.6-1.8/lb. wholesale price

Challenge: other retailers do not pay instant cash.