

**ACCESS TO NICHE MARKETS AND EFFICIENCY OF SMALLHOLDER
BROILER PRODUCERS IN TANZANIA**

MALIWAZA MBWANA

**A THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS OF
SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.**

2016

ABSTRACT

This study was conducted to examine the possibilities of integrating smallholder broiler producers into the niche market supply chains for improving their efficiency and incomes. Specifically the study: i) characterize the broiler supply chains with particular emphasis on requirements of participating in the niche market supply chain; ii) analyse technical and cost efficiency of broiler producers; iii) compare the level of benefits realized by broiler producers supplying to niche and conventional retail market outlets; and iv) and analyse the farmers' preferential choice decision of supplying to niche markets. Data were collected using checklists and questionnaires where descriptive statistics, stochastic production and cost functions, discounted cash flow and preferential choice analyses were used to analyse the data. The results showed that the structure of supply chain is described in terms of live bird and dressed bird supply channels, where minimum level of coordination existed in both chains. The estimated farm level technical efficiency ranged from 37% to 97% with a mean technical efficiency of 74%. Day old chicks, flock-size and feed intake were critical variables that affected farmers output at 1 percent and 5 percent respectively. Participation by farmers in niche markets significantly influenced technical efficiency and increased output ($P < 0.01$). Farmers were cost inefficient ($P < 0.05$), high cost of feeds, day-old chicks and low price of broiler chicken in the output market are principal causes of the inefficiency. Average return on investment for the farmers supplying to niche markets was significantly ($P < 0.01$) higher than that of farmers supplying to conventional broiler markets. The net present value (Tshs 5 036 179), benefit cost ratio (1.22) and internal rate of return (46%) for farmers selling to niche markets were higher than accordingly, Tshs 793 938; 1.09; and 30% for farmers selling into conventional broiler markets. Farmers' perceptions regarding niche markets indicated that they had positive

attitude to participate in these markets. To increase efficiency and access to niche markets, the study recommends that: policy and institutional supports that would increase investment and innovation in the broiler supply chain deserves priority for enhancing chain's efficiency, productivity and income.

DECLARATION

I, Maliwaza Mbwana, do hereby declare to the Senate of Sokoine University of Agriculture that this thesis is my own original work done within the period of registration and that it has neither been submitted nor concurrently being submitted in any other institution.

Maliwaza Mbwana
(PhD Candidate)

Date

The above declaration is confirmed by:

Prof. N. S. Y. Mdoe
(Supervisor)

Date

Dr. K. D. Mutabazi
(Supervisor)

Date

COPYRIGHT

No part of this thesis may be reproduced, stored in any retrieval system, or transmitted in any form or by any means, without prior written permission of the author or Sokoine University of Agriculture in that behalf.

ACKNOWLEDGEMENTS

Writing a doctoral thesis was a long journey with ups and downs and I wish particularly to acknowledge the support, encouragement and advice extended by many people whom I consider to be part of this success.

I express my heartfelt gratitude and respect to Prof. N. S. Y. Mdoe and Dr. K. D. S. Mutabazi of the Department of Agricultural Economics and Agribusiness (SUA), for their outstanding supervision and enduring encouragement, but above all for their patience and trust on me towards accomplishing this study. My appreciation is also extended to Prof. Kostas Karantininis of the Institute of Food and Resource Economics, University of Copenhagen who played a major part in giving shape to this study at its initial stage.

Thanks to Danish International Development Agency (DANIDA) for granting me full PhD sponsorship under the project Transforming Smallholder Livestock Farm into Profitable Enterprise (Livestock Enterprise Project). My special thanks go to the Project leaders Prof. M. M. A. Mtambo, Prof. A. P. Muhairwa and Prof. J. Olsen for great assistance, care and un-reserved cooperation.

I extend my thanks to Sokoine University of Agriculture (SUA) for granting me the admission and all expected cooperation. My sincere thanks are extended to Moshi Cooperative University (MoCU) for granting me a study leave.

I thank my colleagues, PhD fellows, Erick Komba, Kajeri Gillah, Lupindu Msalale and Abdul Katakweba for fruitful discussions and ideas.

Thanks to Regional and Districts livestock officers, extension staffs, professionals and enumerators. I also thank the respondents for their cooperation during the data collection exercise.

Special thanks to my family; my in-law family who were very considerate, especially during the difficult times of my father and mother in-law's illness, unfortunately my father in-law passed away when I was in the middle of this study. May the Almighty God rest him "*fil Jannah*" – into Paradise. I also thank my own parents, brothers and sisters.

My special appreciation to my dear husband Dr. Hassan G. Hassan, I am heartily grateful for his understanding and dedicated support, which was truly inspirational for accomplishment of this study. My precious kids, Najaah, Imraan and Hadia, thank you for your "*Du'a*" – prayers. I love you very much.

Above all I thank the Almighty God for His Love, Mercy and Forgiveness He has bestowed on me to accomplish this work.

However, I am entirely responsible for any shortcomings in the study.

DEDICATION

This successful completion of this doctoral thesis is dedicated to my beloved mother, Saida Mohamed Sharia, my hero, for all she has undertaken throughout my life with her tenderness and ceaseless efforts towards my every happiness and success.

TABLE OF CONTENTS

ABSTRACT	ii
DECLARATION	iv
COPYRIGHT.....	v
ACKNOWLEDGEMENTS	vi
DEDICATION	viii
TABLE OF CONTENTS.....	ix
LIST OF TABLES	xiv
LIST OF FIGURES	xvi
LIST OF APPENDICES.....	xvii
LIST OF ABBREVIATIONS AND SYMBOLS.....	xviii
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background Information	1
1.2 Statement of the Problem and Justification for the Study	4
1.3 Objectives of the Study	7
1.3.1 Overall objective	7
1.3.2 Specific objectives.....	7
1.4 Research Questions	7
1.5 Research Hypotheses.....	8
1.7 Organization of the Thesis.....	8

CHAPTER TWO	9
LITERATURE REVIEW	9
2.1 Theoretical Background	9
2.2 Empirical Literature	12
2.2.1 Access to niche markets and efficiency among smallholder farmers	12
2.2.2 Studies on efficiency	14
2.2.3 Policy studies	14
2.3 Conceptual Framework of the Study.....	20
2.4 Research Gap	24
CHAPTER THREE	27
METHODOLOGY	27
3.1 Analytical Framework.....	27
3.1.1 Analysis of the structure of broiler supply chain and coordination among actors.....	27
3.1.2 Analysis of technical and cost efficiency of smallholder broiler producers.....	27
3.1.2.1 Estimating stochastic frontier production function.....	27
3.1.2.2 Estimating the inefficiency model	29
3.1.2.3 Estimation of cost efficiency	31
3.1.3 Determining net benefits for broiler producers selling to niche and conventional markets.....	32
3.1.4 Analysis of farmers' preferential choice decisions on niche market supply chains.....	35
3.2 Data for the Study	36

3.2.1	Secondary data	36
3.2.2	Primary data	36
3.2.2.1	Exploratory survey.....	36
3.2.2.2	Questionnaire development.....	37
3.2.2.3	Questionnaire pre-testing	37
3.2.2.4	Recruitment and training of enumerators.....	37
3.2.2.5	Sampling	38
3.2.2.6	Data collection.....	40
CHAPTER FOUR.....		42
RESULTS AND DISCUSSION		42
4.1	Structure of Broiler Supply Chain in the Study Area	42
4.1.1	Input supply in the smallholder broiler supply chain	43
4.1.2	Broiler production	46
4.1.3	Broiler marketing	47
4.1.3.1	Broiler market in live bird supply channel (farm gate, conventional markets and slaughtering premises).....	48
4.1.3.2	Broiler market in dressed (table) chicken supply channel	51
4.2	Broiler Procurement Methods.....	56
4.3	Quality Requirement by Niche Markets with Regard to Fresh Food Products	57
4.4	Market Arrangements in Sourcing Supplies.....	59
4.5	Mode and Period of Payment by Niche Markets	61
4.6	Results of Technical Efficiency Analysis.....	62
4.6.1	Socio-economic and farm characteristics of the sampled broiler farmers.....	62
4.6.1.1	Socio-economic characteristics the sampled broiler farmers	62

4.6.1.2	Farm characteristics	67
4.6.2	Results of the stochastic frontier estimation.....	77
4.7	Results of the Stochastic Frontier Cost Function Estimation	83
4.8	The Benefit of Supplying to Niche Markets versus Conventional Markets.....	86
4.8.1	Comparison of profitability of niche and conventional markets.....	86
4.8.2	Long term economic viability of broiler farming	89
4.9	Farmers' attitudes on Niche Market and Product Development.....	92
4.9.1	Attitudinal analysis.....	92
4.9.2	Farmers' attitudes towards being in farmers associations (groups).....	93
4.9.3	Attitudes towards producing according to weight specification.....	94
4.9.4	Attitudes towards product development in terms of value adding in initial Processing	95
4.9.5	Attitudes towards product development in speciality cuts to add value	96
4.9.6	Attitudes towards consistency in supply of broiler chicken	97
4.9.7	Attitudes towards alternative market strands (Supermarket and hotels)	98
CHAPTER FIVE		100
CONCLUSIONS AND RECOMMENDATIONS.....		100
5.1	Summary and Conclusions	100
5.1.1	Major requirements of the niche broiler markets	100
5.1.2	Technical efficiency	101
5.1.3	Cost efficiency in broiler production.....	102
5.1.4	Access to markets and efficiency in broiler production	103
5.1.5	Benefits of supplying to niche markets vs conventional markets	103
5.1.6	Farmers preferential choice decisions	103

5.2 Recommendations	104
5.3 Study Limitations and Suggestion for Further Research.....	106
REFERENCES	107
APPENDICES.....	121

LIST OF TABLES

Table 1:	Sources of broiler and broiler products sold in niche markets	53
Table 2:	Proportion of niche markets procuring broilers from small scale farmers by location	54
Table 3:	Quality requirements consideration among niche market in Dar es Salaam and Arusha cities	57
Table 4:	Views of niche markets on quality aspect with regard to small farmers’ ability in meeting these requirements	58
Table 5:	Market arrangement in sourcing chicken products.....	60
Table 6:	Type broiler products sold in niche	61
Table 7:	Time taken for payment in niche markets.....	61
Table 8:	Distribution of sample farmers by gender and age.....	63
Table 9:	Distribution of sample farmers by education level.....	63
Table 10:	Distribution of respondent by major occupation	64
Table 11:	Experience of the farmers in broiler farming	65
Table 12 :	Proportion of farmers in different market channel	65
Table 13:	Proportion of farmers accessed extension service.....	66
Table 14:	Sources of capital in broiler farming	67
Table 15:	Total number of birds and flock size under one production cycle	68
Table 16:	Number of batches and birds kept per year.....	70
Table 17:	Main input used and associated cost structure in broiler farming	71
Table 18:	Summary of the key efficiency parameters in broiler production.....	73
Table 19:	Distribution of sample farmer by type and source of input used	75
Table 20:	Distribution of sample farmers by major diseases in broiler farming	75

Table 21: Means for protecting farm from diseases spread.....	76
Table 22: Disposal of litter and dead birds.....	77
Table 23: Maximum likelihood estimates of translog stochastic production frontier and inefficiency model for broiler production	83
Table 24: Maximum–likelihood estimates of parameters of the cost frontier function for broiler keepers, Dar es Salaam and Arusha Cities	85
Table 25: Parameter estimates of the determinants of cost inefficiency	86
Table 26: Comparison of benefits within the market in the same region.....	87
Table 27: Comparison of benefit between niche and conventional market	88
Table 28: Comparison of benefit between regions	89
Table 29: NPV, BCR and IRR for famers selling to niche and conventional broiler markets.....	90
Table 30: Sensitivity analysis for niche markets	91
Table 31: Sensitivity analysis for conventional markets.....	91
Table 32: Total variance explained and factor analysis robustness test.....	92
Table 33: Measurement of attitudes towards participation in farmers’ groups	94
Table 34: Attitudes towards product development weight aspect	95
Table 35: Attitudes towards product development (value added): initial processing	96
Table 36: Attitudes towards product development in specialty cuts to add value.....	97
Table 37: Attitudes towards consistency supply.....	98
Table 38: Attitudes towards alternative market strand: Supermarket and hotels	99

LIST OF FIGURES

Figure 1: Conceptual Framework for improving smallholder broiler productivity23

Figure 2: Broiler supply chain in Dar-es-Salaam and Arusha Cities45

LIST OF APPENDICES

Appendix 1:	Baseline for general information of the industry (policies, acts, regulation, structure, conduct and performance)	121
Appendix 2:	Checklist for breeder farm.....	125
Appendix 3:	Checklist for hatcheries	126
Appendix 4:	Checklist for feed manufacturers/millers	128
Appendix 5:	Checklist for producers	131
Appendix 6:	Checklist for processors	134
Appendix 7:	Checklist for traders of live/dressed broiler	137
Appendix 8:	Questionnaire for retailers	138
Appendix 9:	Questionnaire for small scale farmers.....	144
Appendix 10:	Discounted cash flow: niche market	153
Appendix 11:	Discounted cash flow: conventional markets	154

LIST OF ABBREVIATIONS AND SYMBOLS

AGDP	Agricultural Gross Domestic Product
AMI	Agriculture Management Institute
APOKA	Arusha Poultry Keepers Association
BAKWATA	Baraza Kuu la Waislam Tanzania
BCR	Benefit Cost Ratio
BSE	Bovine Spongiform Encephalopathy
CRS	Constant Returns to Scale
DANIDA	Danish International Development Agency
DCs	Distribution Centres
DEA	Data Envelopment Analysis
DFID	Department for International Development
DOC	Day Old Chick
FA	Factor Analysis
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
INB	Incremental Benefit
IRR	Internal Rate of Return
LEP	Livestock Enterprise Project

ML	Maximum likelihood
MLD	Ministry of Livestock Development
MLE	Maximum Likelihood Estimates
MLFD	Ministry of Livestock Development and Fisheries
MoCU	Moshi Cooperative University
NGDP	National Gross Domestic Product
NPV	Net Present Value
OLS	Ordinary Least Square
PRA	Participatory Rapid Appraisal
RTCs	Ready- to Cook -Chickens
SF	Stochastic Frontier
SFF	Stochastic Frontier Function
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
SUA	Sokoine University of Agriculture
TAZARA	Tanzania Zambia Railway Authority
TBS	Tanzania Bureau of Standard
TE	Technical Efficiency
TFDA	Tanzania Food and Drugs Authority
TRA	Tanzania Revenue Authority
URT	United Republic of Tanzania
USAID	United States Agency International Development

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Livestock production in Tanzania is one among major components of agriculture that contributes to the country's economic growth and poverty reduction (MLD, 2006), and is one of the major economic activities in the rural and urban areas. However, the contribution of the livestock sector to agriculture development is relatively low. In 2010, the sector contributed about 16% and 3.8 percent to the Agricultural Gross Domestic Product (AGDP) and National Gross Domestic Product (NGDP) respectively, compared to the envisaged target of 9 percent contribution to NGDP by 2010 (URT, 2011). In general, low growth rate, high mortality, low productivity and poor quality of final livestock product have been identified as the main causes of low performance for the sector (MLDF, 2011). It is suggested that improvement in efficiency of production coupled with strategies for adding value could significantly increase output and generate more income from the livestock sector (URT, 2011).

The National Livestock Policy (NLP) of 2006 aim at achieving a competitive, sustainable, participatory and commercialised livestock sector using improved and highly productive livestock to ensure food security, improved income for the household and the nation while conserving the environment by 2025 (MLD, 2006). However, the current trend of 2.3 percent growth of the sector implies that such a milestone cannot be attained without commercialisation of major enterprises in the sector. Arguably, the effort to develop the sector is not shared uniformly across livestock enterprises. There are differences across livestock enterprises in accessing markets that could absorb different products. Access to markets for livestock products remains important in addressing the gap between the vision,

the potential and the reality with respect to the livestock sector in Tanzania. The rapid urbanisation and increase in incomes in developing countries have increasingly influencing change in food consumption pattern towards animal source foods and created ample market for livestock products (Delgado *et al.*, 1999; Pingali, 2006). Due to high demand for animal products such as milk, meat and eggs in urban areas, urban livestock farming has become one of the rapid growing enterprises (Steinfeld *et al.*, 2006). The poultry sector has been part of livestock revolution and is possibly the fastest growing of all livestock sub-sectors, driven primarily by very strong demand (McLeod *et al.*, 2009). In this regard smallholder commercial poultry production, particularly broiler production has increased rapidly in urban areas as potential business for income generation. Quick returns over invested capital due to early market age have increased the popularity of broiler farming among smallholder farmers (Farooq *et al.*, 2001; Badubi *et al.*, 2004; Mozumdar *et al.*, 2009).

Studies conducted in most of developing countries show that commercial broiler production offers a better livelihood and is a good alternative for increasing smallholder farmers' income and poverty reduction (Aganga *et al.*, 2000). Notwithstanding, the broiler enterprise is said to be expensive on its own and highly risky due to broiler meat being a perishable commodity, implying that success in broiler production relies not only on good market connection but also on access to niche markets that pay reasonable prices (Maqbool and Buksh, 2007). According to McLeod *et al.* (2009) successful commercial broiler enterprise means acquiring a position in niche markets for broiler meat. On contrary, majority of smallholders in most developing countries including Tanzania participate in markets informally without formal market linkages.

Maqbool and Buksh (2007) show that the marketing system of broiler in many cases is associated with poor information which result into irregularities and mismatch between demand and supply. The problem of mismatch causes price fluctuation that leads to market uncertainty and as a result farmers fail to allocate their resource efficiently and suffer from losses (Mohsin *et al.*, 2008). Uncompetitive price mechanism is another problem that is associated with smallholder broiler marketing system (Anwar *et al.*, 2004), which in most cases has distorted the growth and expansion of the broiler industry.

Extending the issue of marketing, it is noteworthy that the context of commercial poultry production has changed in many developing countries (Kristensen *et al.*, 2004). To date the industry is increasingly facing structural change due to fast expansion of industrial large scale and vertically integrated broiler production as well due to emergence of new food markets such as supermarkets in urban areas (Kristensen *et al.*, 2004). These have increased market orientation among small scale broiler producers which is considered as an opportunity¹.

On the other hand, however, this brings large and small scale production systems in overlapping competitive space (Kristensen *et al.*, 2004; Ahuja and Sen, 2007; McLeod *et al.*, 2009). Within these contexts, smallholders that supply market chains to urban populations will increasingly be subjected to competition as they could be marginalized to a role of subsistence producers or at least producers without access to lucrative niche markets, unless they are equipped adequately to the complex and dynamic demands of these markets (McLeod *et al.*, 2009; Kristen *et al.*, 2004).

¹ It is noteworthy that rising investment in processing and retailing in developing countries also has induced demand for commodities of high value and high quality standards from local producers in order to serve the high-end income consumers in the domestic markets (Swinen *et al.*, 2010)

While experiences from many countries show that broiler production has tremendous development potential, yet marketing channels that commonly serve smallholders are complex and often associated with inefficiencies that lead to limited success in increasing productivity to most of smallholder farmers. The emerging niche markets, however, are an alternative channel to serve smallholder farmers who meet the niche market requirements. Chikazungwa *et al.* (2008) show that efficiency concerns that include lack of success in consistency production cycle and meaningful volume as well as concern on quality of supplies remain the real challenges for smallholders to access lucrative niche markets and benefiting from them. In Tanzania, studies have not adequately addressed the economics of broiler enterprise, which is important for determining its viability especially as it relates to improving productivity and in accessing emerging niche markets.

1.2 Statement of the Problem and Justification for the Study

Broiler production has long been one of cash earning livestock economic activities by smallholder farmers in urban and peri-urban areas of Tanzania (Msami, 2007). Demand for broiler meat is forecasted to increase due to increase in people's income, urbanisation, and change in life style and dietary habits. Moreover chicken meat is very popular meat across the World and is considered to be health, tasty, and nutritious (Shephard, 2004). Thus with improvement in income and standard of living as well as increase in the number of health conscious consumers, chicken meat is likely to be encountered on most chicken meat menus than menus for any other meat.

The increasing demand for chicken meat give the broiler industry more credibility to meet these growing demand compared to local chicken due to efficiency in converting concentrate feeds to meat. Thus the growth potential of the broiler industry show a great promise and hence the industry is considered to be viable farm enterprise which can

effectively tackle the problems of income earning for smallholder farmers. In harnessing this potential, the issue of improving efficiency in production with the consideration of increasing profit to farmers will be particularly important. However, successful improvement in productivity and profitability largely depend on the potential of marketing channel to support such an improvement.

Traditionally, chickens in Tanzania are sold at the farm or at the conventional markets. With market changes, however, broiler meat producers were successful occupied a place in niche markets relatively earlier than local chicken meat producers. Consequently, niche market outlets that include supermarkets, specialized meat stores and tourist hotels have turned to be potential marketing channels for broilers (Ashimogo and Greenhalgh, 2007). Following this trend, some smallholder farmers have been able to re-orient themselves and managed to gain foothold to these new marketing channels. However, relative efficiency and profitability of smallholder broiler producers in supplying through the new marketing channels is not studied in Tanzania. Also, due to the newness of niche markets among smallholder broiler producers, there is lack of understanding on their perceptions on participating in these markets because of the prominence of conventional market for majority of smallholder broiler producers .

Apart from lack of knowledge in terms of efficiency and smallholder broiler producers access to the emerging niche markets, the commercial poultry sub-sector including broiler production has seen limited interest in marketing research and policy advocacy (Msami, 2007). Broiler marketing researches in the country include: Sumberg (1996) studied marketing of broilers describing different practices among study regions; FAO (2004) looked at impact of import surge on broiler and dairy products in Tanzania. Msami (2007) review poultry sector focusing on structure, marketing and importance of local and

commercial poultry. USAID (2010) analysed poultry value chain in Tanzania. Little or no study has analysed smallholder broiler production in the face of increasing importance of new market channels and their effect on relative efficiency and profitability for smallholder producers.

The present study aims to fill the identified knowledge gap in the existing literature. The general objective of the study was to examine the possibilities of integrating smallholder broiler producers into niche markets supply chain for improving efficiency and farmers' income and eventually contribute to poverty reduction and food security. The study is part of a big research project titled "Livestock Enterprise Project (LEP)". The overall objective of the project was to build research capacity in areas of relevance for transition of livestock from subsistence farming to commercial enterprises. The project had four immediate objectives: (i) To improve research capacity in livestock-related social and economic sciences (ii) To improve research capacity in food safety with special focus on the risks in commercial livestock production in relation to human health. (iii) To improve research capacity in animal science with a view to transform livestock to profitable enterprises. (iv) To build capacity in E-learning as a possible tool to disseminate knowledge to livestock extension workers. This study adds to the knowledge on the need to adapt old or develop new views on the functioning of agribusiness and new food markets in Tanzania because there is no research on this area of market shift subject to broiler production in the country. Also the study informs policy on how to promote and sustain small scale broiler farming in the country in the face of stringent market requirements.

1.3 Objectives of the Study

1.3.1 Overall objective

The overall objective of this study was to examine the possibilities of integrating smallholder broiler producers into the niche markets supply chain for improving efficiency and broiler producers' income.

1.3.2 Specific objectives

The study specific objectives were:

- (i) To characterize the broiler supply chains with particular emphasis on requirements of participating in the niche market supply chain
- (ii) To analyse technical and cost efficiencies of broiler producers.
- (iii) To compare the benefits obtained by broilers producers supplying to niche markets and those supplying to conventional markets.
- (iv) To analyse the farmers' preferential choice of participating in niche markets.

1.4 Research Questions

- (i) What are the major characteristics of the broiler supply chain? What are niche markets' requirements that small scale producers in the supply chain have to adhere in order to access them?
- (ii) Are smallholder broiler producers technically and cost efficient, if not what are the limiting factors?
- (iii) Are the benefits obtained from selling broilers to niche markets higher than benefits obtained from selling broilers to conventional markets?
- (iv) Given the challenges and opportunities of supplying to niche markets, are smallholder farmers ready to participate in the niche markets as suppliers

1.5 Research Hypotheses

Four main hypotheses related to above research questions were tested:

- (i) Access to market has no influence on efficiency of broiler producers.
- (ii) Smallholder broiler producers are not technically and cost efficient
- (iii) Niche markets do not offer more benefits to farmers than the conventional markets
- (iv) Given the newness of niche market farmers have negative attitude to participate in the niche markets

1.7 Organization of the Thesis

This thesis is organised in five chapters including this introductory chapter. Chapter Two reviews theoretical and empirical relevant to the study. Chapter Three describes the study's methodology including sampling study area. Chapter Four presents and discusses the results of the study. Conclusions and recommendations emanating from the findings of the study are presented in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Background

This study is concerned with efficiency of broiler supply chain and the productive efficiency at the farm level. It is therefore important to understand the neoclassical economic theory of a firm in relation to efficiency in supply chain and in production for maximising profit subject to optimum resource use.

Regarding efficient resource use for profit maximisation, neoclassical economic theory categorises three classical efficiency measures (Effiong and Onyenweaku, 2006). These include economic, allocative and technical efficiency. According to Farrell (1957); Effiong and Onyenweaku (2006), economic efficiency, is the ability of a firm to produce a given level of output at lowest cost for given level of technology. Allocative efficiency is related to the ability of the firm to choose its inputs in a cost minimizing way to produce a give level of output given their respective prices and existing production technology (Ellis, 1993). Finally, technical efficiency relates to the question of whether a firm uses the best available technology in its production process, this reflects the ability to operate on the highest feasible point along the production frontier. Further, economic efficiency comprises two components technical efficiency and allocative efficiency (Farrell, 1957).

On the basis of supply chain, efficiency has been defined differently by different people. However, efficiency as a concept that is applied in business and in marketing strategy generally focuses on firm's economic behaviour and on solving supply chain problem (efficiency problem) along the chain (Beamon, 1998; Vonderembse *et al.*, 2006.) Thus

efficiency is used to describe performance measurements and inform decision making units and is useful for policy purposes.

Currently developing countries' agri-food supply chains increasingly find themselves in a fast changing business environment. This leads to high uncertainty in the supply chain that cause a lot of inefficiencies and inflexibility that put the supply chains at risk, with the issue of how to measure efficiency especially at farm level becoming very important in developing countries' agriculture (Parikh *et al.*, 1995). Hence efficiency measures have been widely used as an indicator for agri-food supply chain performance (Aramyan *et al.*, 2006; Latruffe, 2010). An efficient and effective supply chain management strategy is considered to involve among others value maximization, process integration, flexibility and responsiveness improvement (Li and O'Brien, 1999). Therefore it suffices to say improvement in efficiency allows food producers to give consumers what they demand in terms of good quality products, low cost while observing customer satisfaction, timely flexibility in supply. This means in this era of increasing volatile and cost consciousness, the food supply chain should not only supply the foods in demand but also seek efficiencies to control costs (Trienekens, 2011).

Two approaches have been developed to estimate efficiency: the econometric approaches whose main example is stochastic frontiers (SF) (Aigner *et al.*, 1977; Meeusen and Van den Broeck, 1977) and the linear programming techniques represented by Data Envelopment Analysis (DEA) proposed by Charnes *et al.* (1978). The DEA model proposed by Charnes *et al.* (1978) was input-oriented and assumed constant returns to scale (CRS).

The major difference between the two approaches can be best explained by the most distinguished characteristics emanating from their advantages and disadvantages. The econometric approach is stochastic and can therefore distinguish the noise effect from inefficiency while the linear programming approach is not stochastic (it is deterministic) and thus deals with noise and inefficiency together, both termed as inefficiency. Furthermore, the econometric approach is parametric and sensitive to the effect of incorrect functional specification. On the other hand, the linear programming approach is not parametric and therefore it is less sensitive to this type of error, as does not include the specification of functional form.

Previous studies focused primarily on efficiency using deterministic production function with parameters computed using mathematical programming techniques. However, with inadequate characteristics of the assumed error term, this approach has an inherent limitation of the statistical inference on the parameters and resulting efficiency estimates. Aigner *et al.* (1977) and Meeusen and Van den Broeck (1977) independently developed the stochastic frontier production function to overcome this deficiency. This approach assumes that deviations from the production frontier may not be entirely under the control of farmers (Aigner *et al.*, 1977). In so doing, it helps to distinguish the effects of stochastic noise from the effects of other inefficiency factors. It also allows hypothesis testing on the production structure and efficiency. However, literature survey shows that none of these two approaches dominate the other; each has advantages and disadvantages even though they have strong advocates. Therefore the choice of one approach over the other depends on the nature of study, the characteristics of the production process, degree of stochasticity, number of outputs and possibility of aggregation, and the researcher's own preference (Herrero, 2005).

It has to be noted that agricultural production is affected by a host of factors. In this regard, the impact of several demographic, socio-economic and institutional factors on the efficient performance of farming systems cannot be overlooked. Generally, statistical inferences with higher degree of precision and accuracy are most practical and desirable for prediction or policy recommendations (Greene, 1993). Considering the limitations of DEA, the current study prefers the stochastic frontier approach (SF) approach; specifically stochastic frontier production and cost function.

2.2 Empirical Literature

2.2.1 Access to niche markets and efficiency among smallholder farmers

Different authors have defined a niche market differently. Kotler (1991) defines niche market as a small market whose needs are not yet fulfilled. Ikerd (1997) defined “niche market” as a market that is different from the predominant market for the same basic commodity or generic class of products. Therefore niche market can have several definitions; however, in general terms, niche markets can be thought as any marketing system (in part or in whole) which does not use the mainstreaming commodity-based marketing channels. Taking all above definitions into account, a niche market in the current the study considers various segments of modern food retail sector, where supermarkets, tourist hotels, fast food chains and exclusive restaurants prevail in the study area during the entire period of this study.

Niche marketing is presumed to be a key success factor in marketing strategies, therefore the market is commonly put forward by theorists and practitioners as a possible strategy for success for small producers (Phillip, 1994; Tamagnin and Tregear, 1998). Niche markets focus on value added strategy through customisation and productivity (Humphrey and Memedovic, 2006). The markets offer growth potential for producers who manage to

access the markets and can thus develop a profitable business, through rising demand and increased price for producers. Recently, studies have shown that niche markets exceedingly act as financial source to small scale producers who are resource constrained (Berdegué *et al.*, 2008), therefore enabling farmers to maintain stable production which increases the safety of the business.

The challenges for producers especially small scale farmers to access and sustain participation in niche markets, include guarantee of supplies through productive and cost effective production methods, compliance to quality standards and other transaction requirements (Trienekes, 2011). All these add enormous challenges to small scale farmers and often find it very difficult to access niche markets, as it entails the need for more resources to respond to flexibly to market changes. Therefore given the financial constraint and other production constraints that most small scale farmers encounter it has always been difficult for small scale farmers to access niche markets (Berdegué *et al.*, 2008).

Several studies have listed the constraints that smallholder producers encounter when they want to access niche markets or become more competitive in existing markets. According to World Bank (2007 cited in Bijman *et al.*, 2007), these include: weak technical capacity; difficulty in meeting quality standards; difficulty in meeting contract conditions; and exposure to additional risks. Other constraints include lack of information on markets (IFAD, 2003; Davis, 2006); lack of bargaining power (Rondot *et al.*, 2004) and high transaction costs (Barrett, 2008). To overcome these constraints, public policies and institutions have central role to improve the condition of smallholders' market access and participation.

2.2.2 Studies on efficiency

Several efficiency studies have been conducted in the livestock sector in both developed and developing countries. Mahjoor (2013) analysed technical, allocative and economic efficiency of broiler farms under different management systems in Iran using DEA approach. The study results show that there was a scope to increase broiler production in all farms, and social economic factors associated with inefficiency were education, age of farmers, training and membership in producer cooperative.

Emokaro and Emokpae (2014) estimated technical efficiency of broiler producers in Nigeria using the stochastic frontier approach. The study revealed technical efficiency of 81%, and sources of inefficiency were farmer's age, gender, nature of farming and age squared of the bird, while factors such house hold size, education level, experience in farming and age at which the birds were sold were not influencing inefficiency of the farm. Otieno *et al.* (2012) used the technique to assess the technical efficiency of cattle production in Kenya. Wikedzi (2013) used the technique to analyse technical efficiency of dairy cattle in Tanga City, while, Mlote *et al.* (2013) estimated the technical efficiency of small scale cattle fattening using stochastic production function.

Understanding the level of efficiency/inefficiency can help to addresses productivity gap and offer opportunities to rectify the problem in production. In Tanzania studies on efficiency in broiler production are limited. This study evaluated technical and cost efficiency of smallholder broiler producers.

2.2.3 Policy studies

The landscape of the agri-food output market in most developing countries including Tanzania has changed significantly and rapidly over the last sixty years. The change

encompasses a shift from commodity to differentiated “product” market as the “centre of gravity” of the food system (Reardon and Timmer, 2007). This transformation can be described by two general phases. Policy debates and research themes concerning how to accomplish general development objectives characterising different sub-periods within the market transformation. We draw attention to the evolution of agri-food markets emphasizing research approaches and policy issues and see what this might reveal about the trajectory of the agri-food system

The first phase, “commodity market development” occurred mainly between the 1950s and 1980s. In this period the food system in many developing countries were characterized by government intervention and state control of food supply chains. Government intervention was commonly through state-led marketing boards, cooperatives, parastatal processing units and state-run retail chains (Harou, 2011; Reardon *et al.*, 2009; Swinnen, 2007). At this time agricultural marketing was strongly integrated with public policy. Consequently, public policy intervention has for many years influenced the commodity market development paradigm.

In the early stage of the first phase around the 1950s-1960s, the policy objective among many governments was to promote growth of the commodity markets (Reardon and Timmer, 2007). The objective was to increase domestic production especially of grain and other basic food crops and to provide subsidized foodgrains from rural area to urban areas via public distribution system. The focus was to address inefficiencies in the distribution of agricultural food products arising from the structure of agriculture production largely prevalent during colonial time; which was traditional small-scale and informal agrifood industry (Reardon *et al.*, 2009). The development of agricultural marketing occurred with formation of state led marketing boards. In this period, smallholder farming was not

considered capable of generating large commodity surpluses (Lewis, 1954 cited in Reardon and Timmer, 2007). Thus there was a general tendency of moving away from small-scale production and promote large scale farmers for growth of international and national commodity markets.

In the 1970s-1980s, the policy objective became improving income distribution from the transactions in commodity markets (Reardon and Timmer, 2007). This was mainly in Latin America and much of Asia where the spread of wholesale markets was rapid and were well integrated into the middle stages of agricultural transformation as a result of the Green Revolution. Africa and some parts of South Asia, remained at earlier stages of transformation. Input markets also entered the debate during this period as they were considered to provide key support for the agricultural transformation following successful Asian Green Revolution (Djurfeldt *et al.*, 2005). The conventional wisdom was for African countries to indulge in large scale agricultural input subsidies as a major feature of agricultural development policies.

The second phase of market transformation, which started in the mid 1980s and continuing to the present, is characterised by “Liberalized Food/Agricultural Price Policies. The Liberalized Food Price Policies are those pertaining to the use of free market as a partner in the commercialization/development of agriculture. Clearly, these types of policy reforms are considered to have a major impact on productivity by altering producer incentives.

In the early 1980s to mid 1990s, developing countries have witnessed a major change in public policy pertaining to government capacity to control/ regulate commodity markets and removal of subsidies and parastatal organisations. This change centered on a first

wave of market reforms by introducing structural adjustment programs. Structural adjustment policy reforms have concentrated on agricultural pricing and on redefining the role of agricultural marketing boards and parastals as part of broad liberalization policies designed to make economies more responsive to market forces. These programs were aimed at encouraging and sustaining a new spurt in growth from the grain commodity markets and beginning the transition from commodity to product markets, including fostering the emergence of competitive markets for nonstaples. “Getting Prices Right” in output and factor markets became the development motto in that decade.

Towards the mid of the 1990s, a second wave of reforms was initiated with a new focus: “getting institutions right”(Williamson,1996 cited by Reardon and Timmer, 2007). The justification for institutional reforms centred on reducing transaction costs, increasing property rights and contract enforcement. This was due to, first, emerging evidence that “market failures” still persisted even after “getting prices right” in the previous phase. To correct those failures, governments have to seek for other non-price-policy measures, such as support to NGOs to provide market assistance to those left out of the benefits of the earlier reforms, and institutional and regulation changes to reduce transaction costs. Second, the reforms focused on the need to develop public and private sector institutions such as property rights and contracts as essential to the development. Concomitantly there was also a resurrection of the theme of social capital and market development, treated in the institutional economics and economic anthropology literature of the 1960s.

The first half of the 1990s was a watershed, when developing countries bore witness to a vast change in public policy in regard to agriculture marketing. This is largely because, by then, structural adjustment programs had substantially reduced or even eliminated, controls on and state interventions in commodity output markets in many developing

countries. Increase in liberalized rules of trade and foreign direct investment, as well as improvements in logistics and infrastructure characterised this period. With subsequent liberalization of capital markets, together with the upsurge of the globalisation, the combined effect was to bring very deep changes in output markets, inducing a further shift in the center of gravity from being in a traditional, commodity system, to the effective initiation of a modernized food system and the emergence of differentiated product markets “globalized and product market development” or “agrifood marketing”. This has resulted in a significant transformation in commodity supply chains to agrifood supply chain; contributing to the development of new sub-disciplines within agrifood marketing. This development has changed the structure of agrifood system.

Two factors are having much greater impact on domestic agrifood systems: (1) the fundamental restructuring of *domestic* food markets, in particular changes in the processing, retail, and food service segments; and (2) the impact of foreign direct investment (FDI) on this restructuring has been basic and fundamental, with an immense flood of FDI, after it was liberalized in most countries in the 1990s, in these downstream segments. These investments altered domestic markets in developing countries far more powerful than has the change in international trade regimes for domestic products. These trends, partly driven by broader income growth and urbanization, have led to the rapid emergence of supermarkets, convenience stores and fast food chains in the developing world.

The rapid rise of supermarkets is the key factor explaining the major changes in food markets that occurred with globalization and concomitant FDI. This is because the change in the retail segment are parallel to the food processing sector, and/or in many cases the changes that led to changes in the processing sector or rather symbiotically

related. Technology change in the procurement systems of supermarkets in developing regions is a key determinant of change in the markets facing farmers. Technology – defined broadly as physical production practices as well as management techniques.

The rise of supermarkets has been controversial everywhere, but their rise to dominance in rich countries over decades permitted gradual adjustments by farmers, processors, wholesalers and traditional small-scale retailers to the new ways of doing business. The adjustment pressures from the rapid emergence of supermarkets (and large-scale processors) in developing countries are far more severe because the change is so fast. The parallels to the overall structural transformation of an economy, and the pressures it puts on agriculture, are obvious. A mix of opportunities and challenges are facing farmers in the deeply transformed agrifood markets of the 1990s and 2000s. In particular, there is evidence that small farmers are particularly challenged to meet the volume, cost, quality, and consistency requirements of the increasingly dominant supermarket chains and large-scale agroprocessors (Barret, 2008) .

As in the 1950s/60s when commodity markets were expanding, there was a major research effort just to describe the new systems, however, most of the new structures, and how they are changing food systems even in poor countries, are simply not on the “radar screen” of research and policy debate because they are developing so quickly and have emerged so recently. This topic simply has not yet entered public debate and research agendas in most places, even where it is moving so fast. There is a pressing need to extend and deepen the analysis of agrifood output markets, with innovative approaches tailored to the transformed agrifood systems.

Finally, it is clear from the above discussion that public policy is only half the story in understanding the transformation of markets in developing countries. Policy was indeed crucial in the initial stages of liberalization, but public policy is now forced to share power with the emerging force of private institutional change. The private standards, developed in the context of the strategic goals of the large firms, will shape food markets in the years to come. In emphasizing the change in food markets, economists have coined the phrase “Market-led development is now supermarket-led development”.

2.3 Conceptual Framework of the Study

The study adopts the conceptual framework developed by Minten *et al.* (2009) for understanding the changes occurring in the modern food supply chain. The adopted framework has been slightly modified to suit the context of the current study, as depicted in Figure 1. The framework illustrates the changes that are occurring in the urban food supply chains between urban consumers and producers. Drivers of changes; changes in urban food demands; changes in marketing sector; farm sectors; and their interaction are shown. Policy and non-policy conditioning factors that are necessary for conditioning the working of supply chain (marketing sector) and the ability of smallholders (farm sector) to respond to the requirements of new supply chain are also put in place.

Various drivers are changing urban food demand in most of developing countries. These drivers include; urbanization, income growth, changing of life style and access to better technologies. The changes in urban food supply chains have led urban consumers in most of developing countries to demand a different food basket in term of : quantity (more quantity is demanded in the markets); composition (non-grain and staple products such as fruits, vegetables, dairy products, meat and fish is more demanded with value added content and convenience); the choices (demand for more choices and greater variety); and

quality and safety issues (consumers are increasingly concerned about quality and safety issues on food consumed).

The changes in demand by urban customers is transmitted to producers through the supply chain. The supply chain should ensure that products are delivered to the customer in the right form, at the right time, and in the right location. Thus the changing requirements of urban consumers lead to restructuring of food supply chains. However, the final food supply chain arrangements and the ability of farmers to respond to changes are not shaped only by demand factors. Conditioning factors (policy and non-policy factors) such as geography, the population structure, the structure of financial sector, regulations as well as institution and infrastructure development are important in facilitating the efficiency of supply chain in general and of smallholders in specific.

This framework is based on the premise that for broiler production to contribute to development of livestock subsector in Tanzania, improvement in production efficiency (technical and cost efficiencies), with which broiler chickens are produced is of increasing importance. This is because, low efficiency leads to low quantity and quality, high cost per batch of broiler produced and consequently poor price to farmers (which in most cases the price is viewed as high price by consumers). On the other hand increase in efficiency of production is associated with low cost per batch of broiler produced, substantial supplies are obtained often with good quality coupled with good price offered to farmers in the market (this price is viewed as fair/competitive by consumers as with regard to quality).

Access to lucrative markets induces increase in farm production and productivity. If the market rewards farmers reasonably, farmers will be motivated to increase production and

the enterprise (farm) is likely to be profitable. However, for this to happen, important changes should occur at supply chain as a whole and at farm level specifically. At the supply chain there should be increasing interaction and collaboration among supply chain actors while at farm level (smallholders) there should be increasing effort on knowledge and skills development as well as increasing access to input and output markets. However, the success of this situation depends on the ability of smallholders to access profitable markets. Given the vulnerable condition of smallholders, the policy making task of assisting farmers to gain access to these restructured supply chain deserve priority.

As regard to the changes on urban food supply chain, improving efficiency of production for smallholders can serve as an entry point in accessing profitable markets, concurrent this will increase production and improve income. Thus the role of government, responsible ministries and agencies should be to facilitate and provide enabling environment not only to the farmers but to the entire supply chain in order to work efficiently and effective.

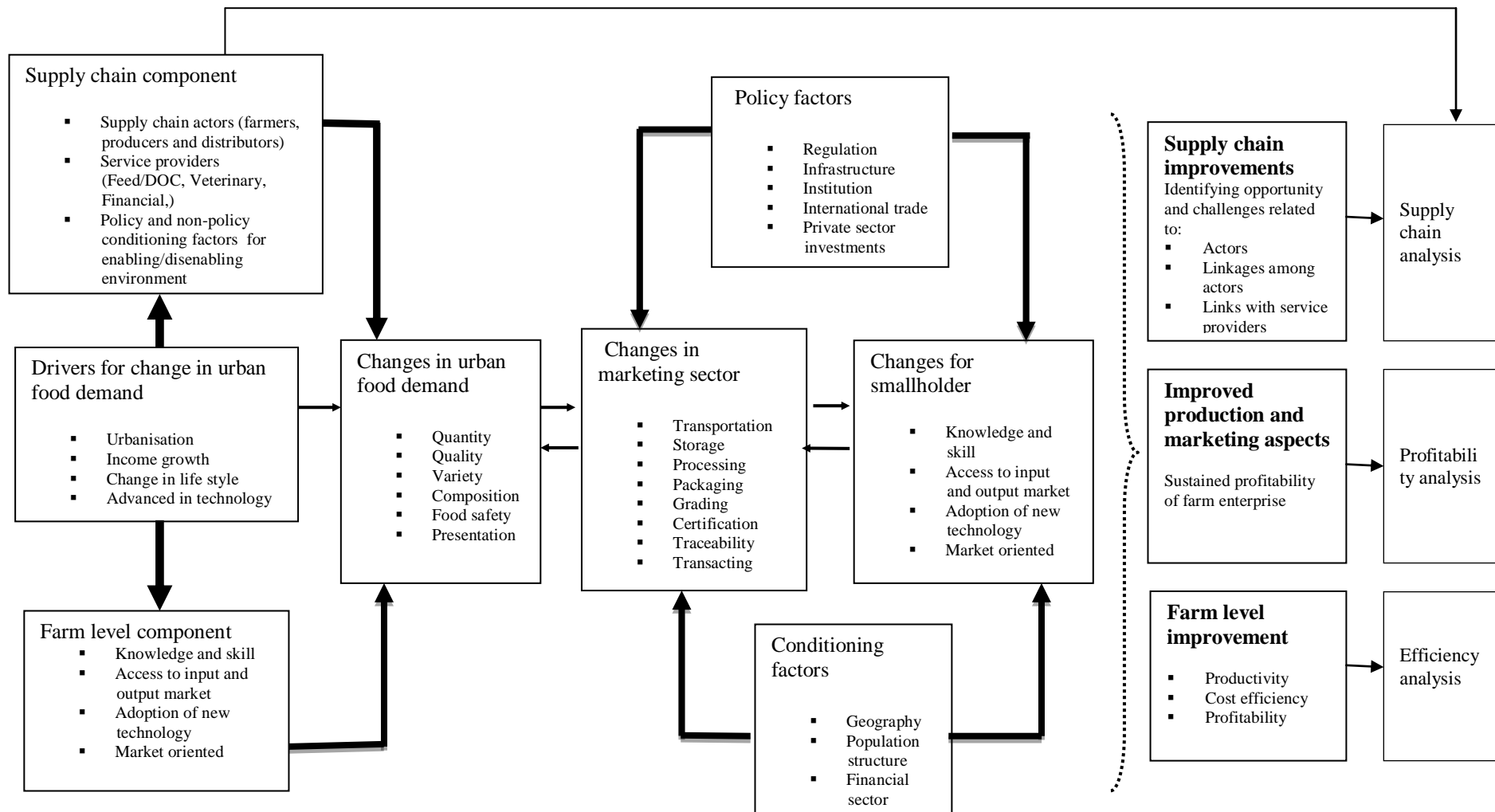


Figure 2: Conceptual Framework for improving smallholder broiler productivity

Source: Modified from Minten *et al.* (2009)

2.4 Research Gap

Experts speculate the future of agriculture to be of growing demand for, and production of animal protein with rising middle class in developing countries “livestock revolution” (Delgado *et al.*, 1999; IFPRI, 2001; Pingali, 2006). These projections concerning meat products, places tremendous opportunities for monogastric species, particularly poultry due to efficiency in converting concentrate feeds. In that sense production and consumption of poultry meat are expected to account for most of the increase, while ruminants will take a far smaller share (IFPRI, 2001).

it is also predicted that the increasing production and consumption of livestock products in developing countries will be possibly featured/associated with the end of commodity supply chain organized via spot markets (AMI, 2012). This means the developing countries require more organized channels for processing and distributing of animal food products. This implies that developing countries are challenged for efficient increase in production and distribution of livestock and livestock products. Given the meager resources in developing countries sustainably, the expansion of poultry and other livestock production need to be guaranteed through efficient use of resources and adoption of new trends in market development.

Improving agricultural productivity on small farms is the key for developing countries whose agricultural growth is vital to poverty reduction (DFID, 2002). However, the opportunity for such growth lies in the markets that offer improvement in production and income. However, previous efforts to address these concerns were mainly focused on conventional food markets coupled with inefficiencies from production to consumption. These markets offer limited returns for improving productivity and income (Bijman *et al.*,

2007). Thus for decades, production, markets and market access remained low with restricted contribution to household income (Bijman *et al.*, 2007).

Following trade liberalization that occurred during 1990s to 2000s foreign direct investments spurred in the food retail sector in most developing countries including Tanzania (Weatherspoon and Reardon, 2003; Reardon *et al.*, 2003). As a result new modern retail food outlets (referred to as niche markets) with supermarket as a role model emerged in urban and peri-urban areas of most of African countries (Reardon and Timmer, 2007). The new food markets are characterised by vertically coordinated food system that calls for efficiency in all points of the supply chain. These new markets give producers an opportunity to access new food markets, and are willing to command a premium price. Within this structural change, efforts to improve agricultural productivity at farm level should focus on increasing efficiency in production that could increase access to markets as a means to an end for competitiveness and profitability towards poverty reduction.

The Literature shows that the access to modern markets for small farmers in developing countries is still relatively new area of research, “without proven replicable models and methodologies” (Berdegué *et al.*, 2008). In that regard, ways of accessing such niche markets and associated social and economic benefit are not known adequately, (Henson, 2005). It thus become relevant to conduct a study to discern the specific domestic context and evaluate the possibilities of integrating small scale producers competitively.

In Tanzania studies show that, changes in food retail markets are more obvious for livestock products such as milk and meat with supermarkets and other new niche markets increasingly playing an important role (Ashimogo and Greenhalgh, 2007; Kamugisha, 2015). With respect to chicken meat, broiler chicken meat is of increasing importance as

niche markets are concerned. With thus and with increasing changes in food markets, a clear understanding of productivity efficiency of broiler production is critical especially where reliability of delivery is major concern in accessing lucrative niche markets. Despite this, there is, however a limited research findings based on the country's farm level broiler productivity. The critical gap the study aimed to address lie on marketing challenges where productivity is viewed to be as a subject as well as an object of accessing lucrative niche markets but also as a source of profit making.

CHAPTER THREE

METHODOLOGY

3.1 Analytical Framework

3.1.1 Analysis of the structure of broiler supply chain and coordination among actors

The broiler supply chain was mapped to reveal different channels through which broiler products passes from production to distribution and identify key actors, their relationships, challenges and opportunities with the aim of providing remedial measures to foster coordination that is necessary for supply chain improvement. Descriptive statistics such as percentages and means were generated to describe the structure of the supply chain.

3.1.2 Analysis of technical and cost efficiency of smallholder broiler producers

3.1.2.1 Estimating stochastic frontier production function

In order to analyse the technical efficiency (TE) of broiler producers and identify the source of inefficiency in broiler production, stochastic frontier production function proposed by Battese and Coelli (1995) was used. The stochastic frontier production function consider firm effect distinctly with the assumption that it is distributed as a truncated normal random variable in which inefficiency effects are directly influenced by a number of farm and socio-economic variables.

The econometric model for stochastic production function is specified as:

$$y_i = f(x_i\beta) + e_i \dots \dots \dots (1)$$

and

$$e_i = v_i - u_i \dots \dots \dots (2)$$

Where; y_i is the output level of i^{th} farm, $f(x_i; \beta)$ is production function of vector X_i of inputs for i^{th} farm and a vector β of unknown parameters to be estimated; e is the disturbance term which consist of two independent elements (v and u). Based on the specification of stochastic production frontier, the difference between the actual and frontier production is captured in the disturbance term $e v_i$ representing a symmetric disturbance term which is assumed to be independently and identically distributed (i.i.d) as a random variable with zero mean and variance σ^2_v independent of u_i i.e. $v_i \sim iidN(0, \sigma^2_v)$ and u_i represents one sided non negative random variables which capture technical inefficiency and assumed to be i.i.d half normal, i.e. $u \sim |N(0, \sigma_u^2)|$.

The study used the stochastic frontier production function with single-output multiple-input trans- log production frontier, with empirical model specified as:

$$\ln y_i = \beta_0 + \sum_{k=1}^3 \beta_k \ln X_{ki} + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \beta_{kj} \ln X_{ki} \ln X_{ji} + v_i - u_i \dots \dots (3)$$

\ln denotes natural logarithm, y is output of broiler in kg, subscript i indicates specific farm, j and k = indices for inputs used and X 's are variables inputs specified as;

X_1 = day old broiler chick per batch (number of chick per batch), X_2 = amount of feed used per batch (kg) and X_3 = labour used per batch (man-days)

For the evaluation of farm specific technical efficiency of smallholder broiler producers in Dar-es-Salaam, Coast region and Arusha, the following translog stochastic frontier production function with decomposed error term was estimated:

$$\ln(\text{Broiler output}) = \beta_0 + \beta_1 \ln(\text{DOC}) + \beta_2 \ln(\text{Feed}) + \beta_3 \ln(\text{Labour}) + \beta_{12} \ln(\text{DOC}) \ln(\text{Feed}) + \beta_{13} \ln(\text{DOC}) \ln(\text{Labour}) + \beta_{23} \ln(\text{Feed}) \ln(\text{Labour}) + \beta_{11} \frac{1}{2} \ln(\text{Doc})^2 + \beta_{22} \frac{1}{2} \ln(\text{Feed})^2 + \beta_{33} \frac{1}{2} \ln(\text{Labour})^2 + V_i - u_i \dots (4)$$

3.1.2.2 Estimating the inefficiency model

The focus of this analysis was to provide an empirical analysis of the efficiency differences in production (farm level inefficiency) among smallholder broiler producers in the study area. A farmer may not reach a production frontier because of various factors including socio-economic, marketing, environment and policy factors. Thus, in order to examine the effects of potential determinants of technical inefficiency the analysis of production efficiency was followed by investigating farm and farmer specific attributes that had impact on smallholders' technical efficiency. The technical inefficiency model which is represented by non-negative error μ_i is specified as:

$$u_i = \delta_0 + \sum \delta_m Z_i + \omega_i \dots \dots \dots (5)$$

u_i is the technical inefficiency of i^{th} respondent for $i= 1, 2, 3 \dots N$

Z represents farm and social specific efficient related variables, that are considered to be the source of inefficiency among the sample smallholder broiler producers in the study area where:

Z_1 represents participation in niche market (dummy variable; 1 = yes; 0 = otherwise)
 Z_2 represents death rate (mortality rate); Z_3 represents experience in raising broiler (years); Z_4 is education of farmers (years); Z_5 is gender of the farmer (dummy; 1 female, 0 = otherwise); and Z_6 represents capacity utilization of the farm (%); ω = error term which is identical and independent random variable with zero mean and variance defined by the truncation of the normal distribution. δ ms are parameters to be estimated. For the technical inefficiency effect, u_i are stochastic and have particular distribution properties (Battese and Corra, 1977). Under the null hypothesis $(\gamma) = \mathbf{0}$, that is no technical inefficiency effects exist. The null hypothesis for the parameters in the stochastic frontier production function and in the

inefficiency model are tested using the generalized likelihood ratio test, specified as: $\lambda = -2\{\log(L(H_0)) - \log[L(H_1)]\}$, where $L(H_0)$ and $L(H_1)$ denote the value of likelihood function under the null (H_0) and alternative (H_1) hypotheses respectively

Logit/Translog parameters are typically estimated using Maximum Likelihood Estimates (MLE). The Maximum Likelihood Estimates (MLE) method using the computer package FRONTIER 4.1 was used to estimate the parameter of Stochastic Frontier Production Function (Coelli, 1996).

MLE is concerned with picking parameter estimates that imply the highest probability or likelihood of having obtained the observed sample. Therefore, the stochastic production frontier defined by equation (5) and the inefficiency model defined by equation (6) were jointly estimated by MLE. The maximum likelihood estimation of the production frontier yield estimators for β and variance estimators and other relationship defined as:

$$\sigma^2 = \sigma_v^2 + \sigma_u^2; \gamma = \frac{\sigma_u^2}{(\sigma_v^2 + \sigma_u^2)} \text{ and } \lambda = \sigma_v^2 / \sigma_u^2, \text{ where } \sigma^2 \text{ is the variance}$$

parameter that denote the overall deviation from the frontier, i.e. the variance of the disturbance term (e), σ_v^2 denotes the deviation from the frontier due to stochastic noise, i.e. the variance of the random error (v) and σ_u^2 denote the deviation from the frontier due to inefficiency, i.e. the variance of technical inefficiency (μ). According to Battese and Corra (1977), the variation of output from the frontier due to inefficiency is defined by a parameter gamma (γ) and it lies between zero and one, i.e. $0 \leq \gamma \leq 1$. Thus, $(1 - \gamma)$ measure the technical inefficiency of the farmers. The closer γ is to 1 the greater the deviation of the actual output from the frontier and

hence the greater the technical inefficiency. The parameter λ is expected to be greater than one.

3.1.2.3 Estimation of cost efficiency

Cost efficiency was estimated using stochastic frontier translog cost function specified as:

$$\ln C_i = f(p_i, q_i; \beta_i) v_i - u_i \dots\dots\dots (6)$$

Where, C_i is observed total variable cost of using input i , p_i is the vector of input prices where P_1 is average price of day old chick (Tshs/chick); P_2 is average price of feed used (Tshs/kg) and P_3 is wage rate for farmers (Tshs/ month); q_i is the level of output produced, β is the vector of technology parameters to be estimated, v_i represents random variation (error term) in output due to statistical noise and u_i is the error term due to economic (cost) inefficiency. The study used single output translog stochastic cost function specified as:

$$\ln C_i = \beta_0 + \beta_q \ln q_1 + \sum_n \beta_n \ln p_n + \sum_j \beta_j \ln z_{ji} + \frac{1}{2} \beta_{qq} \ln q^2 + \frac{1}{2} \sum_n \sum_k \ln p_{ki} + \frac{1}{2} \sum_j \sum_r \beta_{jr} \ln z_{ji} \ln p_{ri} + \sum_n \sum_j \gamma_{nj} \ln p_{ni} \ln z_{ji} + \sum_n \alpha_{qn} \ln q_1 \ln p_{ni} + \sum_j \beta_{qj} + v_i - u_i \dots\dots\dots(7)$$

And the cost inefficiency model was specified as;

$$u_i = \delta_0 + \sum \delta_m m_i + \omega_i \dots\dots\dots(8)$$

Where, it takes the values 1, 2 and 3 with m_1 representing age of the farmer, m_2 is the size of the family that provides labour used in the farm and m_3 is the education level of the farmer.

The rest of variables and procedure treatments are as defined in the estimation of frontier production and technical inefficiency models above.

3.1.3 Determining net benefits for broiler producers selling to niche and conventional markets

Microsoft Excel for quantitative techniques analyses (partial trading budget) was used to calculate net benefit (profit) obtained by broiler producers supplying to niche markets Vis a Vis conventional markets. Since no fixed costs were considered, Gross Margin was used as a proxy for profitability. The objective of determining the profitability of supplying the two alternative markets (conventional vis a vis niche markets) was to determine the most profitable market and therefore could influence farmers in better resource allocation for increasing productivity. Computationally, the Gross margin was calculated as the difference between accrued revenue and total variable cost of production. The formula was specified as:

$$GM_{ij} = \sum_{n=1}^n (PQ_{ij} - TVC_{ij}) \dots \dots \dots (9)$$

Where; GM_{ij} = Average gross margin earned by i^{th} farmer for j^{th} , amount of broiler sold in Tshs;

PQ_{ij} = Total revenue obtained by i^{th} farmer for j^{th} , amount of broiler sold in Tshs/kg

TVC_{ij} = total variable cost incurred by i^{th} farmer for j^{th} , amount of broilers produced and sold in Tshs.

The revenue for broiler producer was the product of number of broiler birds sold and selling price during the 2010/2011 production season. Data on the number of broiler birds sold (output) and selling prices were obtained directly from farmers. Selling prices differed among farmers depending on market channel through which the broiler birds were sold.

Total variable cost for broiler production involved cost for feed; day old chicks; labour; pharmaceuticals, energy (electricity, water and kerosene), bedding, disinfectants and transport costs incurred in the 2010/2011 production season.

Given the fact that smallholders' broiler enterprises mainly use family labour with occasional use of hired labour, valuation of family labour was deemed necessary in this study. Family labour in terms of man days used in broiler production was valued in monetary terms. This was done by asking respondents to provide information on family members' time spent in broiler production. The estimation of opportunity cost of time into monetary terms considered factors such as professional/knowledge of family member, economic potential of the area, most available activities and payment trends in the study area (minimum wage rate in the community).

Gross margin allows a better way to represent cost effectiveness results of the enterprise. However, for long term economic viability of the industry net benefit alone is not enough given the uncertainty of market environment for both output and input prices, therefore, further analysis using discounted budgeting technique was used to determine the long term impact and sustainability of the industry for economic development. This is because budgeting allows for planning and production management (Mutabazi, 2007).

In evaluating long term economic viability and sustainability of smallholder broiler production, some important assumptions were, made in the analysis, which include; the time horizon of 7 years, broiler productivity increased after second year of production, the discount rate of 15% was used which was almost equivalent to the one prevailing in financial market during the study period and fixed cost were not considered because the

likely component (broiler shed) of such cost structure could not be well captured during the survey .

The stream of revenues and costs were discounted to determine the net present value (NPV), Benefit- Cost Ratio (BCR) and Internal Rate Return (IRR). Net present value is the present value of all future net benefits associated with an investment project. The criterion for acceptance of project worthiness is that the NPV must be positive. BCR is the present value of the benefits stream divided by the present value of the costs stream. It is perceived that the project with a BCR of greater or equal to 1 is worthwhile (Lotter *et al.*, 2003; Stutely, 2002). The IRR is the maximum interest rate that could be paid for the project resources that would leave enough money to cover investment costs and still allow the business to break even. Thus, the project with IRR greater than the cost of capital is worthwhile (Senkondo *et al.*, 2004). The computation of NPV, BCR and IRR of the stream revenue and cost was done in MS-Excel worksheet using built in command. Mathematical Equitation underlying the computation of NPV, BCR and IRR are as follows:

$$NPV = \sum_{i=0}^n \frac{B_i - C_i}{(1+r)^i} \dots\dots\dots (10)$$

Where:

NPV= Net Present Value of the project (Tshs), r= discount rate, n = number of years,

B = benefit and C = costs

$$BCR = \frac{\sum_{t=1}^{t=T} \frac{(Benefit_t)}{(1+r)^t}}{\sum_{t=1}^{t=T} \frac{(Cost_t)}{(1+r)^t}} \dots\dots\dots (11)$$

Where:

BCR = Benefit cost ratio, *r*= discount rate, *t*= number of years,

$$IRR = \sum_{i=0}^n \frac{INB}{(1+r)^i} = 0 \dots\dots\dots (12)$$

Where:

IRR= Internal rate of return, *INB*= Incremental benefit in year 1, *r* = discount rate

n = planning horizon or life of project

Taking the fact that, the success of commodity production chain is influenced negatively by cost of inputs and positively by output price, these are considered as risk factors for the broiler production units. Therefore, by considering the same reason given above of uncertainty of input and output markets as influenced by changes in economic and political environment, risk analysis need to be considered. Therefore sensitivity analysis was conducted to forecast change in benefits and costs that affect NPV, BCR and IRR and therefore the sustainability of the industry was determined. The assumption on the increasing operating cost and decreasing output price by the same range were made to determine the sustainability of the industry in relation to types of prevailing markets (i.e. niche and conventional markets) exposed to the same risk factors.

3.1.4 Analysis of farmers' preferential choice decisions on niche market supply chains

The data collected were entered in Ms Excel and then were imported to SPSS version 12.0 for factor analysis to identify the factors (variables) for further analysis. The factors with highest Eigen-values were applied to develop factor scores (calculated as the sum of products of the factor loadings with the original variables) for measuring the attitudinal

variables. As a general rule, the information provided by factors having an Eigen-value less than 1 are considered to be of minor importance in the explanation of the variance.

3.2 Data for the Study

The study used both secondary and primary data as described below.

3.2.1 Secondary data

Secondary data were collected from various sources including Sokoine National Agricultural Library (SNAL), Ministry of Livestock and Fisheries Developments (MLDF), web based information and Tanzania Revenue Authority (TRA).

3.2.2 Primary data

The process of data collection involved an exploratory survey, development of questionnaire, pre-testing the questionnaire, recruitment and training of enumerators, sampling of broiler producers from the study areas and data collection using the questionnaires as described in subsequent sections below.

3.2.2.1 Exploratory survey

The process of primary data collection started with exploratory survey between April and June 2010. During this period, participatory rapid appraisal (PRA) exercises were conducted in the three study regions of Dar es Salaam, Arusha and Coast. The aim was to familiarize with the study area, identify broiler supply chain actors and other stakeholders and establish sampling frame. Supply chain actors in the broiler industry including farmers, processors, input suppliers (feed manufactures, hatcheries, and pharmaceutical shops) and traders were included. Other stakeholders were officials from the Ministry of Livestock and Fisheries Development. Interview guides and focus group discussions

(FGDs) were employed where checklists (Appendices 1 to 7) were used to solicit data from the chain actors and the officials from the Ministry .The information from the PRA was used in mapping broiler supply chains as well as in developing and enhancing implementation of main survey.

3.2.2.2 Questionnaire development

Questionnaires for data collection were developed after the PRA between September and November 2010. Two types of structured questionnaire were constructed. The first one which is attached as Appendix 9 was designed to collect data from broiler chicken producers while the second one which is attached as Appendix 8 was for collecting data from downstream actors (supermarkets and tourist hotels).

3.2.2.3 Questionnaire pre-testing

Pre-testing of the questionnaire was carried out in December 2010 where by 10 and 5 smallholder broiler farmers in Dar-es-Salaam and Coast regions respectively were interviewed. Also two tourist hotels and one supermarket both in Dar-es-Salaam were interviewed. The objective was to establish the validity and clarity of the questionnaires as instruments for data collections. Necessary adjustments were made to operationalize the questionnaires. The actors interviewed during the pre-testing exercise were not included in the sampled actors during the main survey.

3.2.2.4 Recruitment and training of enumerators

After questionnaire pre-testing, the process of recruiting enumerator was done for four days from 14th to 17th February 2011. Four enumerators were selected based on academic qualification and experience in data collection, ability to interact with people and fluent in *Kiswahili* and English language, and readiness to work in data collection exercise as

situation demands as well as familiarity with the places where data collection was conducted. Two enumerators had Master Degree in Agricultural Economics, while the other two enumerators, one had degree in Bachelor of Science and the other one had a Diploma in Social Science. The enumerators were trained for one day. The training involved proper way of recording data during interviews, ethics of data collection and how to ask sensitive questions.

3.2.2.5 Sampling

(i) Selection of study locations

The study was carried out in Dar-es-Salaam, Coast and Arusha regions. Dar-es-Salaam and Arusha regions were chosen for the study because being among the potential areas with broiler production, the regions have considerable functional activities concerned with broiler marketing. For example Dar-es-Salaam is considered to be the largest urban market in Tanzania for broiler and other food products in the country, while Arusha region is the popular destination place for tourists in the country.

In both Arusha and Dar-es-Salaam regions, different chicken markets are available including niche markets such as supermarkets and tourist hotels; thus making them suitable areas for identifying the potential of markets for broiler chicken. Moreover, the regions have different categories of consumers (diplomats, expatriates, high profile business men and workers) with high income levels, a situation which increases demand for broiler and broiler products. In addition, the two regions are very urbanized with changing demographic trends which also influence consumption of chicken meat.

Coast region was purposely included in the study because of its proximity to Dar es Salaam (locational advantage) and ample land that can be used to produce broilers for the Dar es Salaam market.

(ii) Sampling of broiler supply chain actors

The study involves two units of population; markets (niche markets) and broilers farmers (smallholders). Selection of niche markets and alternative markets followed purposive sampling due to limited number of these markets in all studied areas. Selection of small scale farmers followed simple random stratified sampling while selection of midstream actors such as processors and distributors followed purposive and convenient sampling techniques.

The study estimated to obtained total sample size of 385 respondents along the supply chain, comprising of 308 farmers, 19 processors and distributors and 57 niche market outlets. The distribution of respondents followed an hourglass supply chain perspective, with many farmers at the top and few processors and distributors at the bottom. However, the final composition of the respondents was 351 farmers, 9 processors and distributors and 57 niche market outlets, amounting a total of 417 respondents. The farmer node was over sampled (by 43) respondents, this was to allow for making replacement if some farmers were not willing to provide information. .

The total sample size was determined using a proportionate sampling formula as shown below:

$$S = Z^2 P(1 - P) / e^2$$

Where;

S = sample size

Z = confidence interval (95%)

P = estimate of the proportion of the people intended to be interviewed (50%)

e = proportion of error to be accepted (0.05).

In order to address the farmers' attitudinal choice, a sub sample of 52 respondents was randomly drawn from main sample of farmers (202) located in Dar-es-Salaam and Coast Region. This was done because information from the PRA exercise revealed that majority of farmers in Dar es Salaam and Coast Region were not participating in niche markets. The middle node (processor and distributors) were under sampled (by ten) this was largely due to the limited number of these actors. The processors, who happened to be large scale farmers, were omitted because the emphasis of the study is on small scale broiler producers. However they are described as one category of actors in supply chain.

3.2.2.6 Data collection

Data from the sampled downstream actors (niche markets) and upstream actors (small scale farmers) were collected for six months between March and September 2011 using the structured questionnaires described in section 3.3.2.2 above. To ensure availability of respondents, appointments were made one or two days before the date of interview through Extension and Wards Officers. Interviews with owners or managers of supermarkets and tourist hotels were conducted with and without prior appointments. These interviews were conducted by the researcher herself. The trained enumerators were only involved in interviewing the sampled broiler producers. Questions in all sections of the broiler producers' questionnaire were administered to the whole sample of producers while questions regarding perception and attitudinal statements were administered to the 52 respondents who were not participating in niche markets. The technique measured

latent preferential choice decisions of the potential of niche market supply chains for farmers who did not participate/supply to these markets.

The 52 respondents were educated on the possible marketing opportunities and challenges related to niche markets for broiler chicken. Attitudinal statements about opportunities and challenges were addressed to the respondents. The statements were adapted from previous related research work and researcher's knowledge on the study topic and the area as well. For each of the attitudinal statements, respondents were required to state if they strongly agree, agree, disagree, strongly disagree or undecided. In order to recognize the statements jointly explaining the variation, the sample variation was determined for each item, whereby items which showed insignificant variance were eliminated. Presence of sufficient variance in the axiomatic statements is a precondition for running factor analysis successful.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Structure of Broiler Supply Chain in the Study Area

This section describes the smallholder broiler supply chain from the input supply node to distribution node. Relevant information on large scale farmers is used only for comparison purposes in providing an understanding of large scale broiler production operations.

In general, the structure of broiler supply chain in Tanzania can best be described based on the channel of end product. The end products are dressed broiler chicken and live bird broiler chicken. Dressed chicken refers to broilers that are produced, processed, packaged and distributed in the form that is convenient and ready-to-cook (RTC), i.e table chicken. This supply chain is mostly dominated by large scale producers with integrated facilities. On the other hand, live bird chicken refers to chicken that is produced mainly by small scale farmers and sold live at farm gate and in conventional food markets. The supply chain for live birds is neither controlled by the public nor private grading system. This study found that about 60.4% of smallholder broiler producers in the study area traded through the live bird (broiler) supply channel and 39.6% traded through the dressed broiler supply channel.

The basic structure of the broiler supply chain which shows functional (value chain) blocks, actors and potential services is depicted in Figure 2. The chain begins with input supply, broiler production, live broiler marketing, slaughtering and broiler processing and lastly is marketing of dressed broiler and broiler products. Details on the functions and actors identified in the broiler supply chains, found in Dar-es-Salaam and Arusha are given in subsequent subsections below.

4.1.1 Input supply in the smallholder broiler supply chain

Main inputs supplied to broiler producers include broiler day old chick (DOC), concentrate feeds, veterinary pharmaceutical and vaccines as well as laboures. Farmers obtained broiler (DOC) mainly from sales agents, pooled markets and from hatcharies. Most of the sampled farmers obained DOCs from sales agents In Dar-es-Salaam, 49% of the farmers obtained DOCs from sales agents while in Arusha, 90.6% of the sampled farmers obtained DOCs from sales agents. Chicks handling and distribution is an important aspect in increasing farm productivity. Sourcing chicks from pooled market is considered to be risky. This is because in the pooled markets different types of day old chicks are brought into these markets by different hatcheries or through dealers for distribution. The Tazara market in Dar-es-Salaam is an example of such market where chicks from different hatcheries are brought for sale. However, given the delicate condition and vulnerability of the chicks the market is considered to be risky as chicks from different farms are collected at one point for sale. Moreover, the conditions into which chicks are transported and exposed also make them susceptible to quality deterioration. Chicks need to be transported by speacial made trucks with protection against sun, wind, dust and rain. While some hatcharies have this kind of transport facilities, most of smallholders use common buses to trasfer chicks to their farms.

Broiler farmers use either branded concentrate feed, home compounded feed or mixture of the two. The use of branded concentrate feeds was very common among farmers in both Dar es Salaam and Arusha. In Dar-es-Salaam, about 81.2%, 15.4%and 3.4 percent of farmers were using branded concentrate feed, mixture and home compounded feeds respectively. In Arusha, farmers who used branded concentrate feed, mixture and home compounded feeds were 88.7%, 2.1 percent and 9.1 percent respectively. Majority of farmers in both Dar-es-Salaam and Arusha were sourcing branded concentrate feeds from

feed agents. About 84% and 88% of farmers in Dar-es-Salaam and Arusha respectively sourced branded concentrate feeds from feed agents.

Farmers in both Dar-es-Salaam and Arusha mainly depended on private veterinary shops for vaccine, animal pharmaceuticals and advice of veterinary experts. About 81% of farmers used private veterinary services, while 12% of farmers used own experience and 7 percent obtained the service from public veterinary experts. Although farmers from both regions registered their concerns on the efficacy of the vaccines, pharmaceutical and veterinary services as in most cases their use didn't provide the expected results. This was especially the case for the use of vaccines.

Labour used in broiler production in small scale broiler farms were both family members and hired labourers. The amount of hired labour used in broiler production and its cost varied greatly among farmers in both areas.

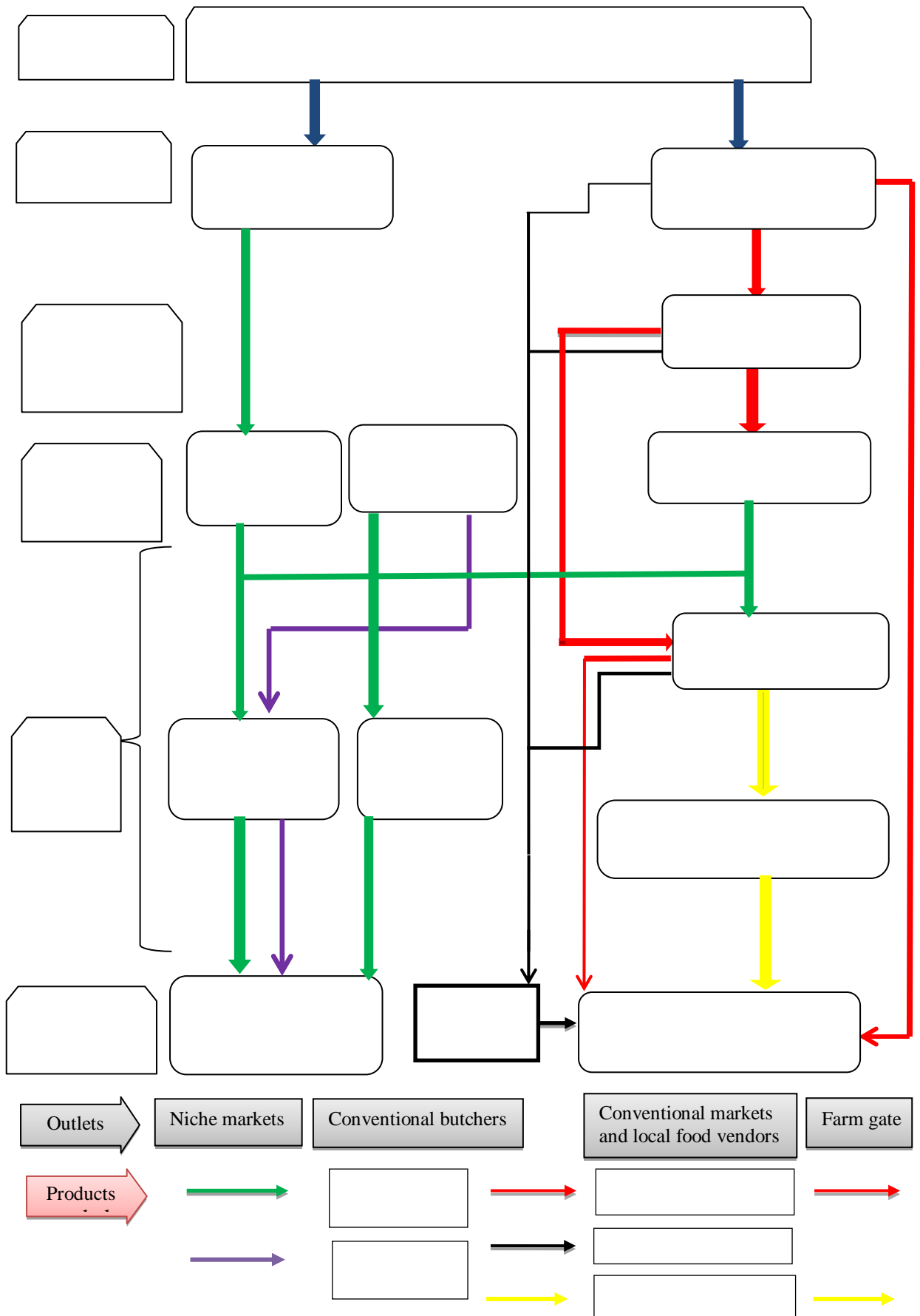


Figure 2: Broiler supply chain in Dar-es-Salaam and Arusha Cities

4.1.2 Broiler production

The production of broilers is throughout the year with seasonal variation in production volume due to weather conditions and market demand. Two types of broiler production chains were observed: small scale production chain and large scale production chain. The small scale broiler production chain is the largest production chain in terms of participants. It consists of several farmers who keep broilers around their households. The scale of production for most these farmers in all out system range from 100 to 4 000 birds. About 71% of these farmers in the study area kept flock sizes of 300 - 999 birds, while 19% of farmers kept flock sizes of 1 000 birds and the remaining 10% kept flock size of less than 300 broilers birds. However, all batches selected for analysis had a median flock size of 400 broilers, which represent the typical flock size of one batch in small scale production in the study area. Majority of farmers kept one to two batches of broiler once and on average farmers kept six batches per year, with an average of 3889 broilers. Farmers raised broilers for a period of 4 - 6 weeks to attain marketing age, where on average broilers score live weight of 0.8 to 1.7kg. This rearing period observed in the study however is below the recommended period of at least 6 weeks with an average weight of 2.5 kg (FAO, 2010b).

Diseases and disease control are among major problems in the small scale production chains. Major diseases found in the farms in the order of importance were pulmonary diseases (sort of flue), *Coccidiosis*, *Typhoid*, *Gumboro* and Lameness. The average mortality rate in small scale production chain was 9%. This rate is high as it reduces the total production and productivity.

Actors operating in large scale production chains mostly comprise of industrial producers that are vertically integrated. The scale of production for farmers in large scale production

range from 5 000 to 200 000 birds in different batches at once. In large scale production chains, broilers were kept for at least 6 - 8 weeks to reach marketing age with live weight above 2.4kg. The mortality rate in large scale farms is lower than in small production chains, ranging from 1 to 4 percent.

Costs of production up to market age differed among producers and across production chains. Results of the study on the cost structure reveal that, in small scale production farms feed cost accounted for 50.7% of total production cost followed by the cost of chicks including mortality that accounted for 32.75% of total cost. Labour cost was 3.8 percent, while vaccines, pharmaceuticals and veterinary advisory services costs accounted for 5.3 percent of total cost. Other variable cost items include energy and bedding which accounted for 5.4 percent of total cost. In large scale production chain, feed cost constituted about 60 - 65% of total cost.

Production and marketing institutions such as contract farming and farmers association existed along the chain though to a lesser degree and formed part of broiler production support units. Only one registered poultry association based in Arusha namely Arusha Poultry Keepers Association (APOKA) was found during the survey. The Association had 300 members and was influential in the supply of inputs to members, training and advisory services as well as securing markets for members, but yet it had to fulfil the development of the sector due to lack of capital and strong will from poultry supply chain actors.

4.1.3 Broiler marketing

Broilers are sold through wholesale and retail market outlets. The main outlets for broilers can be categorized into live bird and dressed bird market outlets .In both outlets, sale of

broiler chicken was throughout the year with seasonal volume sale variations experienced during different times and events. High sale of broilers occurred during holidays, festivals (Eid days, X-Mas), ceremonies (wedding feasts, organized get together events with meals, etc.) while sales were reported to be low during fasting months.

4.1.3.1 Broiler market in live bird supply channel (farm gate, conventional markets and slaughtering premises)

(i) Farm gate Selling

Farm gate represent one of the marketing outlets for live broiler chickens. This outlet mainly involved small scale farmers and brokers /traders who buy broilers in wholesale terms from farmers and re-sell them in retail outlets.

In Dar-es-Salaam, the sale of broilers at farm gate to traders was mainly for live birds while in Arusha the sale at farm gate mainly involved primary processed birds where chicken heads, legs, liver and intestines were removed. Family and hired labour were used in broilers processing, where hired labourers were paid in kind in terms of offal such as chicken heads, intestine, leaver and legs. The channel also involved consumers who bought broilers directly from farmers. However, the use of this outlet by consumers was of less importance, as it was estimated that normal trend of broiler sales to consumers at farm gate in both Dar-es-Salaam and Arusha account for less than 5% of total production. In Dar-es-Salaam, farm gate price ranged between Tshs 3 400 and 3800 per bird while in Arusha it ranged from Tshs 4 500 and 5 500 per bird.

The farm gate as a marketing outlet serves important role to farmers because large numbers of broilers (80-85%) from small scale farmers are sold to traders through this

outlet. Apart from the importance of the channel to farmers, however, the channel offers low growth potential for increased productivity and output as the sale levels are not assured. Farmers spent more time to search for buyers when broilers are ready for sell. In most of time it took more than a week to sell all the products from the same batch. Moreover, the farmers in both Dar es Salaam and Arusha had complaints on traders who were opportunistic, thus trust between actors was limited and business relationship was framed in win-lose terms. This suggests that the channel lacked necessary measures for improving supply chain efficiency.

(ii) Conventional markets

In Dar-es-Salaam there are number of conventional markets known as chicken terminal markets that sold live broiler birds in both wholesale and retail markets. The well known conventional broiler markets in Dar es Salaam include Kisutu, Buguruni, Shekilango, Manzese and Temeke Sterio. Most of these markets were linked with the state owned slaughtering facilities, thus customers can request for slaughtering services with additional slaughtering payment after buying a live broiler bird. During research period, the slaughtering cost for was Tshs 300 per bird. It was found during the survey that more than 80% of sales were done with in-market slaughtering. Prices for broilers in these markets varied substantially depending on the size the bird. In Dar-es-Salaam the price of broiler bid in conventional markets ranged from Tshs 4 000 to 4 500 for a bird that weighed approximately 0.75 to 1kg. Customers in these markets were mainly retailers such as conventional slaughtering premises and commercial food retail outlets such as local restaurants and food vendors. Low income consumers also bought broiler chicken at retail level along both conventional markets and slaughter premises for home consumption.

In Arusha, the trade of live broiler birds in conventional food markets was not practised at all. Instead, main broiler products sold in the conventional markets were whole frozen dressed broiler. Traders had cold chain facilities for increasing shelf life of dressed broilers. In these markets, the price of whole frozen broiler bird weighing on average 1 to 1.2 kg was 5 500 to 6 000 Tshs. The main customers of this market outlet were food service providers such as hotels, restaurants and food vendors as well as consumers.

(iii) Broiler processing and distribution

Processing of broiler chicken meat can be divided into two stages; primary processing and secondary processing. Technically, primary processing involves pre-slaughter (catching, loading and transport); slaughtering (Immobilizing, killing and bleeding); de-feathering (scalding, plucking); removal of head, oil glands, feet, and evisceration. Secondary processing involves chilling, cutting, de-boning, aging and packaging, storage and distribution. Generally, processing is an important value-adding activity in marketing of broiler chickens. Appropriate processing of broiler chicken is a challenge for most of small scale producers due to lack processing facilities and skills. Therefore broiler processing for majority of small scale farmers is mainly limited to primary processing using locally available processing equipment. However, processing of broilers in the country is at an advanced stage among broiler processing companies which in most cases they are also large scale broiler producers. Four companies that produce and process broilers namely Interchick Co. Ltd, Twiga Poultry Ltd, Chubby Chicks and Mkuza Chicks Ltd were identified in Dar-es-Salaam. In Arusha, three broiler producing and processing companies namely Kijenge Animal production, Balden Company Ltd and Kiltan Company Ltd were identified. Interchick Co. Ltd is the leading company for producing and processing broilers in the country, accounting for about 70% of dressed broiler market share.

4.1.3.2 Broiler market in dressed (table) chicken supply channel

Retail outlets for dressed broiler products include supermarkets and classic butchers for raw meat products and tourist hotels and exclusive restaurants for prepared broiler meals.

(i) Supermarkets

Both foreign and local based supermarkets were found in the study area. The surveyed supermarkets were of different sizes and quality, so had different practices in sourcing and procurement as well as different perspectives on product value added criteria. Based on these standards, supermarkets in the study area can be categorised into big and small/mini supermarkets. This categorisation does not only feature in the size but also the quality and the type of customers being served. Overall Dar-es-Salaam city had many big and more advanced supermarkets compared to Arusha city. However, all the big and the mini-supermarkets in both Dar-es-Salaam and Arusha were increasingly becoming important as common outlets for food retailing and for broiler chicken in particular. High and middle class consumers were major customers in these channels. Almost all supermarkets found in Dar-es-Salaam (big and small supermarkets) were mainly supplied by reputable processing companies, while in Arusha most supermarkets were supplied by small scale farmers.

In Arusha, the main broiler products found in many supermarkets were whole frozen broiler chickens with price ranging from 6 000 - 6 500 Tshs for 1to 1.2kg dressed bird. In Dar-es-Salaam, the main products of broiler chickens sold in many supermarkets were in the form of cuts in both fresh and speciality frozen, and whole frozen broilers. Prices of broiler products in those supermarkets varied buy cut size, types (whole or chicken cuts) and forms (fresh/frozen). The most expensive cut for broiler chicken was fresh breast

whose price ranged from 13 000 to 17 000 Tshs depending on the weight, while the price for whole frozen broiler weighing 1 to 1.4 kg ranged from 6 000 - 9 000 Tshs/broiler

(ii) Meat shops/classic butchers

Meat shops/classic butchers are becoming popular and are increasing their share in selling broiler and broiler products. Substantial amounts of broiler chickens were sold through these outlets. These outlets are considered to be convenient due to conducive and hygiene environment, thus safety of the meat is perceived to be higher than the meat sold in the conventional butchers. These outlets are found in a number of places but mostly in urban centres. During the field survey four classic butcher shops selling broiler products were found in Dar-es-Salaam, but none in Arusha. Households that were well off were the main customers in these channels.

(iii) Tourist hotels and exclusive restaurants

This market segment is relatively large because broiler chicken traditionally is eaten as meal away from home. This makes chicken meat to be the most popular meat in most hotel/restaurant menus. Moreover, the consumption of chicken is also associated with high income therefore, makes tourist hotels and exclusive restaurants the primary retail outlets for broiler meat. The study found that hotels and restaurants were increasingly becoming important as broiler marketing channels in the urban areas, with common slogan “no chickens no market”. Also, appreciable amount of broiler chickens were eaten in non-commercial foodservices such like schools and hospitals. This can be attributable to the fact that chicken meat has health image and is the meat of choice for many people.

During the survey, it was found that the supply channels for dressed (table) chicken were increasingly becoming popular. In Dar-es-Salaam, for example, the sale of broiler chicken

in one of the outlets outstrips that of a live bird channel in the ratio of 120: 20 tonnes per month while in Arusha city the sale of live broilers in conventional market is not a common practice. Broilers are largely sold through niche markets. The niche markets sourced the dressed broilers from farmers in both small and large production chains. However, participation of small scale farmers in this channel is not uniform across the regions (Table 1).

Table 1: Sources of broiler and broiler products sold in niche markets

	(%) All	(%) Dar-es-Salaam	(%) Arusha
Source/Supplier			
Small scale farmers	33.3	3.4	64.3
Industrial producers and processors	36.8	69.0	3.6
Both (industrial and small)	29.8	27.6	32.1

Table 1 shows that niche markets that sourced broiler and broiler products from only small scale farmers accounted for 33.3% of sampled niche markets. Likewise, 29.8% of sampled niche markets sourced broiler and broiler products from both small farmers and industrial producers, where 36.8% sourced only from industrial producers. The Table indicate that in Dar-es-Salaam only 3.4 percent of the niche markets sourced from small scale farmers while majority 69% of niche markets sourced broiler chicken from industrial producers and 27.6% of them sourced the broilers from both industrial producers and small scale farmers. In Arusha, the trend was rather opposite where majority (64.3%) of niche markets were sourcing from small farmers and 32.1% sourced from both small farms and industrial producers while only 3.6 percent sourced from industrial producers and processors only.

The study further investigated the proportion of supplies sourced from small scale farmer. Table 2 shows that on average all sampled niche markets sourced about 74% of broiler supplies from the small scale farmers in the study areas. While in Dar-es-Salaam and

Arusha on the average the niche markets sourced about 49% and 82% of their order for broiler and broiler products from small scale farmers respectively.

Table 2: Proportion of niche markets procuring broilers from small scale farmers by location

Niche Market	Minimum	Maximum	Average	Median	1st quartile	3rd quartile
All niche markets (n=57)	10	100	73.9	95	50	100
Dar-es-Salaam (n=9)	10	100	48.9	50	20	60
Arusha (n=27)	20	100	82.2	100	50	100

Although small scale farmers in both Dar-es-Salaam and Arusha were participating in the niche market supply chains, the results show that small farmers in Arusha have been relatively more successful in penetrating into niche markets in term of number of participants and volume of broilers supplied than small scale farmers in Dar-es-Salaam. The results have three explanations based on researcher's observations. The first one is the range of product attributes that are required by the niche markets. In Dar-es-Salaam, the requirements of many niche markets were whole and chicken cuts with value added criteria ranging from fresh, specialized frozen to normal frozen while in Arusha the majority of niche markets required whole frozen broilers. Therefore lack of technical know-how and processing facilities for standardisation seems to be major challenges for small scale farmers in Dar-es-Salaam to participate in niche markets. The second one concerns the difference in the level of broiler industries and niche markets development between the two regions. In Dar-es-Salaam, there were more processing companies for broiler than in Arusha. Also the available processing companies for broilers in Dar-es-Salaam were highly developed with a variety of value adding techniques and specialities,

therefore offer strong competition to small scale farmers than the case in Arusha. With regard to market development, the niche markets in Dar-es-Salaam were highly developed focusing on highly value added products as opposed to the niche markets in Arusha, majority of them being min-supermarkets with moderate or minimum quality concerns. In general, majority of the niche markets in Dar-es-Salaam are more coordinated in terms of supply chain than the niche markets in Arusha.

In most cases, the reason behind limited access by small scale broiler producers to niche markets is associated with demand to meet market requirements for these markets. For example, Arusha being the hub of many tourists in the country for a long time, niche markets in terms of tourist hotels existed long before the existence of large and consolidated broiler supply chain in the country. Thus, small scale broiler producers in Arusha could easily access the niche markets and have an opportunity for establishing themselves as potential suppliers of broiler chickens.

(iv) Coordination along the broiler supply chain

The study results found that the inter-actors coordination among chain actors in live broiler (chicken) supply chain in the study area was governed by spot market relations as there was no close tie made on formal business agreements such as contracts. Instead, the relationship between producers and other actors is based only on spot transaction terms; however to a lesser extent some form of long term business relationship was also maintained. Contrary to live broiler supply chain, actors in the dressed broiler (chicken) supply chain somehow maintained formal business relationship including contractual arrangements mostly in output markets (forward linkages). However, still strong network relationship in both input and output market could add more advantage. Also actors were not found to be organised and cooperating between themselves, therefore lower their

potential as they lack coalition among and between actors which is important for safeguarding actors' position and the chain as a whole. For example in a way to seek recognition and improve the industry, in Arusha farmers had established poultry association, known as Arusha Poultry Keepers Association (APOKA), however the association has not been very successful to its mission of keeping farmers and other actors together towards improvement of the poultry industry as a whole.

4.2 Broiler Procurement Methods

Procurement methods are among the important market requirements for niche markets especially for fresh food products. Normally there are different procurement methods used by niche markets especially the supermarkets in obtaining supplies into their stores. The most common known procurement method by supermarket is the use of distribution centres (DCs) as stock unit for their supplies. However, the method is not commonly used in the country. In relation to chicken products, niche markets were completely depending on suppliers to deliver the products into their stores as per prescribed terms of delivery. Again this mode of supply is also a challenge for small scale broiler producers, as majority of them do not have transport and cooling facilities to store and deliver the products safely and on time.

This makes small scale farmers to face obstacles in accessing niche markets. This observation is in agreement with the observation by Heijden (2010), who assert inadequate access to supermarkets by smallholder is due to factors that limit the ability of smallholder farmers to observe market requirements.

4.3 Quality Requirement by Niche Markets with Regard to Fresh Food Products

The most important concern in supplying to niche markets is the requirements in terms of quality food products supplied into these outlets. The results in Table 3 show that there is a very small difference in the consideration of quality requirements in niche markets between study sites.

Table 3: Quality requirements consideration among niche market in Dar es Salaam and Arusha cities

Considerations	Dar-es-Salaam	Arusha
Product type	15 (10.4)	7(5.7)
Size/weight	29 (20.1)	28 (22.8)
Carcass dressing quality	21(14.6)	22 (17.9)
Freshness	28 (19.4)	28 (22.8)
Packaged	28(19.4)	27 (22.0)
Labelling	23 (16.0)	11 (8.9)

Note: Figures in brackets are percentages

The most noticeable difference is the product type which seemed to be more relevant for niche markets in Dar-es-Salaam than in Arusha. Another important difference of requirement between niche markets in the two cities was the issue of labelling, which again, was of importance in Dar-es- Salaam than in Arusha. These differences in requirements may also explain why small scale farmers in Arusha could easily access niche markets relative to the small farmers in Dar-es-Salaam. These differences in requirements among niche markets also explain the level of development of niche markets themselves. In most cases, the increased quality requirement is associated with higher niche market development and vice versa. However, in both cities the issue of weight, carcass dressing quality, freshness and packaging scored high responses, indicating that these are among major requirements by niche markets with respect to chicken market.

Therefore, due to the importance of quality standards it is inspiring to understand the ability of small scale farmers supplying to niche markets with respect to quality requirements. Table 4 shows the views from the sampled niche markets about the ability of small scale farmers in meeting niche markets requirements. The table shows that small scale farmers have problems in meeting most of the quality requirements. However, the increasing importance on the consideration for weight, carcass quality and freshness specifications means meeting the requirements of these specifications is necessary for small scale broiler producers to participate in the niche market supply chain.

Table 4: Views of niche markets on quality aspect with regard to small farmers' ability in meeting these requirements

	Dar-es-Salaam (n=29)	Arusha (n=28)
	%	%
Comments on size		
Poor	51.8	57.1
Fair	37.9	28.6
Good	10.3	14.3
Freshness of product		
Poor	44.8	28.6
Fair	27.6	64.3
Good	27.6	7.1
Product quality		
Poor	62.1	42.8
Fair	6.9	17.9
Good	31.0	39.3
Dressing quality		
Poor	51.7	75.0
Fair	24.1	17.9
Good	17.2	7.1
Product packaging		
Poor	62.1	89.3
Fair	24.1	7.1
Good	13.8	3.6

Apart from the consideration of quality attributes there are other requirements that the markets gave due consideration in selecting suppliers. The most common issues included volume of products to be supplied, consistency of supplying them, logistics in production and handling technologies and mode of payments. However, most of these issues remained very general that cut across many food products that supplied into the niche markets. But with fresh meat products and chicken meat specifically the issue of slaughtering in accordance to Halal procedures was very important and highly considered in selecting suppliers. In some of the niche markets especially in Dar-es-Salaam, this was so important that it required an accreditation from recognised authority. In Tanzania, the accreditation for Halal procedures is under the Muslim Judiciary (BAKWATA). Licenses and code of conduct were also considered, however it is peculiar especially for small farmers. These aim to guarantee traceability, transparency and accountability of the food produce supplied and also acts as a catalyst for more collaboration in the supply chain. However, for smallholder farmers these requirements are part of the constraints that weaken their position to access niche markets. The issue of licenses is under Tanzania Revenue Authority (TRA); while the mandate for food authority is under the Tanzania Food and Drugs Authority (TFDA) and the Tanzania Bureau of Standards (TBS) which makes the licensing procedure to be cumbersome.

4.4 Market Arrangements in Sourcing Supplies

In sourcing chicken products, market arrangements such as contracts where orders and other logistics are pre-stated in terms of both quality, time and technology were commonly used. However, given the nature of demand for chicken products which is highly variable within the short time, spot orders were also practised. Table 5 shows the market arrangements practiced in sourcing broiler chickens by the niche markets in Dar-es-Salaam and Arusha.

Table 5: Market arrangement in sourcing chicken products

Variable	Dar-es-Salaam (%)	Arusha (%)
Contract	55.2	35.7
Spot market	44.8	64.3
Type of contract		
Formal (written)	43.7	10.0
Informal (written)	18.8	30.3
Informal (verbal)	37.5	23.1

The results shows that niche markets in Dar-es-Salaam mostly preferred contracts in market arrangements, where in Arusha purchases by niche markets were mainly through spot orders (Table 5). Contracts were preferred because of the guarantee they offer, but spot orders also require high level of flexibility on all necessary measures to meet high demand when it arises. Considering all these arrangements, it is increasingly difficult for small scale farmers to supply to niche markets given their limited production; lack of enough labour and equipment to meet the orders in time. Also the importance of reducing lead time in supply chain is challenge for small scale farmers in terms of flexibility and agility to meet the required orders efficiently. This necessitated determination of the amount of orders made by niche markets per week, in order to see how small scale production chain can be organised for efficient supply. It was found that, in Dar-es-Salaam the maximum likely order by supermarkets from smallholders was about 400 kg per week while in Arusha it was 500kg per week. Taking the minimum acceptable weight in niche market of 1.2 kg per bird, it means that an individual farmer supplying to niche market should have about 500 and 600 broiler birds ready for sale per week in Dar-es-Salaam and Arusha respectively.

Another important aspect to take into account is the type of order in relation to chicken products. The chicken product refers to the form that chicken should be sold, which

include whole broiler, and or cut of different chicken parts (Table 6). Discussion held with supermarkets during the survey showed that supermarkets are more demanding in terms of chicken cuts especially in Dar-es-Salaam. Hotel and restaurants in both Dar-es-Salaam and Arusha preferred whole birds for making their own cuts. Supplying chicken cuts was a challenge to small scale farmers in both cities because most of them did not have processing facilities.

Table 6: Type broiler products sold in niche

Type of product	Dar-es-Salaam	Arusha
Whole chicken	7 (24.1)	15 (53.6)
Portion	15 (51.7)	9 (32.1)
Both	7 (24.1)	4 (14.30)

Note: Figures in brackets are percentages

4.5 Mode and Period of Payment by Niche Markets

Time lag in payment is another important requirement when one considers selling to niche markets such as supermarkets. Table 7 shows that payment to suppliers by niche markets are hardly in cash basis. According to the table, majority (60%) of niche markets both in Dar-es-Salaam and Arusha took at least two weeks to effect payments. Therefore small scale farmers who supply or want to sell through the niche market supply chain should take into account the possibility of late payment, which in most cases may pose a challenge to them given their small volume of production and immediate need of cash for continuing with production.

Table 7: Time taken for payment in niche markets

Duration	Dar-es-Salaam	Arusha
Instant payment upon supplying	4 (13.8)	1 (3.7)
1 week after supplying	7 (24.1)	10 (37.0)
2 weeks after supplying	7 (24.1)	11 (40.7)
1 month after supplying	8 (27.6)	4 (14.8)
More than I month after supplying	3 (10.3)	1 (3.7)

Note: Figures in brackets are percentages

4.6 Results of Technical Efficiency Analysis

This section presents the technical efficiency estimations results on overall farm TE and the determinants of TE (i.e. Technical inefficiency model). However, before presenting results for TE, the section begins with the description of socio-economic characteristics of the sampled farmers and farm characteristics which are likely to influence the efficiency and productivity of the farm.

4.6.1 Socio-economic and farm characteristics of the sampled broiler farmers

4.6.1.1 Socio-economic characteristics the sampled broiler farmers

(i) Gender and age of sampled farmers

The results in Table 8 show that in both regions number of women participating in keeping broiler is significantly higher than that of men. The higher involvement of women in broiler keeping and poultry keeping in general has been documented by many studies in developing countries (FAO, 2010a). The age of farmers ranged from a minimum of 20 years and 26 years in Dar-es-Salaam and Arusha respectively, to a maximum of 68 years in both regions. The average age of farmers participating in keeping broiler between the two regions seemed to be almost the same, which is 46 years. Over 90 % of farmers in both regions were in 25 to 64 years age group. These results can be attributed by the fact that both Dar-es-Salaam and Arusha are major cities, with almost equal patterns of living style and farming behaviour.

Table 8: Distribution of sample farmers by gender and age

Variable	Dar-es-Salaam	Arusha
Gender		
Male	46 (22)	31 (21.8)
Female	163 (78)	111(78.2)
Age (years)		
Minimum	20	26
Maximum	68	68
Average	46	46
Median	46	46
Age group	%distribution within the region	%distribution within the region
≤25	1.0	0.0
25-44	42.1	45.1
45-64	52.6	52.8
≥ 65	4.3	2.1

(ii) Level of education of the farmers

The results in Table 9 show that the majority of farmers (over 75%) had attained primary and secondary education. Only about 5% of respondents had attained university education. This presents a challenge in the sector, as education plays an important role in improving agricultural growth through better use of technical and professional knowledge both in farming and in marketing of farm products.

Table 9: Distribution of sample farmers by education level

	Dar-es-Salaam	Arusha
Primary	100 (48.8)	70 (49.3)
Secondary	79 (37.8)	49 (34.5)
A-level	19 (9.1)	15 (10.6)
University	11 (5.3)	8 (5.4)
Years in school		
Minimum	2	4
Maximum	17	18
Average	9.3	9.5
Median	9	10.5

(iii) Occupation

Table 10 shows the distribution of respondents by their major occupation. Majority of farmers both in Dar-es-Salaam and Arusha depended on broiler farming as their major occupation. The results further shows that were also farmers involved in other businesses apart of broiler keeping for supplementing their incomes. The higher dependence on broiler keeping indicates that broiler farming is an important income generating economic activity in major cities in the country. Given the limited opportunity of employment in formal sector, the industry provides a good source of employment, suggesting the need to harness the sector for both employment opportunities and agricultural growth.

Table 10: Distribution of respondent by major occupation

	Dar-es-Salaam	Arusha
Broiler keeping	132 (63.2)	80 (56.3)
Government Employee	17 (8.1)	18 (12.7)
Private employee	6 (2.9)	6 (4.2)
Business	54 (25.8)	38 (26.8)

(iv) Experience

Experience is an important factor that can affect farm productivity. Table 11 shows that, on average, farmers had experience of 8 and 10 years for Dar-es-Salaam and Arusha respectively. The results indicate that the majority (49%) of farmers in Dar-es-Salaam have less than 5 years in farm experience while in Arusha majority (39%) of farmers had experience of more than 10 years. This implies that farmers in Arusha had more experience in broiler farming than farmers in Dar-es-Salaam.

Table 11: Experience of the farmers in broiler farming

Years of experience	Dar-es-Salaam	Arusha
Minimum	1.0	1.0
Maximum	49.0	41.0
Average	7.5	9.5
Median	5.0	8.0
Proportion of farmers with experience of:		
Less than 5 years	48.8	26.1
Between 5-6 years	14.8	18.3
Between 7-10 years	11.0	16.9
Above 10 years	25.4	38.7

(v) Market participation

Farmer's socioeconomic characteristics may influence their participation in new markets. Table 12 generally show that farmers in Arusha were selling more through niche markets than farmers in Dar-es-Salaam. Generally the results show that more women and older farmers were major participants in both types of markets. The high participation of women in both markets is confirms the defining (basic) characteristics of poultry industry in developing countries of Africa and Asia (FAO, 2010a). The involvement of old farmers could imply that broiler farming is a labour intensive activity which also relies on experienced farmers.

Table 12 : Proportion of farmers in different market channel

Region	Niche Market	Conventional Market
Dar-es-Salaam	8 (5.6)	201 (97.1)
Arusha	136 (94.4)	6 (2.9)
Age group	% of farmers distribution within the market	% of farmers distribution within the market
15-24	0 (1.0)	2 (1.0)
25-44	67 (46.5)	85 (41.1)
45-64	74 (51.4)	111(53.6)
≥ 65	3 (2.1)	9 (4.3)
Education		
Primary	69 (47.9)	101(48.8)
Secondary	48 (33.3)	80 (38.6)
A-level and university	28 (18.8)	26 (12.6)
Gender		
Male	32 (22.2)	45(21.7)
Female	112 (77.8)	162 (78.1)

(vi) Farmer's access to extension and veterinary services

Extension and veterinary services are very important in broiler farming as the means of improving farmers with needed knowledge. Table 13 shows that 56% of farmers in Arusha could access extension services while in Dar-es-Salaam only 36% of farmers accessed the extension services. The results further show that over 80% of farmers in both Dar-es-Salaam and Arusha who had easy access to extension and veterinary services obtained them from private sources. Suppliers of inputs such as feed, chicks and pharmaceuticals were the main providers of extension services to farmers. These results suggest that, more extension services to broiler farming are still required.

Table 13: Proportion of farmers accessed extension service

	Dar-es-Salaam	Arusha
Access of extension services		
Yes	76 (36.4)	80 (56.7)
No	133 (63.6)	61 (43.3)
Easy access of veterinary services		
Public veterinary	10(4.8)	15 (10.6)
Private	168(80.4)	116 (81.7)
Self-experience	31 (14.8)	11 (7.7)
Proportion of farmers obtained extension services from different sources		
Government	7 (9.2)	2 (2.4)
Supplier of inputs	33 (43.4)	51 (60.0)
Institution/Professional	4 (5.3)	9 (10.6)
Fellow broiler farmers	28 (36.8)	20 (23.5)
Self-reading and internalisation	4 (5.3)	3 (3.5)

(vii) Source of capital

Broiler farming is cash driven enterprise. Therefore reliable source of capital is very important for farmers to produce and to continue with production. Table 14 shows the

sources of capital and financing arrangements in broiler farming in the study area. The results show that own savings remained the most available source of capital in starting broiler farming among farmers in the study area. Also, the results show that majority of farmers didn't take loans to finance production activities.

Table 14: Sources of capital in broiler farming

Variable	Dar-es-Salaam	Arusha
Source of capital in broiler farming		
Own saving	178 (85.2)	116 (81.7)
Loan	12 (5.7)	15 (10.6)
Assistance	19 (9.1)	11 (7.7)
Loan taken		
Yes	56 (26.8)	32 (22.5)
No	153 (73.2)	110 (77.5)
Loan provider		
Commercial bank	8 (14.3)	3(9.1)
Microfinance	37 (66.1)	21 (63.6)
SACCOs	6 (10.7)	4(12.1)
Peer group loan	2 (3.6)	1(3.0)
Informal lender	3 (5.4)	4(12.1)

4.6.1.2 Farm characteristics

(i) Scale of operation

Scale of operation, is one of the parameters that can influence efficiency and access to different markets. Table 15 shows the total number of birds that was kept in one production cycle by producers in the study area in 2011/12 production season.

Table 15: Total number of birds and flock size under one production cycle

Number of broilers:	Dar-es-Salaam	Arusha
Total number of broilers/production cycle	121 000	125 500
Minimum	100	100
Maximum	4 000	15 200
Average	578	883
Median	500	525
1 st quartile	300	300
3 rd quartile	600	1 000
Proportion of farmers with flock size of:		
≤300	3.1	6.8
300-499	22.8	10.0
500-999	25.6	12.5
≥1000	8.0	11
Proportion of farmers operating at full capacity		
Yes	55	63.4
Capacity utilization of farm /production cycle (%)		
Minimum	8.3	10
Maximum	100	100
Average	79.0	77.4
Median	100	100.0

The results show that Arusha had a total of 125 500 broilers while Dar-es-Salaam had a total of 121 000 broilers per production cycle. In 2011/12 production season, 70% of these broilers were in 249 flocks of 650 broilers, 20% were on flock size of about 2 000 broilers, while 10% were in 35 flocks of less than 300 birds. Within these small scale farmers in Dar-es-Salaam had a median broiler flock of 500 birds while Arusha had median flock per farmer of 525 birds.

The results also show that, for Arusha, the upper quartile of birds kept as an all in all out growing capacity was 1 000 birds, while for Dar-es-Salaam this capacity was only 600 birds. These production levels represent a median capacity utilization of 100% per of one time production cycle. The results further show that farmers in Dar-es-Salaam and Arusha generally operated under full capacity. However, the results are not implying maximum

efficiency, since the capacity utilization referred here represented the farmer's farm size which does not necessarily mean maximum farm size that farmers have to occupy.

(ii) Number of batches

Number of batches kept at once also can be a source of farm efficiency. This is because, broilers are placed on the farm after every seven or eight weeks including time lag between batch productions, therefore allow a farmer to keep about six to seven batches per year using the same facilities. With this production schedule, technically a farmer goes out of actual production for about 14 weeks, which is approximately four months in a year. Therefore, in order to reduce the lag period, which in most cases affect not only farmers income but also reduce farmers' reliability in the market, farmers tend to keep more than one batch at once to allow for continuity of production throughout the year. Table 16 shows that, the typical number of batches kept at one time by farmers in Dar-es-Salaam and Arusha was one batch and two batches respectively. The results also show that majority of farmers in Dar-es-Salaam had a median of 5 batches per year while in Arusha they had a median of 8 batches per year.

Table 16: Number of batches and birds kept per year

Statistics	Dar-es-Salaam	Arusha
Number of batch at one time		
Minimum	1	1
Maximum	8	6
Average	1.2	1.7
Median	1	2.0
Number of batch per year		
Minimum	1	3
Maximum	51	30
Average	6.1	9.4
Median	5	8.0
Total number of broilers/year		
Minimum	687 900	712 550
Maximum	300	600
Average	42 500	76 000
Median	3 291	5 018
1 st quartile	2 000	2 900
3 rd quartile	1 500	1 500
	3 000	5 000

(iii) Main inputs used and other efficiency measure of broiler production

The major inputs used for broiler production were day old chick, feed, labour, veterinary and other pharmaceuticals. Apart from the physical inputs there are other parameters that are important for efficiency. These include mortality rates, number of days to reach market weight, live weight at selling, feed conversion ratio and growth rate. Table 17 summarizes the cost structure for major physical inputs in broiler production in the study areas.

Table 17: Main input used and associated cost structure in broiler farming

	All farms	Dar-es-Salaam % total cost	Arusha
Day old chick including mortality	35.1	35.7	29.8
Feed	48.3	47.4	54.0
Labour	3.7	3.6	4.0
Vaccine and pharmaceuticals	2.9	2.6	2.7
Bedding	0.2	0.2	0.2
Energy	2.1	2.1	2.0
Medical	2.8	2.6	2.7
Other variable costs	5.0	5.8	4.6
Total	100	100	100

The table shows that feed is the major cost item, accounting for 47% and 54% of total cost associated with broiler farming in Dar-es-Salaam and Arusha respectively. This is apparently lower than what is commonly known from the literature. Most literature show that feed cost in broiler production occupy about 60-70% of total cost (Msami, 2007). However, this is not static, as FAO (2010b) shows that the cost of feed do vary depend on desired final product, which means higher quality meat depend on more quality feed used which imply higher feed cost. Feed cost in broiler production depends mostly on feed conversion ratio. The higher the feed conversion ratio, the lower the feed cost and vice versa (Shephard, 2006). While low proportion of feed cost can be explained by the marginal effect of feed used, it does not entirely mean superior feed conversion ratio, because it can also be explained by reduced feed amount used to bring the chicken birds to market weight. This may be due to increased price of feed, which for the past ten years has been experiencing exponential increase. While this is taken as a response to cut down cost, it affects the quality (live weight) of chicken to be sold which is reflected in the final price of chicken bird (low price) and so affects the profit margin of the enterprise. Table 18 provides a summary of key efficiency parameters in broiler production from different flock sizes of the studied farms.

The results in the table show that all batches selected for analysis had a median of 400 broilers, which represent the typical flock size of one batch in small scale production. However, looking the flock size in each region separately, Dar-es-Salaam had a median flock size of 500 birds while Arusha had a median flock size of 300 broiler birds. The number of days that broilers were raised in farm varied widely between the regions. The results further show that farmers in Arusha held their birds in farm for a longer period of 42 days compared to 35 days in Dar-es-Salaam.

Mortality rate varied between the regions and between different flock sizes within the region. The mortality rate from all farms was 9%, where Dar-es-Salaam registered 10% mortality rate and Arusha registered 7.5% mortality rate. In general all sampled farms in Dar-es-Salaam and Arusha were worse off in terms of mortality rate. In both Dar-es-Salaam and Arusha mortality rates were higher for farms with flock size of less than 300 broilers, followed with farms with flock sizes of 1 000 broilers and above.

Live weight at selling varied between regions, in Dar-es-Salaam it ranged from 1 to 1.3 kilogram and in Arusha the live weight at selling ranged from 1.5 to 2.0 kilograms. There is slightly difference in feed convention ratios between the regions with Dar-es-Salaam having higher feed-to-meat convention ratio than Arusha. However, the results also show that, the average amount of feed given to broilers to reach market weight was 2.6 kilograms and 4.0 kilograms for Dar-es-Salaam and Arusha respectively.

Table 18: Summary of the key efficiency parameters in broiler production

	Total number of farm (No)	Batch size	Cost per chick (Tshs)	Days used	Mortality (%)	Live weight at sale (kg)	feed per bird (kg)	Feed convention ratio	Labour cost (Tshs)	Total feed (kg)	Cost for feed (Tshs)
All farm	351	400	1 300	35	9	2	3	1.5	53 550	1250	700 000
Dar-es-Salaam	209	500	1 300	35	10	1.3	2.6	2.1	55 000	1250	700 000
Arusha	142	300	1 300	42	7.5	1.7	3.9	2.3	50 992	1200	693 000
Dar-es-salaam	209	500	1 300	35	10.0	1.3	2.6	2.1	55 000	1250	700 000
flock size 1	20	200	1 200	35	13.8	1	3.3	2.9	28 367	650	376 000
flock size 2	173	500	1 300	35	9.3	1.3	2.6	2.1	54 284	1250	706 000
flock size 3	16	1 000	1 300	35	11.6	1.4	2.4	1.7	120 650	2800	1 630 250
Arusha	142	300	1 300	42	7.5	1.7	3.9	2.3	50 992	1200	693 000
flock size 1	43	200	1 300	42	10	1.5	4	2.5	26 745	800	440 000
flock size 2	86	400	1 300	42	6.7	1.7	3.8	2.3	56 336	1475	8 725 00
flock size 3	13	1 000	1 300	42	8	2	4.1	2.2	239 420	4100	2 490 000

Note: Flock size I: Less than 300 broilers

Flock size 2: 300-999 broilers

Flock size I: 100 and above broilers

(iv) Quality of inputs used in broiler production

Quality of inputs used in broiler production is an important aspect, because poor quality inputs means higher production cost, but most importantly means poor performance in broiler farming. Quality inputs such as feed, day old chicks and pharmaceuticals depend on the source of such inputs. Table 19 shows that majority of farmers (over 80%) in both Dar-es-Salaam and Arusha used branded commercial feeds, where again the majority (over 80%) of farmers in both regions sourced the feed from feed agents than from feed manufacturers and millers. It was also observed during the field survey that farmers used home compounded feeds due to lack of quality feeds in the markets. However, most of them lacked knowledge in mixing the feeds and therefore ended up using poor quality feeds. Therefore there is a need to educate farmers on feed compounding but also the responsible government agency should take lead in assuring feed quality from different manufacturers is observed. Like the case of feeds, the quality of chicks is also very important, and entirely depends on the source of the chicks. The table shows that most farmers in both regions sourced day old chicks from agents. In Dar-es-Salaam, farmers also sourced the chicks mainly from common markets of day old chicks (pooled markets). These are well known markets for day old chicks particularly in Dar-es-Salaam, where the day old chicks are taken to the markets by individual hatchery or through dealers. Given the delicate condition and vulnerability of the chicks the markets can be risk as chicks from different farms are collected at one point for sale. Moreover, the conditions into which chicks are exposed are also susceptible to quality deterioration.

All farmers depended on veterinary shops for vaccine and other animal pharmaceuticals. Although, farmers from both regions expressed their concerns on the efficacy of veterinary products as in most cases use of veterinary products didn't provide the expected results. This was especially the case on vaccines.

Table 19: Distribution of sample farmer by type and source of input used

Variable	Dar-es-Salaam	Arusha
Branded commercial feed	169 (81.2)	126 (88.7)
Home compounded feed:	7 (3.4)	13 (9.2)
Both	32 (15.4)	3 (2.1)
Source of Doc:		
Hatchery	29 (14.4)	6 (3.8)
Pooled market	76 (36.4)	8 (5.6)
Agents	104 (49.2)	128 (90.6)
Source of feed		
Industrial manufacturer	24 (11.5)	5 (3.5)
Feed agents	176 (84.2)	125 (88.0)
Miller	9 (4.3)	12 (8.5)

Figure in brackets denotes percentages

(v) Diseases and diseases management

Diseases and their management are other important aspects in broiler farming. Table 20 shows the major diseases that challenge the farmers in the study areas. In Dar-es-Salaam the results of multiple responses show that flue is the most challenging diseases, as it has 150 responses, followed by *coccidiosis* (119 responses) and *Gumboro* (25 responses). In Arusha, *coccidiosis* was the leading disease with 105 responses, followed by flue and typhoid with 86 and 11 responses respectively.

Table 20: Distribution of sample farmers by major diseases in broiler farming

Diseases	Dar-es-Salaam	Arusha	Total
Flue	150	86	236
Coccidiosis	119	105	224
Typhoid	23	11	34
Gumboro	25	8	33
Lameness	6	1	7

Table 21 shows the proportion of sampled farmers using biosecurity measures to safeguard their farms. The table shows that only 21% and 13% of farmers in Dar-es-Salaam and Arusha respectively were using foot bath as control measure for the spread of the diseases. The most striking feature is that, farms in Dar-es-Salaam are highly accessed by buyers (traders). Discussions with farmers during the field survey revealed that farmers were aware of the dangers arising from allowing other people to enter into their farms or sheds. However, farmers indicated that they had no option because it is common for traders to see the birds before buying. In Arusha, the results were different as farmers in most cases sold the broiler as dressed chickens and were very reluctant to allow traders into the broiler sheds. These results suggest that the selling of live broilers can also be a threat to increased farm productivity. Farmers indicated cases where this mode of selling had caused disease outbreaks and death of broilers.

Table 21: Means for protecting farm from diseases spread

Variable	Dar-es-Salaam	Arusha
Presence of foot bath		
Yes	44 (21.2)	19 (13.4)
No	164 (78.8)	123 (86.6)
Buyers allowed to enter into shed		
Yes	180 (86.1)	39 (27.5)
No	29 (13.9)	103 (72.5)
Fellow broiler farmers allowed to enter into shed		
Yes	60 (28.8)	20 (14.2)
No	148 (71.2)	121 (85.8)

(vi) Litters and dead birds disposal

Broiler farming is highly associated with excessive litter production, and presence of dead birds that can pose environmental problems (Glover, 1996). Therefore, understanding the means of disposal is very important not only for providing solution to environmental sustainability and public health, but also for the sustainability of broiler supply chain

(Yakovleva and Flynn, 2004). Table 22 shows how litters and dead birds were disposed in small broiler farms. The results show that litters are in most cases (119 and 105 responses) used as manure by farmers in both Dar-es-Salaam and Arusha respectively. Also litters were sold and/orgiven to neighbours to use in their farms. For the case of dead birds, the table shows that majority of farmers buried dead birds, while others used them for animal feed. The use of dead birds as animal feed has been documented to be risky as is associated with species of other animal such as Bovine Spongiform Encephalopathy (BSE). BSE is a cow diseases believed to be caused by use of other animal protein.

Table 22: Disposal of litter and dead birds

Disposal methods	Dar-es-Salaam	Arusha
Fertilizer	119 (54.3)	105 (47.9)
Selling	99 (64.7)	54 (35.3)
Give to neighbours (fertilizer)	5 (33.3)	10 (66.7)
Dead bird disposal		
Buried	157(60.9)	101 (39.1)
Animal feed	19 (38.8)	30 (61.2)
Burnt	3 (100.0)	0 (0)

4.6.2 Results of the stochastic frontier estimation

A stochastic production function model was applied to examine whether smallholder broiler keepers operated efficiently and if not what could be the source of inefficiency. The model specified was estimated using the Maximum Likelihood (ML) and Ordinary Least Square (OLS) Methods. However, it was observed that the OLS estimates could not explain the model fitness because all variables were not significant at ($P < 0.01$). This implies that OLS didn't make any improvement towards supporting the model fitness hence was dropped. MLE estimates were observed to be strong in explaining the model fitness because at least two input elasticities (number of chicks and amount of feeds used)

carried expected signs and were found to be significant at $P < 0.01$ and $P < 0.05$ respectively. The input elasticity of labour was statistically insignificant.

The results in Table 23 show the ML estimates and inefficiency determinants. The findings in the table show that the sigma squared (δ^2) 0.03, t value = 32.89) is statistically significant ($P < 0.1$) and different from zero. This indicates a good fit and the correctness of the specified distribution assumption of the composite error term. The value of (γ) is close to 1 and significant at 1%, implying that most of the residual variation is due to inefficiency rather than the effect of the model itself. This also shows the significance of production frontier in allowing improvement than in OLS regression model.

The overall mean technical efficiency of broiler keepers was 0.744. This implies that broiler farms are producing chicken at about 74.4% of the potential frontier production levels. This is somehow high level of production; however productivity in small scale broiler production is about 25.6% below the frontier which indicates that there was 25.6% scope for improving broiler production at a given input level, technology and facilities used. Thus given the reality of urban dynamics, broiler farming remains the major source of animal protein for urban dwellers, hence the industry provide potential for increasing income for farmers, thus there is a need for increasing efficient use of the resources in attaining higher productivity in broiler production.

The estimated coefficient (input elasticity) for number of day old chicks indicate that, increase in number of chicks was increasing efficiency as the coefficient of this parameter carried positive sign. This probably is true because the number of chicks in most cases reflect scale of farms. Therefore increasing the number of chicks is synonymous with increase in the size of the farm, and in most cases scale of economies is related to

increasing efficiency. This parameter was positive and statistically significant ($P < 0.01$), indicating that it increases significantly the frontier of broiler output. This implies that, if the number of chicks is increased by one per cent, then the total production of broiler would increase by 2.15 percent.

The coefficient of the amount of feed used is negative and statistically significant ($P < 0.05$), indicating that the elasticity of output with respect to feed use has negative relation. This suggests that, if the feeds use is increased by one percent, broiler weight gain will be lowered by 0.99. This is the marginal effect of amount of feed used in relation to amount of meat gained i.e. feed convention ratio. This result further indicates that as the amount of feed increases, efficiency of the farm is reduced as coefficient of this parameter carries a negative sign. This result coincided well with the theory of feed in broiler farming. This means that, when more feeds are used to reach market weight, feed convention ratio declines and thus more cost is incurred to convert feed to meat and therefore low productivity and efficiency of the farm. The explanation of amount of feed and the negative coefficient in this study probably fits well the issue of feed convention ratio, because doubling of feed amount resulted into statistically significant with positive sign. This, means farmers had to feed more to attain required selling weight.

Labour used was hypothesised to have significant effect in increasing efficiency of the farm. However, the model results show that this parameter was not significant in influencing efficiency in broiler farming. This is probably attributed by the nature of production systems that was studied where labour was not considered as one of the main requirements in smallholder broiler farming.

Generally the model estimation suggests that feed and day old chicks remain the most important inputs in broiler farming in the study area. The negative sign of feed elasticity is of importance because it explains the quality rather than the quantity of feed therefore provide useful information on improving efficiency of the farmers towards higher productivity levels. Feed is the basic unit in broiler production, thus the success of broiler enterprise lies within efficiency of feed conversion to yield chicken meat. This makes feed to be the most used input in yielding meat and therefore the most costing item in broiler production.

In the estimation of technical inefficiency model, the dependent variable was measured in relation to variables considered to be a source of inefficiency in the industry. The inefficiency effects were considered to be those relating to difficulties in accessing profitable markets, higher mortality rate, minimum years of experience in broiler farming, low capacity utilization of the farm, years spent in education and gender.

The study considers that operating/accessing niche markets could increase efficiency of farmers in broiler farming due to the potential benefit of premium price. The results of the parameter in estimation of the model yielded the expected result as the coefficient of this variable was negative and statistically significant ($P \leq 0.01$), indicating that provided other factors are remaining the same, operating in niche market significantly decrease inefficiency. This result remains very true in broadening the full horizon of niche markets as effective marketing channel in increasing smallholder's productivity. This is because the higher price in niche market could offset the high cost attached in the production processes. Therefore, the estimation of inefficiency model with regard to niche market remains true that accessing niche marketing channel can increase relative efficiency of producers.

Mortality rate was considered to cause farm's inefficiency, the coefficient of this parameter from the model estimation carried positive sign and statistically significant ($P \leq 0.01$), suggesting that increase in mortality rate increases inefficiency. This is because high level of mortality results into low productivity and therefore inefficiency. The estimated positive coefficient for experience, indicate that increase in experience increases inefficiency, this is an interesting result but suggests that experienced farmers were less efficient. This may probably because due to their experience they become over confident and overlook some managerial and production aspects than less experienced farmers who are very conscious and keen in production, so become more efficient. The coefficient of experience square carried negative sign and predicts the case of having more experience help in decreasing inefficiency. This is because more experience means staying more in broiler industry, which is an indication that farmers consider the enterprise to be potential and profitable business and therefore become less inefficient (efficiently) in conducting their farming activities.

Another parameter that was considered to be source of inefficiency was rate of utilization of farm size (capacity utilization of farm). It was hypothesized that increase in capacity utilization would increase efficiency or decrease inefficiency and was expected to carry negative sign, however, the estimated coefficient of capacity utilization is positive and statistically significant ($P \leq 0.05$), suggesting that increase in capacity utilization of the farm results into increasing inefficiency. This is an interesting results which probably portrays the issue of improper use of farms' inputs and miss-management of flocks due to increased size, and therefore increase mortality and hence inefficiency.

Increasing number of years of education was considered to influence the industry positively, since more years spent in education means more knowledge which can lead to

efficiency use of farm resources. Likewise it was hypothesised that increasing role of women in poultry farming is results into higher efficiency. However, the estimated results show that both education and gender were not influencing efficiency in any meaningful way. Probably this can be due distribution of education and gender of sample farmers used in the study that are more or less the same therefore lack variations that could be a point of discussion.

The primary objective of estimating inefficiency model was to explore the productivity impact of smallholder broilers farms in attempt to increase efficiency in the broiler supply chain considering that other factors are held constant. Therefore, the general conclusion of inefficiency model estimation shows that availability of market that offer good price (premium price) is very essential in improving efficiency of broiler farming. Also it was observed that increasing mortality is associated with lowering productivity and therefore increases inefficiency. Increasing capacity utilization of the farms increases inefficiency probably indicates inadequate management in relation to the increased farm activities. The increase in farm activities should go hand in hand with increased level of technical and managerial aspects to improve efficiency.

Table 23: Maximum likelihood estimates of translog stochastic production frontier and inefficiency model for broiler production

Variables	beta/delta	Coeff.	Std.error	t-ratio
Frontier output model				
Number of DOC	beta 1	2.15	0.451	4.77***
Amount of feed	beta 2	-0.99	0.407	-2.43**
Family labour	beta 3	0.03	0.091	0.30
Squared number of DOC	beta 4	0.08	0.106	0.76
Squared feed	beta 5	0.19	0.099	1.98**
Squared family labour	beta 6	-0.01	0.006	-1.29
DOC x feed	beta 7	-0.29	0.201	-1.45
Doc x family labour	beta 8	-0.07	0.054	-1.21
Feed x family labour	beta 9	0.06	0.047	1.18
Hired labour (hired=1)	beta10	0.00	0.018	0.17
Vaccination regime (appropriate=1)	beta11	-0.01	0.029	-0.49
Constant	beta 0	-0.01	0.740	-0.01
Inefficiency model				
Operating in niche market (1=niche)	delta 1	-0.67	0.070	-9.50***
Mortality rate (%)	delta 2	0.02	0.002	7.89***
Experience (years)	delta 3	0.01	0.004	2.01**
Squared experience	delta 4	0.00	0.000	-1.77*
Education (years)	delta 5	0.01	0.027	0.19
Squared education (years)	delta 6	0.00	0.001	-0.54
Sex (female =1)	delta 7	-0.03	0.030	-1.02
Capacity utilization (%)	delta 8	0.00	0.000	2.93**
Constant	delta 0	0.19	0.143	1.35
	sigma-squared	0.03	0.003	9.37***
	gamma	0.91	0.028	32.89***

***Significant at 0.01 level; **Significant at 0.05 level; *Significant at 0.1 level

4.7 Results of the Stochastic Frontier Cost Function Estimation

A Stochastic Frontier Function (SFF) model was applied to the collected cross sectional data to examine the efficiency of smallholder's broiler farmers in using farm resources (Cost effectively). The maximum-likelihood (ML) estimates of the parameters of the stochastic cost frontier models are presented in Table 24. The results indicate that all independent variables confirm to the a priori expectations as all the estimated coefficients of the cost of feeds, labour, chicks and output (total revenue) gave positive coefficients

suggesting the conformity with the assumption that the cost function monotonically increases with the input prices. Hence all the independent variables are important determinants of broiler production in the study area.

The estimates for feed cost, labour cost, chick costs and output obtained were 0.024, 1.13, 1.97 and 2.044 respectively which are significant at 5 percent level indicating that broiler performance is much more dependent on feed cost, labour cost, chick cost and output rather than on the genetic make-up of the animal. Hence, efficient use of farm inputs and effective control of input and output price in broiler farming are essential for productivity and cost-efficiency improvement.

Cost efficiency estimates ranged from a minimum of 1.0 to 2.3, with mean efficiency estimated at 1.17. This indicates that broiler farms in Arusha and Dar-es-Salaam are somehow cost inefficient as in every shilling invested they are able to recover only 0.17 shillings. This is probably because of high input cost that the industry faces and low price of chicken product that farmers received particularly from the conventional market, where majority of sampled farmers were participating. These findings support that of (Taru *et al.*, 2010) that examined the economics of broiler production in Cameroon.

The sigma squared (0.018) and gamma (0.37), are statistically significant ($P < 0.05$) and different from zero. This shows that there was cost inefficiency effects in broiler farms which implies that about 37% of the variation in the total cost of production among the sampled farmers was due to the differences in the cost structure in input and output markets. This can be because of high variation of price in input and output markets that cause high variation in production cost and profit from broiler sales.

Table 24: Maximum–likelihood estimates of parameters of the cost frontier function for broiler keepers, Dar es Salaam and Arusha Cities

Variable	Parameters	Estimates	T–Ratios
General Model			
Constant	β_0	–6.45	–1.68
Feed cost	β_1	0.024	4.27***
Labour cost	β_2	1.13	–1.79*
Chicks cost	β_3	1.97	2.08**
Output (TR)	β_4	2.044	1.93*
Diagnostic statistics			
Sigma–squared	δ^2	0.018	2.29**
Gamma	Γ	0.370	4.73**
Log likelihood function	LLF	211.13	

*= significant at 1% probability level, ** = significant at 5% probability level, *** = significant at 10% probability level

Results of the estimation of the determinants of cost inefficiency are shown in Table 25. Age was used as proxy for the broiler farmer’s experience. The results show that age had positive sign but insignificant effect on cost efficiency. The positive coefficient of the age of household head implies that farmers of older age tend to be less cost efficiency. Estimates of family size and years spent in schooling were observed to be significant indicating the positive effect of these factors on cost efficiency of the farms.

Indeed, cost efficiency increases with higher levels of education. This is in conformity with the assumption that the households of educated family have a greater access to the extension services and have better knowledge about the cost of production since they are comparatively more educated than the households of older age. This finding agrees with the study of Paudel and Matsuoka (2009) when estimating the cost efficiency of maize in Nepal and that of Ojo (2003) that estimated productivity and cost efficiency of poultry

eggs production in Nigeria. Furthermore the positive coefficient of family size signifies the labour assurance that can be provided by the family members.

Table 25: Parameter estimates of the determinants of cost inefficiency

Independent variables	Parameter Estimates	
	Coefficient	t-value
Inefficiency estimation		
Constant	-0.029	-1.01
Age of household head	0.03	1.02
Family size	0.016	1.94*
Years spent in schooling (Education)	0.009	-2.95**

4.8 The Benefit of Supplying to Niche Markets versus Conventional Markets

4.8.1 Comparison of profitability of niche and conventional markets

The study hypothesized that choice of market channel is important in influencing efficiency of the farmers. Therefore the study examined the potential of available markets by determining the benefits accrued from selling to these markets in terms of profit. On average the results in Table 26 show that the amount of profit obtained by farmers who sold to niche markets was higher than the profit obtained by farmers sold to conventional markets.

Table 26: Comparison of benefits within the market in the same region

	Arusha		Dar Es Salaam	
	Niche Markets	Conventional Markets	Niche Markets	Conventional Markets
1. Receipts				
Broiler sold Per Batch (Median)	290	229	453	380
	5		4	
Prices of broiler (median)	000.00	4 500.00	600.00	3 800.00
Revenue	1 450 000.00	1 028 250.00	2 083 800.00	1 444 000.00
2. Variable Costs				
Chick	390 000.00	280 000.00	650 000.00	560 000.00
Feed	736 517.50	667 773.00	813 520.00	728 020.00
			89	
Other Costs	55 750.00	42 250.00	000.00	69 300.00
Total Variable Costs	1 182 267.50	990 023.00	1 552 520.00	1 357 320.00
Net Benefit	267 732.50	38 227.00	531 280.00	86 680.00
Profit per bird	923.22	167.30	1 172.80	228.11

The comparison of profit from niche and conventional markets within the regions shows that on average profit obtained from niche markets was higher than that of conventional markets in both Dar-es-Salaam and Arusha. This finding support the finding by Gangwa (2010) in the study of broiler's supply value chain in New Delhi. However, the difference in profit within Arusha were not statistically significantly, while in Dar-es-Salaam the comparison between outlets show that on average profit per batch for farmers selling to niche markets was significantly ($P < 0.05$) higher than the profit per batch for farmers selling to conventional markets by Tshs 470 196.

To illustrate, although the median amount of broilers traded by farmers into niche markets in Dar-es-Salaam was higher than the amount traded into conventional markets, in terms of variable cost, farmer selling to niche markets had even higher costs than farmers selling to conventional markets. Therefore the major difference in profit between the two markets in Dar-es-Salaam is largely explained by the relatively higher price that farmers were offered by niche markets. The statistical insignificant difference in the profit between the

markets within Arusha markets is probably explained by the narrow range of price between the two markets. The results show that the broiler industry is price driven and given the fact that price offered in niche markets is higher than that of conventional markets, definitely makes the potential of conventional markets insignificant in terms of returns to capital invested.

The study also compared the benefit of supplying to niche and conventional market without considering the location. The results in Table 27 shows that despite the fact that niche markets sell less compared to conventional markets, farmers selling to niche market could earn more profit than farmers selling to conventional markets, and the profit was significantly ($P < 0.01$) higher than the profit accrued from conventional market (Tshs 501 491 versus Tshs 368 056). The difference is largely explained by the potential of niche markets offering farmers good price and therefore good profit.

Table 27: Comparison of benefit between niche and conventional market

Revenue/Cost	Niche Markets	Conventional Markets
1. Receipts		
Yield Per Batch (Median)	300.00	400.00
Prices (Median)	5 000.00	3 800.00
Revenue	1 500 000.00	1 520 000.00
2. Variable Costs		
Chick	420 000.00	540 000.00
Starter Feed	251 000.00	196 000.00
Finish Feed	464 500.00	459 000.00
Other Costs	93 150.00	107 200.00
Total Variable Costs	1 228 650.00	1 302 200.00
Net Profit	271 350.00	217 800.00
Profit per bird	904.50	544.50

Finally the study compared the benefit of markets with respect to broiler by comparing two regions without considering whether it sells into niche or not. The results in Table 28 show that farmers in Arusha were better in terms of profit than farmers in Dar-es-Salaam, despite the fact that the number of broilers traded by farmers in Dar-es-Salaam was far higher than the amount traded in Arusha. Given the fact that more farmers in Arusha were selling to niche markets, the issue of potential of niche market in strengthening farmers' profit came up very clearly. However, the high profit in Arusha was not statistically significant. Probably this was due to the relatively low amount of broilers sold by farmers in Arusha. Therefore it can be generalized that both price and quantity traded are essential for broiler enterprises to earn higher profit sustainably.

Table 28: Comparison of benefit between regions

Revenue/Cost	Arusha	Dar Es Salaam
1. Receipts		
Yield Per Batch	290	426
Prices	5 000.00	3 878.04
Revenue	1 450 000.00	1 652 640.11
2. Variable Costs		
Chick	390 000.00	612 631.89
Feed	731 267.00	816 915.82
Other Costs	53 000.00	175 987.52
Total Variable Costs	1 174 267.00	1 605 535.23
Net Profit	275 733.00	47 104.88
Profit per bird	950.80	110.54

4.8.2 Long term economic viability of broiler farming

Given the importance of cash income and economic development of the industry, Benefit cost ratio (BCR), Net present value (NPV) and internal rate of return (IRR) were determined as criteria for long term economic viability of broiler farming. Table 29

compares the NPVs, BCRs and IRRs for farmers selling to niche and conventional markets.

Table 29: NPV, BCR and IRR for famers selling to niche and conventional broiler markets

Discount Measure	Farmers selling to niche market	Farmers selling to conventional markets
NPV	5 036 179.22	793 938.59
BCR	1.22	1.09
IRR	46%	30%

Results in Table 29 indicate that NPV had positive values for both markets (5 036 179.22 and 793 938.59 for niche and conventional markets respectively). This implies that the businesses were economically profitable. The table show BCR of 1.22 and 1.09 for farmers who produce for niche and conventional markets respectively indicating the viability of enterprises, since is greater than 1. Also the NPV of Tshs 5 036 179.22 and Tshs 793 938.59 were found for farmers selling in niche and conventional markets respectively. These positive value show it is more profitable and viable to invest in poultry business at applied discounted interest rate of 15%. The IRR of 46 % was estimated for farmers who supplied to niche markets, while for farmers supplied to conventional market the IRR was 30% which shows that the return on investment and profit of the business was high (compared with discounted Factor of 15%) for farmers that supplied to niche market than those supplied to conventional markets.

Results of Sensitivity analysis in Table 30 shows that when the price of broilers in niche markets decline by 5 percent the NPV will decline from 5 036 179.22 to 2 467 544.00 Tshs and IRR falls from 46% to 22%, while an increase in operating expenses by 5 percent

NPV will decline from 5 036 179.22 to 2 467 544.00 Tshs and the IRR falls from 46% to 33%. This implies that the project's revenue will not be affected much by the change in selling price in niche markets and operating expenses.

Table 30: Sensitivity analysis for niche markets

Sensitivity Analysis	% Change	IRR	NPV
Base	0	46%	5 036 179
Decline in sales price	-5%	32%	2 467 544
increase in operating exp	5%	43%	4 588 591
Base	0%	46%	5 036 179.22
Decline in sales price	-10%	20%	-93 001.14
increase in operating exp	10%	41%	140 868.18

However, the situation is different for the broiler farmers selling to conventional markets (Table 31) whereby a decline of 5 percent in price of their products, would lead to fall in IRR from 30% to 12% below the discount factor of 15% meanwhile the NPV drop from Tshs 793 938.59 to Tshs - 621 906. The increase in operating expenses by 5 percent would lead to fall in IRR from 30% to 27% while NPV would fall from Tshs 793 938.59 to Tshs 588 512.

Table 31: Sensitivity analysis for conventional markets

Sensitivity Analysis	% Change	IRR	NPV
Base	0	30%	793 939
Decline in sales price	-5%	12%	(621 906)
increase in operating exp	5%	27%	588 512

The general conclusion from the sensitivity analysis is that broiler farming is largely affected by decrease in selling price than increase in operating cost. Therefore, the

economic viability is largely price dependent. Therefore as it was hypothesized that the choice of marketing channel is important in efficiency improvement the result from sensitivity analysis suggest accepting the hypothesis.

4.9 Farmers' attitudes on Niche Market and Product Development

4.9.1 Attitudinal analysis

Factor Analysis (FA) was used to assess farmers' attitude with regard to niche market and product development. Measurement items with respect to niche market and chicken products were developed using both niche market practices and available technology in product development with respect to value addition. Farmers in the sub-sample of 52 farmers were asked to indicate their agreement or disagreement on each item using five-point Likert-type scale ranging from strongly agree to strongly disagree. Table 32 shows the robustness of the factor analysis.

Table 32: Total variance explained and factor analysis robustness test

Component	Initial Eigen Values		
	Total	% of Variance	Cumulative %
Component 1	10.250	28.473	28.473
Component 2	3.697	10.271	38.744
Component 3	2.735	7.597	46.341
Component 4	2.395	6.652	52.993
Component 5	1.793	4.980	57.973
Component 6	1.473	4.093	62.066
Component 7	1.361	3.781	65.847
Component 8	1.212	3.366	69.213
Component 9	1.108	3.079	72.292
Component 10	1.001	2.780	75.071

Extraction Method: PCA

The robustness of the output from the factor analysis signified that 75.1% of the cumulative variance was explained by the statements included in the analysis. This cumulative variance is almost the same as that reported by Sewando *et al.* (2011) in a

study on attitude towards preferential choices among alternative cassava value chains conducted in Morogoro Rural District. A *varimax* rotation of the factor matrix yielded eight significant factors with eigenvalues greater than one, with the highest value of 10.25 vested in component 1 as the most critical factor. All the factors identified for the six themes had factor loadings (correlations coefficient) greater than 0.3 which is considered as sufficient in forming factor analysis (Hair *et al.*, 1995) and Kim and Meuller (1978) cited by Senkondo (2000).

4.9.2 Farmers' attitudes towards being in farmers associations (groups)

Attitude towards being in farmers' associations (groups) comprised attitudinal statements which classified risky decisions within the control of the respondents. Among the statements loaded on the attitude of farmers towards working in farmers' groups or associations, farmers' responses to items B20 and B12 were different from the researcher's assumptions as shown in Table 33. According to statement B20, the researcher hypothesized that farmers would disagree with the statement that they would join and work in farmers' association at any cost because of the experience with of many groups' performance which lack full responsibility and the cost associated with them. Therefore it was expected that due to ill experience of performance of groups, farmers wouldn't prefer being in groups (B12). In the contrary, the results indicated farmers agreed that they were ready to work in groups at any cost. The responses to the rest of the measurement items: B18, B22, B23, B21, B31 and B19 were as assumed by the researcher. The respondents' disagreement with the researcher's assumption on groups implies that despite the collapse of farmers groups (associations) and some performing poorly, still the broiler farmers were ready to work in farmers' groups.

Table 33: Measurement of attitudes towards participation in farmers' groups

S/N	Statements	Researcher's hypothesis	Farmer's outcome	Factor loading
B18	Attitude towards working into farmers' group	Agree	Agree	0.654
B20	I will join and work into group at any cost	Disagree*	Agree*	0.622
B23	Working into groups will help you to access resources and services at lower cost	Agree	Agree	0.501
B21	In group work you can learn more techniques about broiler production	Agree	Agree	0.581
B22	Working into group help you to increase bargaining power for your product	Agree	Agree	0.505
B31	Working into group will help you to access more market easily	Agree	Agree	0.522
B19	Working into group will help you improving your current production	Agree	Agree	0.629
B12	You don't like to work into groups, as most of time you have witnessed many groups to collapse	Agree*	Disagree*	-0.609

Source: Principal Component Analysis Results

The responses on the readiness of the farmers to produce at niche market specifications in order to ensure access to market, no matter if it means more cost were different with researcher's assumptions. The researcher assumed that farmers wouldn't agree to such situation due to cost implications and other consequences that may arise in new markets. However, the farmers showed readiness of adhering to any specified broiler market requirements at any cost, provided that they get market.

4.9.3 Attitudes towards producing according to weight specification

Farmers were asked to respond to five items used to measure the farmers' attitude towards of producing according to weight specification. Table 34 summarises sample responses. Among these statements two researcher's hypotheses were contrary to farmers' responses.

These include the statement in B17, where the researcher assumed that the broiler farmers would disagree with the statement of producing according to weight specification making sure they get the market, no matter if they incur more cost. The farmers revealed readiness of producing according to this aspect. The second statement was B11 which stated that if the weight aspect adds more cost, it is better you continue with conventional production and market as you also fetch good price. The researcher assumed that the broiler keepers would agree with the statement, but they disagreed showing that the conventional production and market is not worthwhile for them.

Table 34: Attitudes towards product development weight aspect

S/N	Statements	Researcher's hypothesis	Farmer's responses	Factor loading
B17	You agree to Producing good weighted broiler is very important for you to get assured market	Disagree*	Agree*	0.466
B28	Producing good weighted broiler is very important for you to get good price	Agree	Agree	0.622
B27	It will just add more cost, is better you continue with current production and market as you also fetch good price	Agree	Agree	0.672
B11	It is difficult for broiler to be 1.8-2kg for 6 weeks	Agree*	Disagree*	-0.613
B30	Producing 1.8-2kg broiler with given price won't pay	Disagree	Disagree	-0.512

Source: Results of Principal Component Analysis

4.9.4 Attitudes towards product development in terms of value adding in initial

Processing

Table 35 presents the five statements that researchers postulated regarding value addition in initial processing. Two responses (B26 and B6) appeared to be the same with researcher's expectations. For B26 it was assumed that due to most of people being cost conscious, farmers alike were expected not to be ready to produce broiler according to such specification (initial processing as slaughtering, de-feathering, handling and packing)

in order to get good market. However, the broiler keepers agreed that they were ready to undertake value addition even if it involves more work and additional costs. The same was also applicable to statement B6 on readiness of raising broilers for niche market specification no matter if they had to pay for it. All the assumptions relied on the cost and work for meeting the niche market demand.

Table 35: Attitudes towards product development (value added): initial processing

S/N	Statements	Researcher's hypothesis	Farmer's outcome	Factor loading
B26	You are ready to produce broiler according to such specification in order to get the market even if you will have additional cost and more work	Disagree*	Agree*	0.529
B32	Added value to broiler fetch more profitable market	Agree	Agree	0.505
B6	I am ready to learn to raise broiler to niche market specification, no matter if I have to pay for it	Disagree*	Agree*	0.777
B8	I am satisfied with producing and selling live broiler, therefore I do not prefer producing for tourist hotel	Disagree	Disagree	-0.725
B13	Producing throughout the year can be very difficult, I cannot enter to such agreement	Disagree	Disagree	-0.537

Source: Results of Principal Component Analysis

4.9.5 Attitudes towards product development in speciality cuts to add value

Four items were used in measuring the attitude towards speciality cuts in value addition. The results of the factor analysis in Table 36 indicate that two statements (B7 and B34) of the researcher's assumption did not tally with the responses from the broiler farmers. For B7 the researcher hypothesized that the farmers would disagree to learn how to process broilers into different cuts at any cost, in order to get good market. For B34 the researcher assumed that farmers would disagree with the statement that with known power of large

producer in value added markets, small scale farmers cannot access such market. But the broiler farmers agreed with the statement. This means that large scale producers are a threat to small scale development. The concern remains true even in developed countries' markets. Therefore, policy task and well-functioning market institutions can accommodate the issue in a win-win market relationship. For the statement B14 and B16 farmers' responses concurred with researcher's hypotheses.

Table 36: Attitudes towards product development in specialty cuts to add value

S/N	Statements	Researcher's hypothesis	Farmer's outcome	Factor loading
B14	Value addition to broiler is important if you want to find more profitable market	Agree	Agree	0.530
B16	Without adding value to broiler in today's market, broiler farming is not worthwhile	Agree	Agree	0.512
B7	I am ready to learn how to process broiler into different cuts at any cost, in order to get good market	Disagree*	Agree*	0.769
B34	With known power of large producers in value added market, small scale farmers cannot access such market	Disagree*	Agree*	0.465

Source: Principal Component Analysis

4.9.6 Attitudes towards consistency in supply of broiler chicken

Table 37 indicates that out of five researcher's hypotheses, B24 and B10 were contrary to the farmers' opinions. For B24 the researcher assumed that due to farmers being motivated by profit would agree that producing broilers according to tourist hotel specification fetch more profitable price, but farmers were against this opinion. Also Table 38 shows that the researcher's hypothesis was contrary to farmers' opinion that they are ready to learn how to produce broiler according to hotel specification at any cost (B10). The farmers'

responses to the rest of the items (B25, B2 and B1) were same as expected by the researcher.

Table 37: Attitudes towards consistency supply

S/N	Statements	Researcher's hypothesis	Farmer's outcome	Factor loading
B25	Without adding value to hotel requirements, broiler marketing is not worthwhile	Disagree	Disagree	-0.557
B24	Producing broiler to tourist hotel specification fetch more profitable price	Agree*	Disagree*	-0.590
B2	I am ready to produce broiler according to hotel specification in order to get the market even if it involve additional cost and more work	Agree	Agree	0.831
B1	I am satisfied with producing and selling live broiler, therefore I do not prefer processing	Disagree	Disagree	-0.861
B10	I am ready to learn to produce broiler according to hotel specification at any cost	Disagree*	Agree*	0.653

Source: Results of Principal Component Analysis

4.9.7 Attitudes towards alternative market strands (Supermarket and hotels)

The attitude towards alternative market strands: Supermarket and hotels was loaded by five items which all of the researcher's hypotheses concurred with the responses of the farmers. The results of factor analysis (Table 38), on item measurements that were designed to gather farmers' opinion with respect to real working of niche markets, provide a strong decision guide. Generally, the results show that farmers were more than ready to participate in niche markets apart from being presented with the real challenges associated with the niche market requirements in terms of value addition. But the fact that these challenges are key factors to step into accessing high value supply chains that could offer more market with better price was well understood. The readiness of farmers to join niche markets despite of increase in cost elements due to challenging quality issues suggest that farmers are positive towards participating in niche markets. Therefore the remaining task

is to make small scale farmers part of the growing supply chain for growth and modernisation of the sector.

Table 38: Attitudes towards alternative market strand: Supermarket and hotels

S/N	Statements	Researcher's hypothesis	Farmer's outcome	Factor loading
B5	If there is an opportunity to get more money by processing broiler for supermarkets, I can do it	Agree	Agree	0.800
B4	If there is an opportunity to get more money by processing broiler for tourist hotels, I can do it	Agree	Agree	0.800
B15	Adding value to broiler bring into different products thus increase market access/expand market opportunities	Agree	Agree	0.514
B33	Correct and prior information on price is important for one to decide producing different products	Agree	Agree	0.622
B36	With the present well known market of live broiler, I cannot prefer incur more cost for producing different products for other markets	Agree	Agree	0.692

Source: Results of Principal Component Analysis

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The general objective of the study was to examine the possibilities of integrating smallholder broiler producers into niche markets supply chain for improving efficiency and broiler producers' income. More specifically the study intended to analyse the benefit access to niche market in increasing efficiency of broiler supply chain by small scale farmers. The study intended to address the following specific objectives: (i) To characterise the broiler supply chains with particular emphasis on requirements of participating in the niche market supply chain; (ii) To analyse technical and cost efficiencies of broiler producers (iii) To compare benefits obtained by farmers supplying to niche versus conventional markets for broiler chicken, and (iv) To analyse the farmers' preferential choice decision of participating into niche markets. This chapter provides a summary of the major findings, conclusions and recommendations arising from the findings of the study.

5.1 Summary and Conclusions

5.1.1 Major requirements of the niche broiler markets

Requirements in niche markets differ depending with level of development of individual market. In general markets, however, requirements in niche markets can be categorised into quality standards and transactional requirements. With respect to broiler chicken, quality standard requirements included type of products to be supplied, size/weight, carcass quality, freshness, presentation, packaging and labelling. On the other hand, transactional requirements included adherence to the level of supplies to be delivered, time to supply, price to be offered and agreement on timing of payments, conformity to production and handling technology; slaughtering method; logistics of distribution mode;

contracts arrangements, issue of traceability; formal business registration and quality compliance certification.

The empirical evidence showed that majority of small scale farmers lack all necessary means to adhere to most of quality standard requirements as well as transactional requirements. Both quality standards and transactional requirements mainly involved specifications that focused on customization, which are more of technological and regulation in nature. The major limitation is the relative inefficiency of small scale farmers to meet niche market requirements as compared to large scale integrated farmers. Although niche markets have been growing in recent years, yet small scale farmers have not been successful in accessing these markets, while large integrated broiler producers find it necessary to increase their efficiency towards accessing the niche markets.

5.1.2 Technical efficiency

Technical efficiency for broiler producers was found to be satisfactory which indicated the potential of smallholders to meet specifications in volumes and reliability required by niche markets. However, feeds used were found to be a major source of inefficiency in the small scale broiler production chain. This was mainly due to poor quality of feed that made farmers to incur high cost to bring the broiler chickens to market weight or dispose broiler birds at low weight and consequently fetching price which cannot cover production cost. Attaining excellent feed conversion ratio remains the only challenge in modern broiler today, implying the need to enforce production of quality feeds which is necessary for the transformation of broiler industry to new levels of efficiency.

Mortality rate was another aspect that contributed to inefficiency. Generally the findings show that mortality rate was very high, varying across flock size and regions. Scale of operation, was considered to play role in increasing efficiency, but findings suggested that increasing capacity utilisation was associated with increasing inefficiency. This was attributed by other factors such as mismanagement in broiler farms due to increase in size.

Results of efficiency analysis in broiler production revealed that access to profitable markets increases efficiency in broiler production. This was probably due to the assured price premium offered to broiler producers in niche markets. Farmers who supplied to these markets had agreement on price offered before supplying while, on the other hand, farmers who supplied to conventional markets in most cases received low prices through spot market transactions, as a result lack incentive to use resources efficiently in their broiler production.

5.1.3 Cost efficiency in broiler production

Small scale broiler production system was found to be cost inefficiency; this was due to high cost of inputs that the industry face and low price of broilers that farmers received in the markets. Traditionally feed was considered to be the only major cost in broiler production, surprisingly however, the study found that costs of chicks were also skyrocketing and ran just behind the feed cost. High cost of inputs was associated with poor quality of the inputs as was the case of feeds in the analysis of production efficiency. Mostly importantly, prices received by farmers especially for those supplied to conventional markets were relatively low to cover cost of production.

5.1.4 Access to markets and efficiency in broiler production

Results of efficiency analysis in broiler production revealed that access to profitable markets increases efficiency in broiler production. This was probably due to the assured price premium offered to broiler producers in niche markets. Farmers who supplied to these markets had contracts of supplying broilers at prices agreed before supplying. On the other hand, farmers who supplied to conventional markets were found to be relatively inefficient in broiler production. These farmers were in most cases received low prices in spot market transactions, hence no incentive to use resources efficiently in their broiler production

5.1.5 Benefits of supplying to niche markets vs conventional markets

Niche markets have shown to be potential in terms of increased farmer' income when compared to conventional markets. Also they have shown to be essential in terms of investment potential as farmers supplying to niche markets had good cash flow due to price premium obtained from these markets. This is due to the fact that broiler industry proved to be sensitive to price decrease rather than increase in operating cost. While this is true across the industry, cash flows of farmers who supplied to conventional markets were badly hit by decrease in price. As it has been argued earlier, that small scale farmers have not yet adequately accessed these markets due to limited capacity of their supply chain to meet production and cost efficiency.

5.1.6 Farmers preferential choice decisions

The analysis of farmers' preferential choice decisions towards niche markets has generally shown that despite the fact that smallholder farmers had little knowledge on how to process broilers into different products, yet these farmers had positive attitude towards learning and supplying into niche markets such as hotel and supermarkets. This readiness

explains farmers' dissatisfaction on the price of broiler chicken in conventional markets which is too low to cover production costs.

5.2 Recommendations

Based on the major findings of this study, the following policy measures/implications are recommended:

- i. The study recommends on enhancing the relation and coordination of broiler supply chain as a central point of increasing efficiency in the chain. Coordination among chain actors is important for farmers to access required inputs and produce quality and reliable chicken products that could meet market requirements with reasonable price.
- ii. Policy should take initiative to increase production of the major inputs used in broiler production (feeds and day old chicks) at larger scale. Efforts should be made to find alternative source of energy to replace consumption of maize in poultry feed. Finding an alternative source of energy to replace consumption of maize in poultry feed could reduce high cost of feed, as currently the use of maize which is also a staple for human consumption in the country resulted into competition which increase the cost of feed. Therefore alternative can be the use of yellow maize and cassava.
- iii. For the case of high costs of chicks, the government should create a conducive environment to encourage investment of breeder farms and to increase production of hatch-able eggs to meet supply requirements. This can results to readily availability of day old chicks and thus reduce the cost of chicks. Also, more

important, importation of hatching eggs should be discouraged by properly taxing of imported eggs to allow for increasing efficiency of breeder farms in the country.

- iv. The quality of input used (feeds, chicks and pharmaceuticals) in broiler production varied greatly and were found to reduce efficiency in broiler production. Therefore there is need for the government to design effective quality assurance together with the development of laboratory facilities for quality assurances of those inputs.
- v. Farmers should be imparted with knowledge of good poultry husbandry and awareness on necessary factors to be taken into consideration in production and marketing of broiler and broiler products for increasing productivity and competitiveness.
- vi. It is recommended that the government and private institutions should facilitate the participation of small scale farmers in accessing niche market as they are evolved in domestic food markets, because these markets seemed to be potential in terms of increasing farm income. Access to niche markets by small scale farmers could be increased through integrating all the necessary value chain blocks of input markets, productions and output markets. This requires some form of vertical integration with innovation at each stage of value chain. Effective participation of smallholders in domestic niche markets also needs support in terms of improving infrastructure and smallholders' technical know-how for linking them to new domestic markets.
- vii. There is a need to promote appropriate processing technologies for adding value, educate farmers on these technologies and facilitate acquisition of processing equipments so as to enable more farmers to access niche markets as currently they

face limited production techniques to be able to access niche markets for improved output and income.

- viii. The study, further recommends on the formation of poultry association that could be helpful in organizing farmers in different aspects such as accessing inputs, funds, and markets.
- ix. The study also recommends on the development of comprehensive national poultry policy that would take account of many relevant issues in promoting broiler industry as well as poultry industry at large. This is because, currently poultry sector is only briefly referred in the NLP of 2006.

5.3 Study Limitations and Suggestion for Further Research

The recommendations on this study remain very industry specific, since the current study did not evaluate the prospects of niche markets for other livestock products and crop products such as grain and vegetables. Therefore it is suggested that further research on access to niche markets for producers of other agricultural commodities. Moreover, the study did not look at the negative side of niche market development such as supermarket developments as they been associated with both environmental and health problems with regard to intensive farming and selling of junk food. Thus, further research on the issue of niche market in relation to environment and health impact in the country is proposed.

REFERENCES

- Aganga, A., Omphile, U., Malope, P., Chabanga, C., Motsamai, G. and Motsumi, L. (2000). Traditional poultry production and commercial broiler alternatives for small-holder farmers in Botswana. *Livestock-Research-for-Rural-Development* 12(4): 1-8.
- Ahuja, V. and Sen, A. (2007). "Scope and space for small scale poultry production in developing countries." IIMA Working Paper No. 2007-12-02. Available at: [<http://www.iimahd.ernet.in/publications/data/2007-12-02Ahuja.pdf>] site visited on 08/07/2009.
- Aigner, D. J., Lovell, C. A. K. and Schmidt, P. (1977). "Formulation and Estimation of Stochastic Frontier Function models." *Journal of Economics* 1(1): 21-37.
- AMI (2012). "Global Perspectives for Growing Farm Profits." *AMI Conference*. Delta Hotel, Guelph, ON. February 15-16, 2012.
- Anwar, M. Z., Abdul, H. Q. and Muhammad, I. A. (2004). Marketing Issues Affecting Broiler Production in Pothwar Region of Punjab, Pakistan. *Pak. Journal of Life and Soc. Sci. Volume*, 2(1): 76-78.
- Aramyan, L. H., Lansink, A. G. J. M. O., van Kooten, O. and Lansink, A. D. (2006). "Chapter 5 Performance indicator in Agri-Food Production Chains", in Ondersteijn, C. J. M., Wijnands, J. H. M., Huime, R. B. M. and van Kooten, O. (Eds) *Quantifying the Agrifood Supply Chain*, Springer, Dordrecht. pp49-66.

- Ashimogo, G. and Greenhalgh, P. (2007). Small Scale Producer in Modern Agrifood Market in Tanzania. Recovering Market. [<http://www.regoverningmarket.org>] site visited on 18/06/2009.
- Badubi, S. S., Ravindran, V. and Reid, J. (2004). A Survey of small-scale broiler production system in Botswana. *Tropical Animal Health and Production* 36 (8): 823-834.
- Barret, C. B. (2008). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food Policy* 33: 299–317.
- Battese, G. and Coelli, T. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics* 20: 325–332.
- Battese, G. E. and Corra, G. S. (1977). “Estimation of a Production Frontier Model: With Application to the Pastoral Zone off Eastern Australia.” *Australian Journal of Agricultural Economics* 21(3): 169-179.
- Beamon, M. (1998). Supply chain design and analysis: Models and methods. *International Journal of Production Economics*, 55: 281–294.
- Berdegúe, J. A., Biénabe, E. and Peppelenbos, L. (2008). *Keys to inclusion of small-scale producers in dynamic markets - Innovative practice in connecting small-scale producers with dynamic markets*, Regoverning Markets Innovative Practice series, IIED, London.

- Bijman, J., Ton, G. and Meijerink, G. (2007). *Empowering Smallholder Farmers in Markets: National and International Policy Initiatives*. WUR: Wageningen. (ESFIM Working Paper 1).
- Charnes, A., Cooper, W. W. and Rhodes, E. (1978). Measuring the Efficiency of Decision Making Units. *European Journal of Operational Research*, 2(6): 429-444.
- Chikazungwa, D., Ndiyoi, M. and Muloongo, O. (2008). Restructuring food markets in Zambia: Dynamics in the beef and chicken sub-sectors. Recovering Market. Policy Brief no.9 [<http://www.regoverningmarket.org>] site visited on 18/09/2009.
- Coelli, T. J. (1996). A Guide to Frontier Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation, CEPA Working Papers, No. 7/96, School of Economics, University of New England, Armidale.
- Davis, J. R. (2006). How can the poor benefit from the growing markets for high value agricultural products? *High Value Agricultural Products Workshop*, held in February, 2006.
- Delgado, C., Rosegrant, M., Steinfeld, H, Ehui, S. and Courbois, C. (1999). *Livestock to 2020 The Next Food Revolution*. IFPRI. Food, Agriculture, and the Environment. Discussion Washington, DC, IFPRI.
- DFID (2002). *Better Livelihoods for Poor People: The Role of Agriculture*, (London: DFID).

- Djurfeldt, G. and Jirstrom, M. (2005). *The puzzle of the policy shift – the early Green Revolution in India, Indonesia and the Philippines*. In: Djurfeldt, G., Holmen, H. M. Jirstrom and R. Larsson, eds: *The African food crisis: Lessons from the Asian Green Revolution*. CABI Publishing. Cambridge MA, USA, and Oxen, UK. pp. 43-63.
- Effiong, E. O. And Onyenweaku, C. E. (2006). Profit efficiency in Broiler production in Akwa Ibom State, Nigeria. Department of Agricultural economics, Michael Okpara University of Agriculture, Umudike, Umuakwa, Abia State, Nigeria. *Int. J. Agric. Rural Dev.* 7(1): 72-79.
- Ellis, F. (1993). *Peasant Economics: Farm Households and Agrarian Development*. Second ed. Wye studies in Agricultural and Rural Development. Cambridge University Press. pp68.
- Emokaro, C. O. and Emokpae, O. P. (2014). Technical Efficiency and Production Elasticity of Broiler Producers in Edo State, Nigeria. *Applied Tropical Agriculture*, 19 (1): 59 – 65.
- Emokaro, C.O. and Emokpae, O.P. (2014). Technical Efficiency and Production Elasticity of Broiler Producers in Edo State, Nigeria. *Applied Tropical Agriculture* 19(1): 59 – 65.
- FAO (2004). *Impact of Import Surges: Tanzania Country case Study Results*. FAO, Rome.

- FAO (2010a). *Smallholder poultry production – livelihoods, food security and sociocultural significance*, by K. N. Kryger, K. A. Thomsen, M. A. Whyte and M. Dissing. FAO Smallholder Poultry Production Paper No. 4. Rome.
- FAO (2010b). *Agribusiness Handbook. Poultry Meat and Eggs*.
- Farooq, Z. M., Durrani, F. R., Chand, N. and Ahmed, J. (2001). Status of broilers produced in Swat, Pakistan. *Livestock Research for Rural Development*, Volume13 (3): [<http://www.cipav.org.co/lrrd/lrrd13/3/zahi133.htm>]. site visited on 12/10/2012.
- Farrell, M. J. (1957). The measurement of productive efficiency', *Journal of Royal Statistical Society, Series A (general)*, 120(3): 253-281.
- Gangwar, L. S., Sandeep, S. and Kumar, S. (2010). Broilers' Supply Value Chain in the National Capital Region Delhi: A Case Study of Ghazipur Poultry Market. *Agricultural Economics Research Review*, 23: 461-468.
- Glover, T. (1996). "Livestock Manure: Foe or Fertilizer?". *Agricultural Outlook*. June (1996): 30-35.
- Green, W. H. (1993). *The Econometric Approach to Efficiency Analysis*. In *The Measurements of Productive Efficiency. Techniques and Application*. "Edited by" (Fried, H. O. and Lovell, C. A. K.) Oxford University Press, New York. pp68-119.

- Hair, J. F., Anderson, R. E., Tatham, R. L. and Black, W. C. (1995). *Multivariate Data Analysis: With Readings*. Prentice-Hall, Englewood Cliffs, N. J. 757pp.
- Harou, A. (2011). *Smallholder Market Access. Policy Brief* pp4.
- Heijden, T. and Van Der (2010). *Good for who? Supermarket and Small Farmers in South Africa- A critical Review of Current Approaches to Market Access for Small Farmers in Developing Countries*. Master Thesis. 94pp.
- Henson, S. (2005). *Facilitating Small Producer Access to High-Value Markets*. Department of Agricultural Economics and Business, University of Guelph, Ontario N1G 2W1 Canada.
- Herrero, I. (2005). 'Different approaches to efficiency analysis. An application to the Spanish travel fleet operating in Moroccan waters', *European Journal of Operational Research* 167(1): 257-271.
- Humphrey, J. and Memedovic, O. (2006). *Global value chains in the agrifood sector*, UNIDO, Vienna.
- IFAD (2003). *Promoting Market Access for the Rural Poor in Order to Achieve the Millennium Development Goals*. Roundtable Discussion Paper for the Twenty-Fifth Anniversary Session of IFAD's Governing Council.

- IFPRI (2001). Rosegrant, M. W., Paisner, M. S, Meijer, S. and Witcover, J. (2020). Global Food Outlook. A 2020 Vision for Food, Agriculture, and the Environment. International Food Policy Research Institute, Washington, D.C.
- Ikerd, J. E. (1997). The Role of Marketing in Sustainable Agriculture. [<http://web.missouri.edu/~ikerdj/papers/Stl-mkt.htm>] site visited on 12/07/2011.
- Kamugisha, P. P. (2015). Quality Beef Supply Chain Efficiency and Consumption in Arusha and Dar-es-Salaam Cities, Tanzania. A PhD Thesis, at Sokoine University of Agriculture (SUA), Morogoro, Tanzania. 243pp.
- Kotler, P. (1991). *Marketing Management: Analysis, Planning and Control*, 8th ed., Prentice-Hall, London. 128pp.
- Kristensen, E., Larsen, C. E. S., Kyvsgaard, N. C., Madsen, J. and Henriksen, J. (2004). Livestock Production - The twenty first century's food revolution (Discussion paper on the donor community's role in securing a poverty oriented commercialization of livestock production in the developing world). *Livestock Research for Rural Development* 16 (1).
- Latruffe, L. (2010), "Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors", *OECD Food, Agriculture and Fisheries Papers*, No. 30, OECD Publishing. [<http://dx.doi.org/10.1787/5km91nkdt6d6-en>] site visited on 20/03/2012.
- Li, D. and O'Brien, C. (1999). Integrated decision modelling of supply chain efficiency. *International Journal of Production Economics* 59: 147–157.

- Lotter, D. W., Seidel, R. and Liebhardt, W. (2003). The Performance of Organic and Conventional Cropping System in an Extreme Climate Year. *American Journal of Alternative Agriculture* 18(3): 146-154.
- Mahjoor, A. A. (2013). Technical, Allocative and Economic Efficiencies of Broiler Farms in Fars Province, Iran: A Data Envelopment Analysis (DEA) Approach. *World Applied Sciences Journal* 21(10): 1427-1435.
- Maqbool, A. A. and Bukhsh, K. (2007). Issues and Economics of Poultry Production: A Case Study of Faisalabad, Pakistan. *Pakistan Vet. J.*, Volume 27(1): 25-28.
- McLeod, A., Thieme, O. and Mack, S. D (2009). Structural change in the poultry sector: Will there be smallholder poultry 2030? *World Poultry Science Journal*. Vol. 65 pp 191-200.
- Meeusen, N. and Van-den Broeck, J. (1977). "Efficiency Estimation from Cobb-Douglas production function with Composite error". *International Economic Review* 18(2): 123-134.
- Minten, B., Reardon, T. and Vandeplas, A. (2009). Linking Urban Consumer and Rural Farmers in India: A Comparison of Traditional and Modern Food Supply Chains. IFPRI Discussion paper 00883.
- MLD (2006). National Livestock Policy (NLP). [<http://www.mifugo.go.tz>] site visited on 04/10/2012.
- MLFD (2011). Livestock Sector Development Program. Government document.

- Mlote, S. N., Mdoe, N. S. Y., Isinika, A. C. and Mtenga, L. A. (2013). Estimating technical efficiency of small scale beef cattle fattening in the lake zone in Tanzania. *Journal of Development and Agricultural Economics*, Vol. 5(5), pp. 197-207.
- Mohsin, A. D., Riaz, R., Asad, S. and Mushaq, A. (2008). Profitability Analysis of Broiler Production in Rawalpindi District. *Pakistan Journal of Agricultural Science*, 45 (4): 514-519.
- Mozumdar, L., Farid, A. J. U. and Rahman, M. W. (2009). Broiler farming: An approach to improve rural livelihood. *J. Bangladesh Agril. Univ.* 7(2): 395–402, ISSN 1810-3030.
- Msami, H. (2007). Poultry Sector Country Review: The structure, marketing and importance of the commercial and village poultry industry: An Analysis of the sector in Tanzania. FAO Animal Production and Health Division.
- Mutabazi, K. D. S. (2007). Farmers' perceptions, attitude and adaptation to rainfall variability risky in upland areas of Tanzania. Thesis for Award of PhD Degree at Sokoine University of Agriculture (SUA), Morogoro, Tanzania. 178pp.
- Ojo, S. O. (2003). Productivity and technical efficiency of poultry egg production in Nigeria. *International Journal of Poultry Science*, 2 (6): 459–464.

- Otieno, D. J., Hubbard, L., Ruto, E. (2012). Determinants of Technical Efficiency in beef cattle production in Kenya. Selected paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguacu, Brazil. paper 28. 72 pp. paper. CIRAD and World Bank. Preliminary draft for comments and suggestions.
- Parikh, A. F., Ali, F. and Shah, M. K. (1995). "Measurement of Economic Efficiency in Pakistani Agriculture." *American Journal of Agricultural Economics* 77: 657-685.
- Paudel, P. and Matsouka, A. (2009). Cost efficiency estimates of maize production in Nepal: a case study of the Chitwan district. *Journal of Agricultural Economics-Czech* Vol. 55 (3): 139-148.
- Phillips, M. (1994). "The transformation of US food marketing", in Shertz, L. and Daft, L., *Food and Agricultural Markets: The Quiet Revolution*, The National Planning Association. pp. 7-18.
- Pingali, P. (2006). Westernization of Asian diets and the transformation of food systems: Implications for research and policy, *Food Policy*, 32: 281-298.
- Reardon, T. and Timmer, C.P. (2007). Transformation of Markets for Agricultural Output in Developing Countries Since 1950: How Has Thinking Changed? In R. E. Evenson, and Pingali, P. (Eds). *Handbook of Agricultural Economics, 3: Agricultural Development: Farmers, Farm Production and Farm Markets* Amsterdam: Elsevier. Press. pp. 2808-2855.

- Reardon, T., Barrett, C., Berdegue, J. and Swinnen, J. (2009). “Agrifood Industry Transformation and Small Farmers in Developing Countries.” *World Development* 37(11): 1717-1727.
- Reardon, T., Timmer, C. P., Barrett, C. B. and Berdegué, J. (2003). ‘The Rise of Supermarkets in Africa, Asia, and Latin America,’ *American Journal of Agricultural Economics* 85 (5): 1140-6. *Research*, 167(1): 257-271.
- Rondot, P., Biénabe, E. and Collion, M. (2004). “Rural Economic Organization and Market Restructuring: What Challenges, What Opportunities for Small Holders?” A global issue paper. CIRAD and World Bank. Preliminary draft for comments and suggestions.
- Senkondo, E. M. (2000). Risk attitude and risk perception in agroforestry decisions; the case of Babati, Tanzania. Thesis for Award of PhD Degree at Wageningen University, Mansholt, Netherlands. 218pp.
- Senkondo, E. M. M., Msangi, A. S. K., Xavery, P., Lazaro, E. A. and Hatibu, N. (2004). Profitability of Rainwater Harvesting for Agricultural Production in Selected Semi-Arid Areas of Tanzania. *Journal of Applied Irrigation Science*, Vol. 39(1): 65 – 81.
- Sewando, P., Mdoe, N. Y. and Mutabazi, K. D. (2011). Farmers’ Preferential Choice Decision to Alternative Cassava Value Chain Strands, in Morogoro Rural District, Tanzania. *Agricultural Journal*, 6(6): 313-321.

- Shephard, A. (2004). *The Structure and Economic of Broiler Production in England*. Special Studies in Agriculture Economics. No.59, ISBN 1 870558 78 2. University of Exeter, Centre for Rural Research.
- Steinfeld, H., Wassenaar, T. and Jutzi, S. (2006). Livestock production systems in developing countries: status, drivers, trends. *Rev. Sci. tech. Off. int. Epiz.*, 25 (2): 505-516.
- Stutely, R. (2002). *The Definitive Business Plan*. Pearson Education Limited, U.K. 312pp.
- Sumberg, J. E. (1996). *Livestock Production in the Peri-Urban Areas of Africa: An Analysis of Dar-es-Salaam, Mwanza and Shinyanga, Tanzania*. Overseas Development Group, School of Development studies, University of East Anglia, Norwich NR4 7TJ, UK.
- Swinnen, J. F. (ed.) (2007). *Global Supply Chains, Standards and the Poor*. Oxfordshire: CABI Publishing.
- Swinnen, J., Maertens, M. and Vandeplass, A. (2010). *Governance and Smallholder Farmer Competitiveness in High Value Food Chains*. Paper prepared for the World Bank-SPIA-UC Berkeley conference "*Agriculture for Development – Revisited*" UC Berkeley October 1-2, 2010.
- Tamagnini, V. and Tregear, A. (1998). "An Assessment of Niche Marketing Opportunities in the Delicatessen Meat Sector." *British Food Journal* 100(5): 228-235.

- Taru, V. B., Nkwi, G. E., Medugu, A. I. and Reuben, J. (2010). Economics of Broiler Production in Meme Division of Cameroon. *Journal of Agricultural Science* 1(2): 83-87
- Trienekens, J. H. (2011). Agricultural Value Chains in Developing Countries A Framework for Analysis. *International Food and Agribusiness Management Review Volume* 14(2): 51-82.
- URT (2011). *Livestock Sector Development Programme*. Ministry of Livestock and Fisheries Development. 44pp.
- USAID (2010). Partnership for safe poultry in kenya (PSPK) program. *Value chain analysis of poultry in Tanzania*. Winrock International. 42pp.
- Vonderembse, M. A., Mohit, U., Huang, S. H. and Dismukes. J. P. (2006). Designing Supply Chains: Towards Theory Development. *International Journal of Production Economics* 100 (2): 223-238.
- Weatherspoon, D. and Reardon, T. (2003). The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural Poor. *Development Policy Review* 21(3): 333–355.
- Wikedzi, I. A. (2013). Economic Analysis of Production Efficiency and Marketing Performance of Dairy Value Chain in Tanga City. Ms. Thesis, at Sokoine University of Agriculture (SUA), Morogoro, Tanzania. 131pp.

Yakovleva, N. and Flynn, A. (2004). Innovation and the Food Supply Chain: a Case Study of Chicken. Working Paper Series No. 20. The Centre for Business Relationships, Accountability, Sustainability and Society.

APPENDICES

Appendix 1: Baseline for general information of the industry (policies, acts, regulation, structure, conduct and performance)

1. Date..... Company/Industry name.....
2. Region..... Municipal..... Ward.....
3. Respondent name.....
4. Position in the company/industry..... Phone number.....
5. Role of respondent in the broiler supply chain
 - i. Policy maker and institutional supporter
 - ii. Actor of supply/value chain (Specify)
 - iii. Service provider (which? Specify)
 - iv. Other (specify)
6. *(Note: ask only if it is a member of supply chain)*. What is your experience in the business of broiler?
7. What constitute broiler supply chain in the country? Chain performance and constraint?
8. How strong is the interaction/linkage/relationship and level of power among chains actors? Is there any agency (private, public and civil society) that links the actors at different node?
9. Is there any programme /organisations/associations of poultry which stand for the interest of sub-sector and chain actors (*if yes*, extent to which they exist, historical background). Role they play? Benefit and constraints. If not exist why?
10. What is your view on sub sector development in the past 5 years as a result of country's research and development in the broiler sub sector?

11. How is environment institution of the industry (available infrastructure, policies, law, regulation and other investments requirements such as land acquisition, licences and registration influencing the sub sector?
12. Sometimes back Tanzania was importing broilers. What was the experience of business during the importation? To what extent was it challenging/supported sub sector in the country?
13. What is Structural and /or economic changes (dynamics) that have occurred in broiler industry and its retail part in the past 5 years. Factors/sources influencing such changes?
14. How would you rate the consumption trend of broilers relative to other meat in the country for the past 5 years ? Factors influencing broiler consumption
15. How potential do niche markets stand as broiler marketing channel relative to other marketing channels of broiler in the country (in terms of increasing farmer's profit)? What is the position of smallholder farmers in accessing niche markets?
16. The poultry market has been badly hit by the AI outbreak. What is experience in the country?
17. Broiler farming is suspected with unethical production (speculative comments) with regard to human health. To what extent these comments affecting market?
18. Broiler production is said to cause effect on environment in relation to waste disposal, air pollution and energy use. How do you observe environmental issue for sustainable production and consumption in the country?
19. From your perspective, how would you describe the innovations made in broiler supply chain towards consumer demand on value added market?
20. What are your views on value adding activities in broiler supply chain to meet niche market requirements? Practicability and costing?

21. *With regard to vision of livestock policy 2006;* How realistic do you think the vision is on the part of broiler sector (extent to which it enabling or constraining the poverty-reduction potential of the broiler sub sector).
22. What are drivers and barriers to efficiency and profitability in today's broiler business as niche marketing is concerned?
23. In developed countries issue of animal welfare is highly considered in marketing of animal products. What is the experience in the country in relation to broiler marketing?
24. What is prospect for the Tanzania's broiler sector to acquire a place in foreign market? Factor influencing/inhibiting?
25. Vertical integration in broiler industry/sector is said to be crucial in increasing efficiency due to quality continuity and cost reduction; How effective have this been in the country?
26. How is effectiveness of institutional arrangements such as contract, network/interlinks in helping small scale farmers to meet production and marketing requirements in the country? Practicability, reliability?
27. How do you find the potential of the sector in the country's economic and social development/poverty reduction strategy? How potential is broiler sector relative to other farm product/meat product/poultry products for the past 5 years?
28. In your view, what type of production and marketing system will provide a quality and consistent value added poultry products?
29. What are opportunities and constraints that exist in the broiler supply chain?
30. What changes on livestock policy and associated acts do you think should be put in place to respond to dynamic in broiler sector? Any general/technical suggestions that you would offer with regard to broiler industry?

31. From your perspective/experience, what do you think are the biggest areas of challenge for broiler sub sector to contribute to poverty reduction strategy of the country?
32. Please suggest any additional question/issue that you would like to be discussed by you and/or addressed to other actors of broiler supply chain

Thank you very much for your time

Appendix 2: Checklist for breeder farm

Date of interview.....	Name of the company.....
Interviewee.....	Position.....
Contacts.....	Region.....

1. What is the size of the farm (no. of birds owned)?

Current	5 years ago

2. Is that production represent full farm capacity 1= Yes 2= No

3. If not, what are Reasons for not utilising your full plant capacity?

4. What is the Hatchability rate?

5. Source and cost of input

Input	Parent stock chicks	Feed	Pharmaceuticals	Others (specify)
Source				
Cost				

6. Issue of labour requirement and cost

7. What is the estimated cost for establishing parent stock farm

8. Main sales outlets of the fertile eggs

Type of market	% of product sold	Comments
Own hatchery		
Commercial farms		
Others (specify)		

9. If sold to other market, what is the prices and its trends in the past 5 years?

10. What are opportunities for having breeder farm in Tanzania

11. What are the Challenges facing breeder farm production?

12. What are waste disposal criteria

Thank you very much for your time and cooperation

Appendix 3: Checklist for hatcheries

Date of interview.....	Name of the company.....
Interviewee.....	Position.....
Contacts.....	Region.....

1. Experience in business
2. Capacity of hatchery (Amount of live day old broiler chicks produced and marketed per year for the past 5 years).
3. Is that production represent your full capacity 1= Yes 2= No
4. If not, what are Reasons for not utilising your full plant capacity?
5. How is your production changed in the past 5 years?

Year	2007	2008	2009	2010	2011	2012
No. of birds						

6. Hatchability rate?
7. Do you have institutional arrangements in production (such as contract)? Yes
No

Information on inputs used

8. Source and cost of input

Input	Fertile eggs	Pharmaceuticals	Others (specify)
Source			
Cost			

9. Average cost per bird

Current cost/per bird	
2-3 years ago/per bird	

10. What is the cost (estimate) of the hatchery set up

Tshs

11. How have been the trends of inputs market (fertile eggs and pharmaceuticals) in the past 5 years (availability, cost, quality, reliability)?

12. Main sales outlets of the DOC

Type of market	% of product	Comments
Own farm		
Institutional farm		
Individual farm		
Agents		
Others (specify)		

13. What is the price of DO -broiler chick in the past 5 years?

14. How is the market demand and seasonal price for day old broiler chicks?

15. In case of absence of/low market demand, how do you handle the remaining stock of DO-broiler chick? Incurred cost?

16. Source and cost of inputs (fertile)? Changes occurred in last 5 years

17. What are marketing costs incurred in selling DO-broiler chicks (sorting/grading, packing, transportation and distribution)?

18. What type of supporting services do you think is needed to improve performances of hatcheries (technical, institutional, any other)

19. What are the Challenges facing hatchery's performance?

Thank you, for your time and cooperation

Appendix 4: Checklist for feed manufacturers/millers

1. Date..... Company/Industry name.....
2. Region Municipal..... Ward.....
3. Respondent name.....
4. Position in the company/industry..... Phone number.....
5. Type of enterprise by scale of operation
 1= small 2= medium 3= large
6. What is your experience in the business of poultry/broiler feed.....(year)
7. How many type of broiler feed your company produce (starter, grower, and finisher? Form; Mash, pellet and crumble feed?) Which one is most marketed? Reasons?
8. What are type and source of main inputs (feed ingredients) for the past 5 years?
9. How is the availability of inputs and trend in the past 5 years?
10. What is the price of major inputs and trend in the past 5 years?
11. How do you plan for seasonal availability of ingredient such as grain? Buy and store, forward purchase? explain
12. Apart from seasonal availability of agricultural ingredients; what are other causes of poor availability of grain? Competition between human and animal feeds? Other?
13. Qualities of ingredients do vary with source and time; how do you ensure quality consistent in your feed production?
14. How and how often do you improve/change your formula; Underlying factors?
15. What source of energy do you use? Cost?
16. How many employees do you have in your industry? Permanent? Part time labour?

17. What are other major variable costs in feed production? Fixed cost (sources)?

18. How have been production and market trends of broiler feed for the past 5 years?

year	2005	2006	2007	2008	2009	2010
Production level (no. tonnes/year)						
Amount sold (tonnes/year)						

19. Is that production trend represent your full plant size and capacity utilisation? If not what is/are reason(s) for not full utilising plant capacity?

20. Any Institutional arrangements involved (such as contract, market linkage) with input and output market? If yes explain terms and conditions

21. Is there existence of animal feed producers' association/organisation? If yes or not, explain the merit and demerit of such organisation.

22. Where do you most supply? Breeders' farm, broiler farms individual producers?

23. What is publicity of your feed products to your customers? Who are your major competitors?

24. Do you provide nutrients table content for different type of feed you supply?

25. What are your main sales outlets and mode of sale (Distribute to buyers, agents, buyers come) for broiler feed in the past 5 years?

26. Are you engaged in any other component of poultry chain (VI)? Broiler production?

27. How is the market demand and seasonal price for broiler feeds? Trends in the past 5 years?

28. What marketing cost incurred in conducting your business?

29. Do you produce other animal feed apart of poultry feed? *If yes*, please what are they? What are proportions of poultry and or broiler feed from total feeds produced?

30. Cost of feed to broiler production is said to be very high, hence increasing trend of using home made feed. What is your view in relation to sector development and future of your business?
31. Domestic production of poultry feed is said not to meet demand, thus importation of animal feed is practised. What is your view on importing and or imported poultry feed in sector development?
32. What is your view on legislation issue to ensuring quality feed production? Registration, certification and monitoring (role of TFDA and TBS)?
33. From your perspective, what do you think are the biggest challenges facing feed manufacturer in the country? (Technical, investment cost, ingredients; availability, quality, price, market; low demand, high marketing cost)?
34. How is the issue of policies, Act, regulation and other investments requirements influence your activities (the extent to which it enabling/constraining poverty reduction potential)?
35. What types of supporting services are essential in animal feed production (training, BDS, etc)? Who offer the services? How is the accessibility and costs?
36. Feed production involves high utilisation of energy which has impact on environment. How do you consider environmental issue for continuing production sustainability?
37. What are opportunity and constraints that exist in the production and marketing of feed in the country? Problem facing your industry, how do you overcome them?
38. What if any major challenge is of your concern in order to achieve greater efficiency in your part?
39. Please could you suggest anything that you think is worth to be discussed in relation to feed and or / broiler sector for improvement of the sector?

Thank you very much for your cooperation

Appendix 5: Checklist for producers

1. Date..... Company/Industry name.....
2. Region Municipal..... Ward.....
3. Respondent name..... Position in the farm.....
4. Phone number.....
5. Type of farm by scale of operation (small, medium, large scale)?
6. What is the mode of operation? Individual, company, group, partnership?
7. Production capacity, seasonality and trends in the past 5 years? If not utilise plant capacity, why?
8. Number of production cycle (batches) per year?
9. What is the type of broiler house and other structures (Floor, roof, etc) that are used?
10. Uses of brooders? Source of heat in the brooder? Management practices during brooding (feeds and feeding? Vaccine? Medicine? Time taken for brooding?), mortality rate?
11. Management practices (cleaning, feeding, etc)? Personnel involved in production?
12. What are main breed and sources for the past 5 years? Cost, quality, reliability?
13. What are type, source and price of other main inputs? How have been the trends of inputs market in the past 5 years (availability, cost, quality, reliability)?
14. Cost of feed is said to be very high. How has this been in the past 5 years? Apart from high cost of commercial feeds what other problems in relation to these feed (quality, availability, other)?
15. Do you use commercial compounded feed or home making feed? If yes which brand? Reasons (easy availability, price, quality performance, other). If use own producing feed, how do you ensure good quality of feed?

16. What are other major variable costs in broiler sector apart from feed cost? How about fixed cost?
17. What types of supporting services are essential in broiler production? Who offer the services? How is the accessibility and costs?
18. Institutional arrangements involved (such as contract and vertical integrations)?
19. Main sales outlets of the broilers in the past 5 years (number of birds marketed, mode of marketing, form that are sold)?
20. How is the market demand and prices of broilers with their trends in the past 5 years?
21. What is the publicity of broiler chicken in the markets in terms of acceptability and competitiveness, taking into account product origin, product characteristics, production and processing methods?
22. What are changes in product value and cost relationship in the past 5 years?
23. What are the major marketing costs incurred during the sale of broilers?
24. Who are main customers? How do the larger customers influence farm gate price? Farm to retail price spread?
25. What are the Challenges facing broiler production (Diseases; major diseases?), feed (availability, quality, price?), market (availability, distance, stringent requirements, fluctuation, etc); mortality rate?
26. How do the weather changes affect broiler performance? Any serious observation on broiler production due to changing weather condition (mortality rate, feed conversion ratio)?
27. (*Ask only if it is a holding*). Issue of policies, law, regulation and other investments requirements (the extent to which it enabling/constraining poverty reduction potential)?
28. Consideration on environmental issue; means of waste disposal, energy/water conservation for the production and consumption sustainability?
29. Major challenges in production and marketing of broiler?

30. What if any major challenge is of your concern in order to achieve greater efficiency as broiler produce?
31. Other comments in relation to broiler that are relevant to be discussed for improvement

Thank you very much for your time

Appendix 6: Checklist for processors

1. Date..... Company/Industry name.....
2. Region Municipal..... Ward.....
3. Respondent name.....
4. Position in the company/industry..... Phone number.....
5. Scale of operation of the processing industry (small, medium, large)?
6. Mode of operation (independent, part integrated)?
7. Experience in processing broilers?
8. Source of broilers (own farm, contracts, network with producers, purchase from spot market)?
9. What are other variable costs in poultry processing and their trend in the past 5 years? What are fixed cost and source?
10. What is the size of plant and capacity? Equipment used (manual/full automated)?
11. Number of employees? Proficiency and others?
12. What is the volume of processed chickens for the past 5 years? How many chicken products are produces? How are these products in proportional wise?
13. Has capacity of the industry been full utilised? If not, why? On average how many days is processing take place per year
14. How many chicken markets do you have (such fresh, frozen, cooked, etc)? How is proportional of these market?
15. What are your market outlets? Amount of processed chicken sold by market outlets in the past 5 years? Potential customers of your products?
16. Any contractual agreements with input and output market? If yes, describe type of agreement.

17. How are seasonal demand and selling prices by market outlets in the past 5 years?
18. What are requirements of potential buyers (price, quality, size, freshness, packaging labelling, distribution and payment mode). Explain
19. Marketing of ready to cook poultry is not a Tanzania tradition. From your view is there any socioeconomic concern with marketing of processed broilers? So far what have been done to promote the products in the market?
20. What marketing cost incurred in conducting business (such as processing, storage, transportation and distribution cost)?
21. Domestic processing of poultry in the country is said not to meet demand due to limited choice and quality problem; thus importation is inevitable. What is your view on this?
22. From your perspective, how would you describe the innovations (production, processing and distribution) made in broiler supply chain towards consumer demand/value added market?
23. How are the issues of policies, act, regulation and other investment requirements (licensing, taxation and certification) influence your activities?
24. Mass broiler production and processing is liable to environment impact. How do you consider environmental issue for sustainable production and consumption?
25. What kind of supporting services are essential in poultry processing (technical, operational, institutional/organisational, financially, etc).So far how is the availability of these services and their cost?
26. From your perspective, what do you think are the biggest challenges facing the business of poultry to optimize the opportunity of emerging niche markets in the country?
27. What are opportunities that exist in the marketing of processed chicken in the country?
28. What are constraints encountered in conducting business? How do you overcome them?

29. What if any major challenge is of your concern in order to achieve greater efficiency as processor of chicken in the country?
30. Please could you suggest anything that you think is worth to be discussed in relation to poultry processing / broiler sector for improvement of the sector?

Thank you very much for your cooperation

Appendix 7: Checklist for traders of live/dressed broiler

1. Type of trader (wholesaler, retailer)
2. Experience in broiler business?
3. Scale of trader- volume of traded broiler and trend in the past 5 years?
4. Source of broiler in the past 5 years?
5. Which months is supply of broiler low/ and or high
6. How is the buying price and seasonal price in the past 5 years
7. How is demand and trend in the past 5 years
8. What are market outlets and price trend in the past 5 years?
9. Who are your most customers?
10. Do you have any contractual agreement with your buyers/ and or sellers
11. How is mode of payment (in cash, deferred payment) from your main customers?
12. Which means do you use to transport broiler to marketing place? Average distance? Transport cost? Any problem associated
13. (*In case of trader of processed broilers*). How are storage facilities (own? Hire Capacity and cost?). Do you use cold chain transport? Own? Hire? Cost? What are problem associated with transport and storage facilities?
14. On average how many birds do you buy per consignment?
15. Time it take to sell the purchased consignment
16. What are marketing cost incurred in selling broilers
17. On average how much capital did you start with? For now how much would be needed?
18. What was your source of capital?
19. Traders associations/organization- the extent to which they exist and the roles they play
20. Fees and other charges by central and local government
21. From your experiences, what are major challenges encountering broiler markets?
22. Any other comments that you would like to address in improving marketing of broiler?

Thank you very much for your cooperation

Appendix 8: Questionnaire for retailers**(Supermarkets, specialized meat shop, exclusive hotels and Restaurants and barbeque Outlets)**

Date..... Supermarket/ Meat shop/Hotel/restaurant
 name.....
 Region..... Municipal.....
 Ward.....
 Respondent name.....
 Position.....

Firm profile

1. When your firm started business in this country?
2. Is it an independent venture or part of the chain? Independent Chain
3. If it is a chain, how many store/ventures do you have in the country?

Trading information

4. *(Not ask if it is eating place)*What broiler brand do you sell?
 Own labels Manufacture's brand Both
5. What are your sources of broilers supplies (with proportion in each type of supplier)?
 Industrial producers and processors (name if a Small scale farmers
 Both
6. How is the procurement of broiler organised?
 Producer supply to you direct Self procurement Others (specify)
7. What market arrangements do you make with your suppliers?
 Contracts Other (specify)
8. If is contract, what kind of contract do you make with your supplier? Formal
 (written) Informal (written) Informal (verbal/trust)
 Both
9. What is your exactly/estimate order per week?
 Broilers/week
10. What are buying prices from your supplier

Product supplied	Suppliers (brand name)	Buying Price/pc or kg
1. Whole broiler		
2. Breast		
3. Thighs		
4. Drumstick		
5. Wing		
6. Backs		
7. Neck		
8. Leg		
9. Liver		
10. Gizzard		

Product supplied	Suppliers (brand name)	Buying Price/pc or kg
11. Fresh (chilled) broiler		
12. Frozen broiler		
13. Marinated		
14. Cooked		

11. What are your selling prices?

Type of product	Selling Price/pc or kg
1. Whole chicken	
2. Mixed parts	
3. Thigh	
4. Drumstick	
5. Wing	
6. Backs	
7. Neck	
8. Leg	
9. Gizzard	
10. Liver	
11. Fresh (chilled) broiler	
12. Frozen broiler	

12. What are the broiler products which you are selling more and what you are selling less

Broiler products	1 st most selling product		2 nd most selling product		3 rd most selling product		1 st less selling product		2 nd less selling product		3 rd less selling product	
	A lot more	Slightly more	A lot more	Slightly more	A lot more	Slightly more	Slightly less	A lot less	Slightly less	A lot less	Slightly less	A lot less
Whole chicken												
Mixed parts												
Thigh												
Drumstick												
Wing												
Backs												
Neck												
Leg												
Gizzard												
Liver												

13. Which form of broiler do you sell most(in proportion please)

Form that product sold	Per cent from total sell (%)
Fresh	
Frozen	
Cooked	

14. What other meat product do you sell?

Beef Chicken Fish Pork Others (specify)

15. How is the trend of market for broilers relative to other meat products in your firm?

Meat product	1 st moving	2 nd moving	3 rd moving	4 th moving
Broiler				
Beef				
Fish				
Pork				

16. How long does it take to pay to suppliers for the deliveries (broiler) made

Instant pay 30 days 60 days
Others (specify)

17. Do you have specific quality/and or product requirements considered when sourcing broilers?

Yes No

18. What are your requirements (Quality/standard/grade) on broilers to be supplied to you?

Attributes	Grade and standard	Comments
1. Size		
2. Weight		
3. Freshness		
4. Product type (whole and cuts)		
5. Packaging		
6. Labelling		
7. Others		

19. How do you ensure compliance?

20. What is the ability of your suppliers to meet your requirements in terms of quality and reliability?

Type of suppliers	Quality requirements					Non Quality requirements				
	Poor	Fair	Good	Very good	Excellent	Poor	Fair	Good	Very good	Excellent
Large scale farmers and processors										
Small scale farmers and processors										
Importation (If any)										

21. Is the enforcement of grade and standard made you strictly abide for/choose your suppliers? Yes No

22. What from the listed criteria do you consider when sourcing broiler and how important are they?

Criteria	Considered (1=yes/2=No)	Ranks of importance (1=very important, 2=important, 3=fairly important, 4=not important)
Process attributes		
i. Production handling and technologies		
ii. Slaughtering method		
iii. Others		
Functional attribute		
iv. Distributional Arrangement and logistics		
v. Transport cost		
vi. Other		

Coordination attributes		
vii. Price		
viii. Volume produced		
ix. Credit period		
x. Contracts/long term business relationship		
xi. Business registration (License)		
xii. Certificates of Quality and standard compliance (TFDA cert, TBS certificate)		
xiii. Traceability		
xiv. Others		

23. What are the constraints/challenges in sourcing broiler chicken/ products you are supplied with?

.....

24. Do you ever source through importation/and or sell imported chicken?

	Yes	No
If source/sourced through imports		
If sell/sold imported chicken		

25. If yes, how do you rate the ability of local and foreign suppliers in observing your requirements

Type of supplier	Poor	Fair	Good	Excellent
Local suppliers				
Foreign suppliers				

26. What can you say about the trend of consumers to use your outlet as their buying/eating places for chicken/meat in general?

Steady/slow increase increasing fast others

27. (a) If increasing fast, what might be the reason for that?

Reputable	Quality and safety issues	More choice of meat and other food products	Proximity to residences	Others

(b) If not to the above what could be a reason

28. What are the typical consumers of your most served customers?

The lower class The middle class The upper class

29. What is the sales pattern of broiler with time?

All the time Seasonal Others (specify)

30. From your experience what are factors influence chicken consumption?

Health consciousness Tasty Prestige other (specify)

31. From your experience what factors can cause poor consumption of broiler chicken

Price Not a common/staple diet Others (specify)

32. What new or additional kind of value added do you think should be employed to give more opportunities to chicken (broilers) markets?

Thank you for your time and cooperation

Appendix 9: Questionnaire for small scale farmers

BROILER SUPPLY CHAINS ANALYSIS AND SMALL SCALE FARMER ACCESS TO NICHE MARKETS: THE CASE OF DAR-ES-SALAAM AND ARUSHA MARKETS

INTERVIEW DETAILS

Date of interview.....	Interviewer.....	Questionnaire Number.....
Interviewee.....	Sex.....	Age.....
Year in schooling.....	Education.....	
Main Occupation/source of income.....	Region.....	
Municipality.....	Ward.....	Location: Urban
Peri-urban		

A. FARM PRODUCTION INFORMATION

- When did you start keeping broilers (year)
- How many broilers did you keep in your last batch in 2010 production? (specify when was the last production)
 No. of broilers in (no. of batches at one time) last month production
- With the facilities you had in 2010, was that number of broilers your full capacity? Yes No

If no continue to question 4-6; if yes go to question 7

- What was your full capacity production in 2010 according to your facilities? broilers at full capacity
- What is the reason for not utilising your full capacity level at that time?

Between production	Yes	<input type="text"/>	No	<input type="text"/>
Supply shortage of chicks	Yes	<input type="text"/>	No	<input type="text"/>
Shortage of running capital	Yes	<input type="text"/>	No	<input type="text"/>
Market uncertainty (specify)	Yes	<input type="text"/>	No	<input type="text"/>
Other (specify)	Yes	<input type="text"/>	No	<input type="text"/>
- When last did you keep full capacity in 2010 production? Last kept full capacity
- How many times you had stocked broilers at full capacity in 2010 production?
- How many batches did you keep in 2010 production (Total number of batches in 2010)
- Do you have enough area to suit your current need for broiler production? Yes No
- What is the total area of your broiler houses and number of houses? Sq. feet/ sq. metre (specify)
 Number of houses

11. Labour hours and cost used in broiler for the latest batch of 2010 production

Activity	Family Labour (man-days)					Hired Labour (man-days)					Wage rate	
	No. of people			Hrs/ day	No. of days	No. of people			Hrs/ day	No. of days	In kind	Cash (Tshs)
	M	F	C			M	F	C				
Feeding and watering												
Cleaning of the buildings												
Cleaning of the equipments												
supervision												
Others (Specify)												

12. If you assume to work on alternative activities how much you would earn? Tshs/day

13. How much was the running cost for the latest batch in 2010 production

Bedding/Litters	<input type="text"/>	Per batch	Water	<input type="text"/>	Per month
Routinely maintenance	<input type="text"/>	Per batch	kerosene	<input type="text"/>	Per batch
Disinfectant	<input type="text"/>	Per batch	Rent	<input type="text"/>	Per batch
transport	<input type="text"/>	Per batch	Staffs	<input type="text"/>	Per month
Electricity	<input type="text"/>	Per month	Others(specify)	<input type="text"/>	Per year
Charcoal	<input type="text"/>	Per batch			

14. What is the current value/ price of assets used in broiler production

Asset type	Qty	Current value (price)/unit (Tshs)
Broiler houses		
Drinkers		
Feed troughs		
Others (specify)		

B. NETWORKING AND TRADE DETAILS

15. What do you feed your broilers?

Branded commercial feed Home compounded feed both (the previous two) 16. If use commercial feed; what is your source of feed? Manufacturer Agent Others

If manufacturer, name of manufacturer/place

If agent, name of the agent/place

<input type="text"/>
<input type="text"/>

17. What was the cost of feed for most recent finished batch in 2010 production

Type of feed	starter	Finisher	Other feed ingredients
Unit size measurement			
Price per unit(Tshs)			
Quantity of units used up for latest batch in 2010			

Size of batch under reference

18. What was price trend for feed in 2010 production? Starter Lowest Highest
 Finisher lowest Highest

19. If used home made feed what was the cost for making one tonne of broiler feed for the last batch in the 2010 production?

Tshs No. of tonnes made for the last batch

20. What are the sources of DOC?
 Hatchery Market Agent Others (specify)

If it is hatchery, name of the hatchery/place
 If it is market, name of the market/place
 If it is agent, name of the agent/place

If hatchery, is it registered? Yes No Don't know

21. What was the price of DOC in your last batch for 2010? Tshs

22. What was the price trends of DOC for 2010 production year
 Lowest Most common Highest

23. How is the farm operated?
 Individual owned
 Group owned
 Contractual arrangement (specify whether it is processor, feed or company farm)

24. *Ask only if it is under contract:* If it is under contract; specify how do you pay for major inputs

	chicks	Feed	Vaccines and medicines
Cost deducted when you sell the broilers	<input type="text"/>	<input type="text"/>	<input type="text"/>
Paid on cash by yourself during procurement	<input type="text"/>	<input type="text"/>	<input type="text"/>
Not supplied under contract terms	<input type="text"/>	<input type="text"/>	<input type="text"/>

c. PRODUCTION PARAMETERS

25. At what age/live weight are your broilers generally sold or slaughtered? Age in days
 Live weight in Kg

26. How many days it takes to sell all broilers
 Number of days Size of batch under reference

27. On average how many broilers died from the last batch in 2010 production?

28. What was the proportion of death with relation to age period of broilers?

Age period	DOC	1 st week	2 nd week	3 rd week	Over 3 rd week
Proportion of Death occurrence	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

29. How many broilers have you sold in your last batch in 2010? Number of broilers

D. VETERINARY INTERVENTION AND BIOSECURITY INFORMATION

30. What is the cost of vaccines and other pharmaceuticals products used for the last batch in 2010 production?

i. Vaccines

	1 st week	2 nd week	3 rd week	4 th week
Product name				
Unit price for packet/vial				
units used up for latest batch in 2010				

ii. Vitamin-antibiotic mixture used on routine basis during the arrival of DOC

	DOC	1 st week
Product name		
Unit price		
units used up for latest batch in 2010		

iii. Vitamins/multivitamins and antibiotic used on routine basis

	2nd week	3rd week	Over 3rd week
Product name			
Unit price			
units used up for latest batch in 2010			

Size of batch under reference

31. How much did you spend on treating broilers for the last batch in 2010 Tshs

32. What was the most important diseases challenge for your 2010 broiler production?

33. Do you have footbath for people entering and leaving the broiler house? es No

34. Who is allowed to enter into broilers house?
 Buyers Fellow broiler keepers Others (specify)

35. Do you have separate shoes and clothes for entering the broiler farm?

Special shoes	Yes	No
Clothes	Yes	No

36. Do you keep another type of poultry in your area?

Local chicken		Ducks		Guinea fowl		Layers		Others
Yes	<input type="checkbox"/>	Yes	<input type="checkbox"/>	Yes	<input type="checkbox"/>	Yes	<input type="checkbox"/>	<input type="checkbox"/>
No	<input type="checkbox"/>	No	<input type="checkbox"/>	No	<input type="checkbox"/>	No	<input type="checkbox"/>	<input type="checkbox"/>

37. How do you dispose wastes from broilers

Manure	<input type="text"/>
Dead bodies	<input type="text"/>

38. Condition of the farm (to be rated by interviewer): 1= excellent, 2=Good, 3= Fair, 4=poor

Main issues	hygiene	ventilation	Quality	Dryness
condition				

MARKET AND MARKETING CONDITION

39. Do you sell live bird or dressed chicken?

Live bird	Always	<input type="checkbox"/>	often	<input type="checkbox"/>	rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Dressed chicken	Always	<input type="checkbox"/>	often	<input type="checkbox"/>	rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>

40. Where do you sell your broilers?

Farm-gate to middleman	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Farm-gate-consumers	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Butchers/meat shops	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Restaurants/Bars	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Supermarket/hotels/	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Chips-meat roster and food vendors	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Others (specify)		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

41. What was the price for the broiler sold Tshs

42. What was the price of the broiler in your most common outlet for the last batch in 2010 production?
 lowest Most common highest

43. How is price fixed? i. Negotiated at every transaction ii. Fixed at once iii. Others(specify)

44. What is your position in price setting during the sell?

Setting price	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Negotiating price	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Accepting price	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>

45. What is the mode of payment?

Cash on the sell	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
credit	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>
Cash before sell	Always	<input type="checkbox"/>	Often	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Never	<input type="checkbox"/>

46. If credit, how long does it take to receive payment? Number of days

47. What can you say about the potential of your main outlet in increasing profit/broiler farming?

Very potential potential not potential don't know

Continue to ask q45-57 only if sell processed products or supply to (Niche market)

48. Did you supply on contract? Yes No

49. If yes, what kind of contract? Formal (lawyer assisted) Informal written Verbal (trust)

INSITUTIONAL DETAILS

62. Have you received any training on broiler production? Yes No
 If yes, who provided the training?

63. How do you easily access veterinary service for your broilers?
 Public veterinary Private veterinary self-experience to treat others
 (specify)

64. What was the source for your starting capital for broiler production?

65. Did you take loan to assist in running your broiler activities last year? Yes No
 If yes, who provided the loan and what was annual interest rate charged?

Provider	Commercial bank	microfinance	SACCOs	Individual	Others (specify)
Rate					

66. Do you keep any farm record? Yes No

67. Do you take another part (other than farmer) in broiler supply chain Yes No
 If yes, which part? Hatchery feed manufacturer processor Retailers

CHALLENGES OF THE INDUSTRY AND VIEWS OF THE FUTURE ON BROILER PRODUCTION

68. What are your most challenges/concerns on the future of your broiler production?

PERCEPTION

Please indicate your attitude with regards to the following statements. Responses: 1=strongly agree, 2=agree, 3=undecided, 4=disagree, 5=strongly disagree

- A. *Attitude towards working in farmers' group*
 Working into groups is thought to be one of the effective ways for success in business. What is your view on raising broiler into group?
1. I prefer working in group
 2. I will join and work into group at any cost
 3. Working into groups will help you to access resources and services at lower cost
 4. In group work you can learn more techniques about broiler production
 5. Working into group will help you improving your current production
 6. Working into group will help you to access more market easily

7. Working into group help you to increase bargaining power for your product
8. You don't like to work into groups, as most of time you have witnessed many groups to collapse

B. Attitude towards product development

Suppose you are told there is ready market for broiler, but you are required to feed broiler for 6 weeks with weight range of 1.8-2kg for 5000 Tshs. What is your view in this situation?

9. You agree to produce to such specification making sure you get the market, no matter if you incur more cost
10. Producing good weighted broiler is very important for you to get assured market
11. Producing good weighted broiler is very important for you to get good price
12. It will just add more cost, is better you continue with current production and market as you also fetch good price
13. It is difficult for broiler to be 1.8-2kg for 6 weeks
14. Producing 1.8-2kg broiler with given price won't pay-

C. Attitude towards risk in engaging in alternative market strand

New market has evolved where buyer want good quality processed broiler with weight range 1.2-1.3kg frozen for 4500 Tshs per kilo. A buyer wants 300-400 broilers to be supplied to his/her shop weekly throughout the year with agreement well observed.

15. You are ready to produce broiler according to such specification in order to get the market even if you will have additional cost and more work
16. Added value to broiler fetch more profitable market
17. I am ready to learn to raise broiler to niche market specification, no matter if I have to pay for it
18. I am satisfied with producing and selling live broiler, therefore I do not prefer processing-
19. Producing throughout the year can be very difficult, I cannot enter to such agreement
20. I am ready to lend the money to increase production to meet customer's order

Apart from this, there is market for chicken parts, the buyer require broiler to be portioned into speciality cuts, and supply 500kg (approximately 400 broilers) weekly for 7000 per kilo with contract. What do you think?

21. Value addition to broiler is important if you want to find more profitable market
22. Without adding value to broiler in today's market, broiler farming is not worthwhile
23. I am ready to learn how to process broiler into different cuts at any cost, in order to get good market
24. With known power of larger producer in value added market, small scale farmers can not access such market
25. Portioned broiler fetch higher price but also involve much time, therefore you would rather sell live broiler for less price than processing into cuts

Apart from it, another market (a tourist hotel) want dressed broiler of 1.5-1.7 kg to be supplied to his hotel. A hotel wants about 200kg of such broiler weekly with price 5000 Tshs per kilo and farmer stick to agreement.

26. I am ready to produce broiler according to hotel specification in order to get the market even if it involve additional cost and more work.
27. Without adding value to hotel requirements, broiler marketing is not worthwhile
28. Producing broiler to tourist hotel specification fetch more profitable market
29. I am ready to learn to produce broiler to hotel specification at any cost
30. I am satisfied with producing and selling live broiler, therefore I do not prefer producing for tourist hotel
31. I am ready to lend the money to increase production to meet the order

Attitude towards market of the alternative/different broiler products:

32. If there is an opportunity to get more money by processing broiler for supermarkets, I can do it
33. If there is an opportunity to get more money by processing broiler for tourist hotels, I can do it
34. Adding value to broiler bring into different products thus increase market access/expand market opportunities-
35. Correct and prior information on price is important for one to decide producing different products
36. With the present well known market of live broiler, I cannot prefer incur more cost for producing different products for other markets

Thank you very much for your time and cooperation

Appendix 10: Discounted cash flow: niche market

Costs	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Fixed Capital		2 661 842						
Working Capital		6 477 753						
Operating Costs		11 077 743	10 551 246	11 318 370	12 147 807	13 045 068	14 016 179	15 067 731
Financial Costs		1 437 158	971 155	427 796	342 237	678 256	171 118	85 559
Total Costs		21 654 496	11 522 401	11 746 166	12 490 044	13 301 746	14 187 297	15 153 290.1
Discount Factor (15%)	1.00	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Discounted Costs		18 829 996	10 019 979	10 214 058	10 860 908	11 566 735	12 336 780	176 774
Sum (A)		87 004 730						
Benefits								
Revenue		13 969 133	13 969 133	15 366 047	16,902,651	18,592,916	20,452,208	22 497,429
Discounted Revenue		12,147,072	12 147 072	13 361 780	14 697 958	16,167,753	17 784 529	19 562 982
Sum (B)		105 869,146						
BCR		1.22						
Net cash flow		(7 685 363)	2 46 733	3 19 880	4 412 607	5,291,171	6 264 911	7 344,139
Disc Cash outflow		(6 682 924)	2 127 594	3 147 722	3 837 050	4 601 018	5 447 749	6 386 208
NPV		\$5 036 179.22						
IRR		46%						

Appendix 11: Discounted cash flow: conventional markets

Costs	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Fixed Capital		400 000						
Working Capital		4 878 918						
Operating Costs		5 278 918	6 678 918	7 256 809	7 887 990	8 577 564	9 331 135	10 154 852
Financial Costs		574 159	341 562	64 286	51 429	38 571	25 714	12 857
Total Costs		11 131 995	7 020 480	7 321 095	7 939 419	8 616 136	9 356 849	10167709.61
Discount Factor (15%)	1.00	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Discounted Costs		9 679 995	6 104 765	6,366,170	6 903 843	7 492 292	8 136 390	8 841 487
Sum (A)		53 524 942						
Benefits								
Revenue		7 712 000	7 712 000	8 483 200	9 331 520	10 264 672	11 291 139	12 420 253
Discounted Revenue		6 706 087	6 706 087	7 376 696	8 114 365	8 925 802	9 818 382	10 800 220
Sum (B)		58 447 639						
BCR		1.09						
Net cash flow		(3 419 995)	691 520	1 162 105	1 392 101	1 648 536	1 934 290	2 252 544
Disc Cash outflow		(2 973 908)	601 322	1 010 526	1 210 523	1 433 510	1 681 992	1 958 733
NPV		\$793 938.59						
IRR		30%						